



Fuel Tanks

FAQ for fuel pumps.

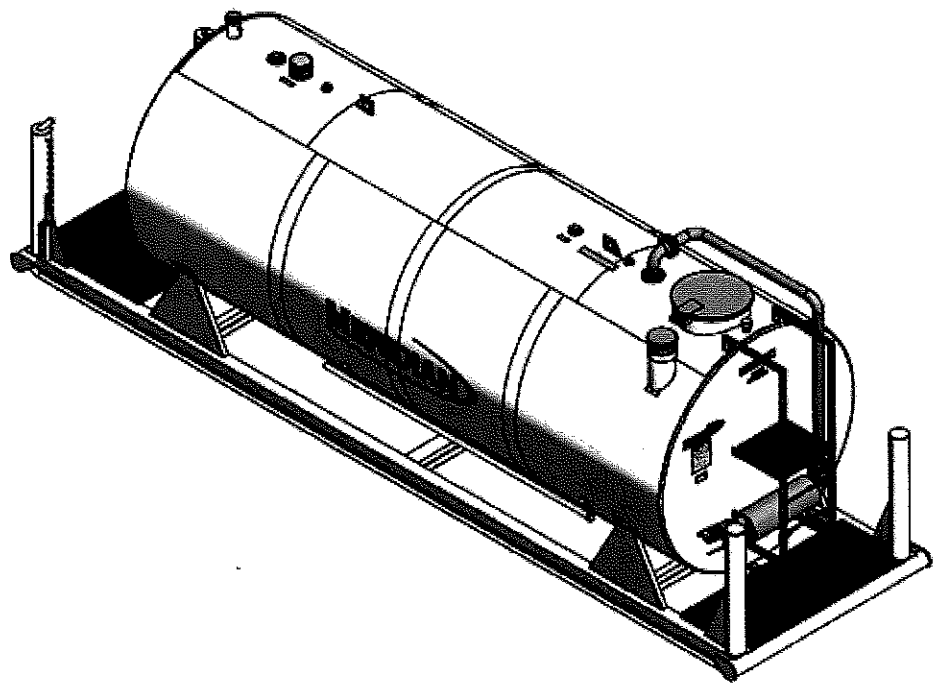
1. Q. My pump will not prime.
 - A. Check for leaks in suction line.
Check that bypass valve is not sticking.
Check Vanes have no nicks or worn down.
Check for excessive wear on rotor.
Check that the dispensing line is not blocked.
Check for vapor lock.
2. Q. My pump has low capacity.
 - A. Check screen for debris, clean and reinstall.
Check that suction line is air tight and it is not restricted.
Check that bypass valve is not sticking.
Check vanes that they are not worn or sticking.
3. Q. My pump is running slow.
 - A. Check that voltage and amp draw is correct for pump.
Check that the proper gauge of wire is being used, for the pump application.
Contact an electrician.
Check amp draw, possible motor failed. Contact your supplier.
4. Q. My motor keeps stalling
 - A. Check that your bypass valve is not sticking.
Check the voltage to the pump 120 or 220V what is the pump set on.
Check for excessive wear on rotor or vanes.
5. Q. I have fuel leaking from filter housing.
 - A. Check that filter is tight.
Check to see if it is coming from threads on piping, retape and dope threads.
Check to see if housing is warped.

6. Q. I have fuel leaking from the hose.
- A. Check the threads that they are taped, doped and tight.
Hose has a defect, contact your supplier.
7. Q. The nozzle will not shut off.
- A. Check flow rate – Min 18.9 Lpm required
Remove nozzle and drain hose.
Faulty nozzle, contact your supplier.
8. Q. The nozzle keeps shutting off while dispensing, or will not dispense at all.
- A. Make sure the pump is on.
Slow down flow rate.
Clean spout end.
Fuel filter dirty, Replace fuel filter on pump.
Check spout assembly, Replace if needed.
Check dispensing pressure - 19psi is required.
9. Q. The Nozzle leaks.
- A. Check for loose spout.
Check hose connection.
Check for cracks in nozzle.
10. Q. The meter will not work.
- A. Check for debris in meter housing.
Gear has stripped, call your pump supplier.
Possible cause to high of pressure in line, install pressure relief valve.
11. Q. The meter reads incorrect.
- A. Consult Manuel for meter calibration.
Possible air in line, Check all connections for leaks.
Clogged meter chamber, clean out.
Check for leaking seals.

12. Q. I have a 4" submersible pump that is pumping very slowly.
- A. Check voltage and amp draw as per Manual, also on cap on top of pump housing.
Check that the gauge of wire is correct for the length and application.
Check to see if seal is seated between pump and discharge in pump housing on top of tank.
13. Q. I have a 4" submersible pump that is leaking at the top of tank.
- A. Check to see if seal is seated between pump and discharge in pump housing
Check to see if it is leaking from around the spiral wound gasket in in piping
They should be torqued at 90 psi. Contact supplier.
Check piping for leaks.
14. Q. I have 220volt power to pump, but no fuel dispensing.
- A. Check to see if ball valve is closed.
Check to see if check valve is open, set screw should be all the way out
See manual.
Have an electrician check capacitor.
Motor has failed, call your supplier.
15. Q. I have fuel leaking from the meter.
- A. Check to see if it is coming from the threaded fittings. Retape and dope fittings.
Bolts in meter stripped replace meter.
Seals in meter perished replace seals.
16. Q. My pump is running but will not dispense
- A. Check for air lock in line. Remove nozzle and prime pump by running.
The nozzle has failed replace
17. Q. My tank rattles when dispensing
- A. Improper venting, check the type of vent and that its capacity meets the required amount needed for the pump that is dispensing
Vent is plugged with debris, clean out the vent.
18. Q. My fuel gauge is not working.
- A. Check that the arrows on the gauge are pointing down the length of the tank.
The float has filled with fuel or broken off, replace float.

MERIDIAN

OPERATOR'S MANUAL



15, 25 & 35,000L DW Fuel Tanks

CAN-ULC-S601-07

Table of Contents

Thank You!	2
Codes, Regulations and Guidelines	2
Personal Safety	3
Machine Safety	3
General Notes	3
Introduction	4
Standard Features	4
Specifications	4
Safety Decals	6
Fuel Tank Safety Decal Location	6
Installing The Tank	9
Installation	9
Location	9
Tank Base	9
Tank Lifting	9
Tank Inspection	9
Tank Venting	10
Overfill Protection	10
Fuel Level Inspection Port	10
Spill Box Fill Connection	10
Bottom Fill (Optional)	10
Environmental Requirements	10
Tank Protection	10
Annual Tank Inspection & Maintenance	10
15,000L Vent & Port Locations	11
25,000L Vent & Port Locations	11
35,000L Vent & Port Locations	11
Fuel Transfer Safety	12
Top Fill Procedure	13
Bottom Fill Procedure	14
Measuring Fuel Tank Levels	15
Limited Warranty	16
Warranty Claim Procedure	16
15,000L Dip Chart (100% Compartment)	5
25,000L Dip Chart (100% Compartment)	6
35,000L Dip Chart (100% Compartment)	7
Index	8

Thank You!

Thank you for purchasing the Meridian 15, 25, or 35,000L Fuel Tank and putting your trust in our hands. Setting the standard for excellence in the storage and fuel handling industry our double wall fuel tanks meet and exceed all safety and environmental standards. Built with meticulous attention to detail by an enthusiastic and skilled production team our best references are thousands of customers, like you, who have placed their trust in our superior design and technology.

Codes, Regulations and Guidelines

Built to exacting standards your 15, 25, or 35,000L Fuel Tank is designed to give years of trouble free use. To ensure it provides that service, **it is critical all operators read this entire manual before attempting to install or operate your new tank.** If you become familiar with all maintenance and safety procedures, pay close attention to safety labels and diagrams your Meridian Fuel Tank will provide years of environmentally safe trouble free service.

Fuel storage tanks fall under a variety of governmental jurisdictions; therefore the following references in this manual are provided only as a general outline. You may be subject to different legislation and governing bodies in your specific location.

IT IS THE TANK OWNER'S RESPONSIBILITY TO DETERMINE WHAT CODES AND REGULATIONS MUST BE FOLLOWED IN YOUR LOCAL AREA

Meridian Manufacturing assumes no responsibility for any errors that may appear in this manual and shall not be liable under any circumstances for incidental, consequential or punitive damages in connection with, or arising from, the use of this manual. Meridian Manufacturing reserves the right to make changes to this manual at any time without obligation or notice.

IMPORTANT

Dependent on the pump and accessory options you ordered additional operator manuals are included with the delivery of your tank. All operators must read and become familiar with these manuals before attempting to install or operate the new tank. Failure to follow these procedures may invalidate any or all warranties.

Personal Safety

Throughout this manual and on fuel tank decals, in accordance with ISO standards, you will find the signal words "**DANGER**", "**WARNING**", and "**CAUTION**" followed by specific instructions. These instructions are there to protect your personal safety and the personal safety of those working with you. Take the time to read these statements and follow the instructions.



Indicates an imminently hazardous situation which, if not avoided, **WILL** result in death or serious bodily injury.



Indicates a potentially hazardous situation which, if not avoided **COULD** result in minor or severe bodily injury.



Indicates a potentially hazardous situation which, if not avoided, **MAY** result in minor or moderate bodily injury.



SAFETY ALERT SYMBOL

Machine Safety

In addition to notes on personal safety the following text notes on Machine Safety will appear as related to machine safety. Following these instructions will help the user avoid possible machine damage.

IMPORTANT: indicates a situation which, if not followed, **WILL** involve deterioration or damage to equipment.

General Notes

The following general notices also appear in the manual. These notices draw attention to correct procedures that will assist the operator.

NOTE: Indicates an important installation, operation and/or maintenance procedure which if not followed **MAY** result in deterioration or damage to the equipment.

ATTENTION: Indicates important procedures which should be followed.

15, 25 & 35,000L DW Fuel Tanks

Introduction

Introduction

The 15, 25 and 35,000L model fuel tanks are designed to meet ULC S601-07 standards for strength and durability. This tank can accommodate a variety of fuel types and features a 100% containment system that is designed to prevent costly leaks.

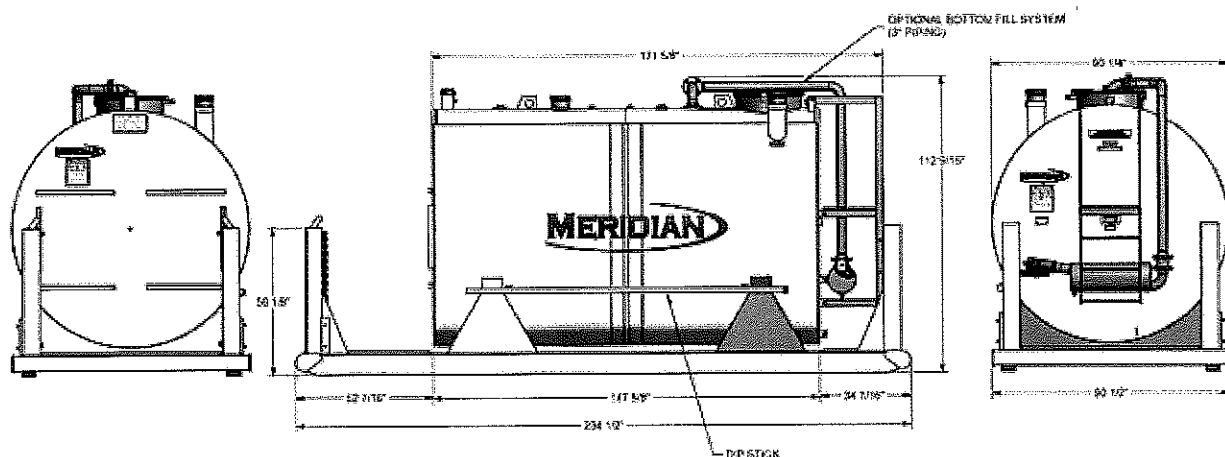
These double walled steel lined tanks are also finished with long lasting durable powder coat paint finish. With proper care and handling these tanks will provide many years of environmentally safe fuel storage.

Standard Features

- CAN-ULC-S601-07 APPROVED
- 100% SECONDARY CONTAINMENT
- HEAVY GAUGE CONSTRUCTION
- LIFTING LUGS
- EMERGENCY VENTS
- SPARE PORT FITTINGS
- FULLY WELDED HEAVY DUTY SKID
- LADDER / PLATFORM FOR EASY & FAST ACCESS TO FILL PORTS
- PREMIUM POWDER COAT FINISH

Specifications

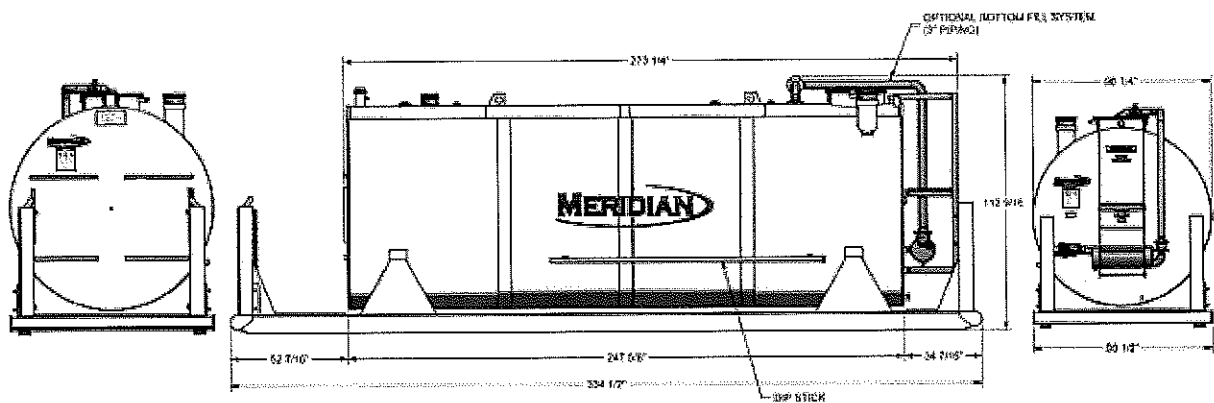
15,000L Fuel Tank	Metric	Imperial
Volume 100% Compartment	14,855 liters	3,299.5 gallons
Diameter	228.9 cm	90 1/4 "
Tank Length	380.68 cm	147 5/8 "
Tank Length (with Ladder)	445.77 cm	171 5/8 "
Tank Length (With Skid)	595.63 cm	234 1/2 "
Weight (empty)	2,962 kg	6,530 lb
Skid Weight	944 kg	2,081 lb
Bottom Fill Weight	129 kg	284.3 lb



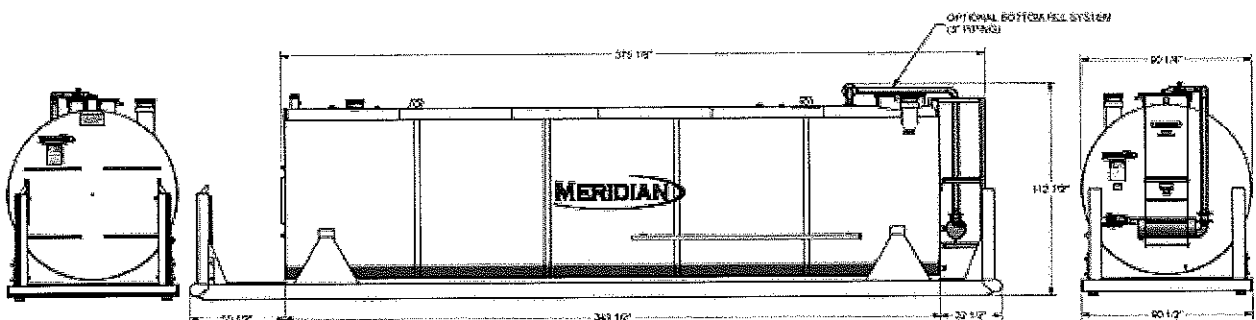
15, 25 & 35,000L DW Fuel Tanks

Introduction

25,000L Fuel Tank	Metric	Imperial
Volume 100% Compartment	24,989 liters	5,496.80 gallons
Diameter	229.87 cm	90 1/4 "
Length (without Skid)	628.96 cm	247 5/8 "
Length (with Skid)	849.63 cm	334 1/2 "
Weight (empty)	4,241 kg	9,349.8 lb.
Skid Weight	1,136 kg	2,504.4 lb.
Bottom Fill Weight	129 kg	284.3 lb.



35,000L Fuel Tank	Metric	Imperial
Volume (Total)	35,051 liters	7,698.9 gals
Diameter	231.2 cm	90 1/4 "
Length (without Skid)	883.92 cm	349 1/2 "
Length (with Skid)	1,098.5 cm	432 1/2 "
Weight (empty)	5,519 kg	12,167.3 lb
Skid Weight	1,314 kg	2,896.8 lb
Bottom Fill Weight	129 kg	284 lb



15, 25 & 35,000L DW Fuel Tanks

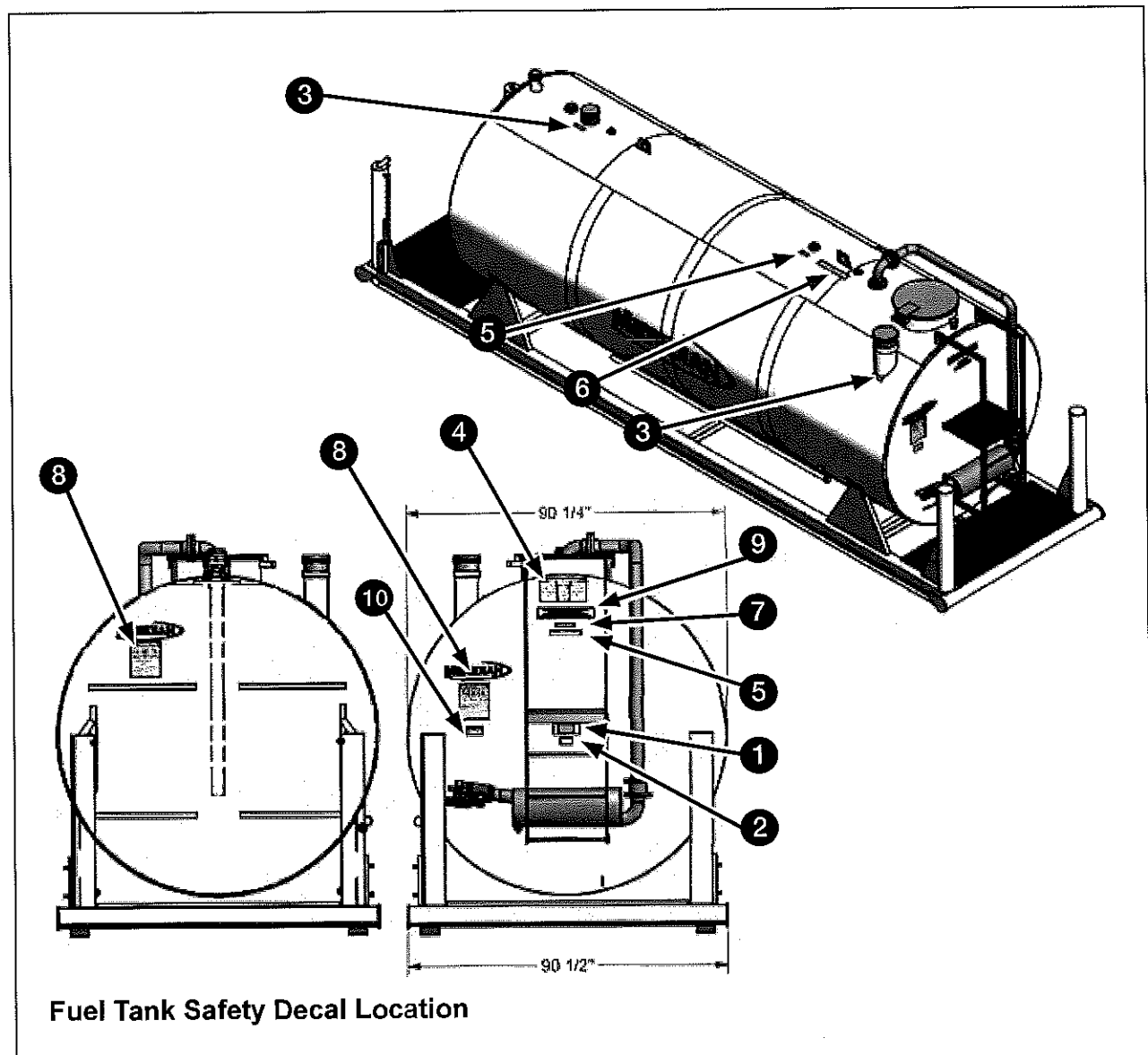
Safety Decals

Safety Decals

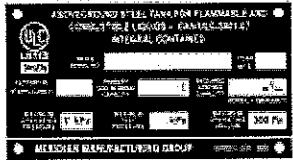
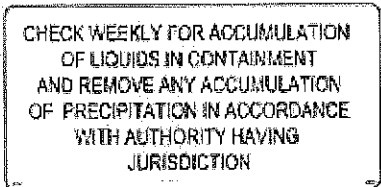
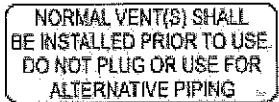
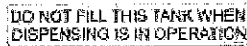
The following warning decals (see table next page) are installed on the tank at the indicated areas. Decals will vary dependent on the options associated with the selected model. They are intended for the safety of you and those working with you. Please become familiar with the location of these warning decals and the information contained on them.



If the safety decals become damaged or cannot be clearly or easily read they must be replaced.



15, 25 & 35,000L DW Fuel Tanks
Safety Decals

Decal Number	Description, Part Number and Location	Image
1	ULC Plate (P/N 20027) Located on rear of tank.	 A black rectangular decal with white text and a UL logo. It contains technical specifications for the tank, including capacity, weight, and safety warnings.
2	Serial Number Decal (P/N 19984)	 A rectangular decal with the Meridian logo at the top and a serial number field in the center. It also includes the text 'MADE IN CANADA'.
3	Emergency Vent Warning (P/N 20105) Located below Emergency Vent.	 A rectangular decal with a black border and white text. It reads: 'EMERGENCY VENTS SHALL BE INSTALLED PRIOR TO USE. DO NOT PLUG OR USE FOR ALTERNATIVE PIPING.'
4	Containment Inspection Warning. (P/N 20045) Located below Containment Inspection Port	 A rectangular decal with a black border and white text. It reads: 'CHECK WEEKLY FOR ACCUMULATION OF LIQUIDS IN CONTAINMENT AND REMOVE ANY ACCUMULATION OF PRECIPITATION IN ACCORDANCE WITH AUTHORITY HAVING JURISDICTION.'
5	Normal Vent Warning (P/N 20026) Located below 3" Spare Port	 A rectangular decal with a black border and white text. It reads: 'NORMAL VENT(S) SHALL BE INSTALLED PRIOR TO USE. DO NOT PLUG OR USE FOR ALTERNATIVE PIPING.'
6	Lifting Lug Warning (P/N 15K 19043, 25K 19044, 35K 19045) Located Below Lifting Lug.	 A rectangular decal with a black border and white text. It reads: 'DW INTEGRAL CONTAINED UTILITY TANK EMPTY WEIGHT 400KG (1000 LBS). DO NOT LIFT OR TRANSPORT TANK CONTAINING FLUID.'
7	Fill Warning (P/N 20022) Located below Vented Fill Cap.	 A rectangular decal with a black border and white text. It reads: 'DO NOT FILL THIS TANK WHEN DISPENSING IS IN OPERATION.'

15, 25 & 35,000L DW Fuel Tanks
Safety Decals

Decal Number	Description, Part Number and Location	Image
8	Danger Safety Decal (P/N 20048) Located on both ends of the tank.	
9	Jurisdictional Warning (P/N 20046) Located on dispensing end of tank.	CONSULT THE AUTHORITY HAVING JURISDICTION PRIOR TO INSTALLATION AND FOLLOW LOCAL REGULATIONS FOR DISTANCES FROM BUILDINGS.
10	Warning Falling Hazard (P/N 19961) Located next to climbing ladder.	

Installing The Tank

This document only covers general installation instructions. Consult the correct authority having jurisdiction in your area prior to tank installation.

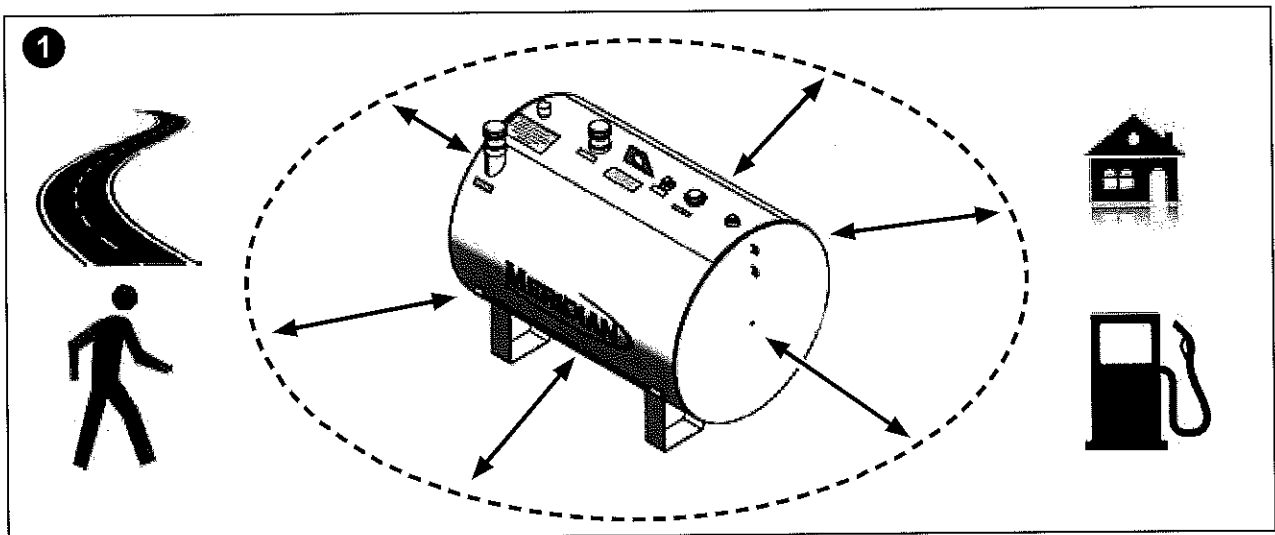
NOTE: This tank must be installed by a qualified tank installer who shall consult with the proper authorities with jurisdiction to ensure all requirements of CAN/ULC-S601-07 and all Federal, Provincial and Local codes are being met prior to installation. Failure to do so, could void your warranty.

Installation

All timber/crates used in shipping must be completely removed from the tank prior to installation of tank.

Location

The tank shall be placed at a safe distance from buildings, other tanks, roadways, waterways, property lines, public ways, etc. Refer to applicable codes and local authorities.



Tank Base

The tank shall be installed on a level base designed to support the tank weight plus 100% liquid loading. The tank skid or legs shall be the only part of the tank in contact with the foundation or base.

Tank Lifting

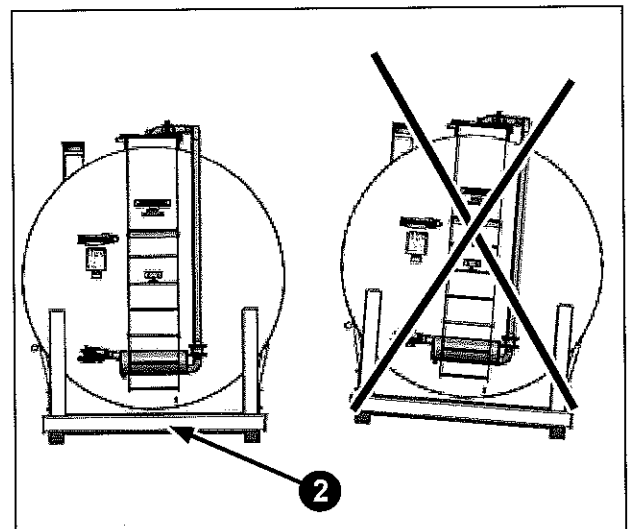
Only the lifting lugs provided with the tank shall be used for unloading or moving of the tank. Do not lift tank containing fluid at any time.

Tank Inspection

The tank installer shall ensure that all fittings, have not loosened during transportation and that they are sealed and tight.

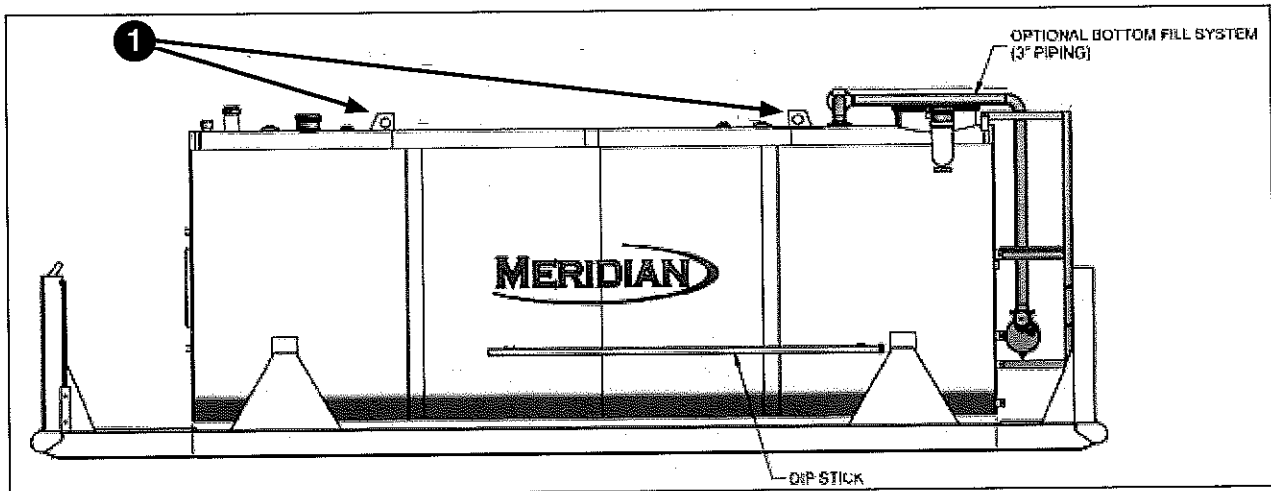
Check all painted areas of tank for damage due to shipping and also at final installation.

All scratched or scuffed areas must be touched up



15, 25 & 35,000L DW Fuel Tanks

Installing The Tank



with paint prior to use. If the damages are deemed to affect the integrity of the tank, contact your distributor or dealer prior to putting any product in the tank.

Tank Venting

The emergency vents are installed by Meridian Industries. The normal vent is to be field-installed by a qualified tank installer prior to use of the tank to prevent pressure or vacuum inside the tank during filling, emptying, or atmospheric temperature changes that may occur.

Containment Inspection

The containment tank should be checked on a regular basis, to confirm that neither precipitation nor product has accumulated therein. The disposal of any liquid found in the containment shall be disposed of in accordance with the requirements of the authority having jurisdiction.

Overfill Protection

The tank installer must ensure that an approved **OVERFILL PROTECTION DEVICE** is installed in the tank prior to the tank being filled with any fuel.

Fuel Level Inspection Port

Fuel Level Inspection Port is located in the 25 " Spill Box on top of the tank. The 2" lockable port allows tank fuel levels to be measured with the dip stick located on the side of the tank. See Measuring Fuel Tank Levels in this manual.

Spill Box Fill Connection

Ensure the hose is properly secured to the 3" connection inside the Spill Box before refueling begins. Never leave while refueling the tank. After the refueling process is completed, drain the hose before disconnecting to eliminate any spilling of fluid. Attach

 **DANGER** 
DO NOT lift or attempt to transport tanks containing fluid at any time.

the fill cap and close the Hinged Spill Box Cover.

Bottom Fill (Optional)

The 3" bottom fill system has a one way valve installed at the factory to prevent fuel from flowing back down the fill line. Ensure the one-way valve has not been tampered with and is installed correctly (arrow pointing up). Secure the fill hose to the three inch bottom fill connection and then open the ball valve on the bottom fill before beginning the refueling process. Never leave while the refueling of the tank is in process. After refueling is complete drain the hose to eliminate any chance of spilled fuel. Close the ball valve, remove the hose and replace the fill cap on the bottom fill.

Environmental Requirements

The tank installer shall ensure that all environmental requirements are implemented in accordance with the local authority having jurisdiction.

Tank Protection

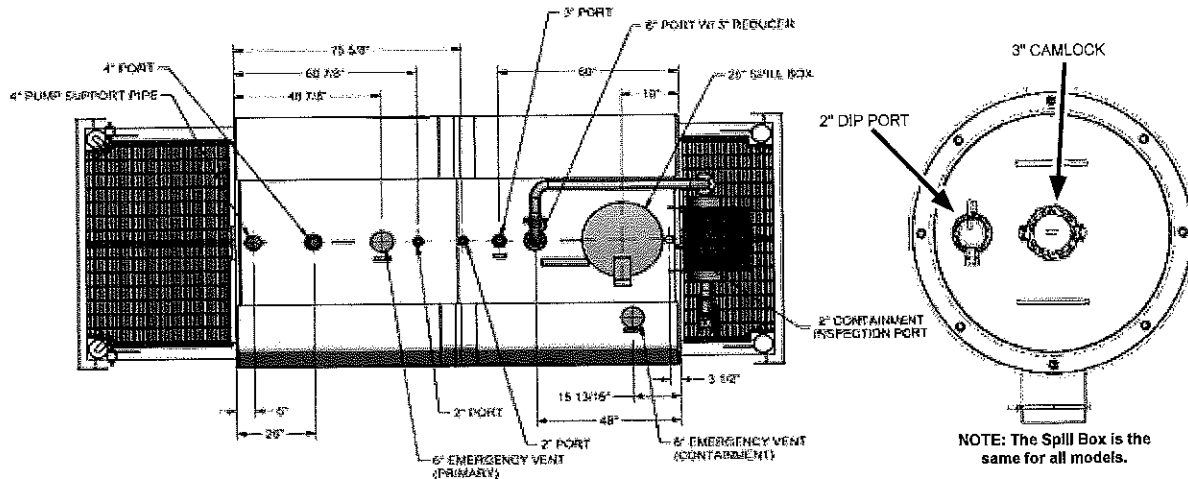
The installer is to ensure that the tank, is adequately protected against damage from vehicular traffic in compliance with all Federal, Provincial and Local Codes.

Annual Tank Inspection & Maintenance

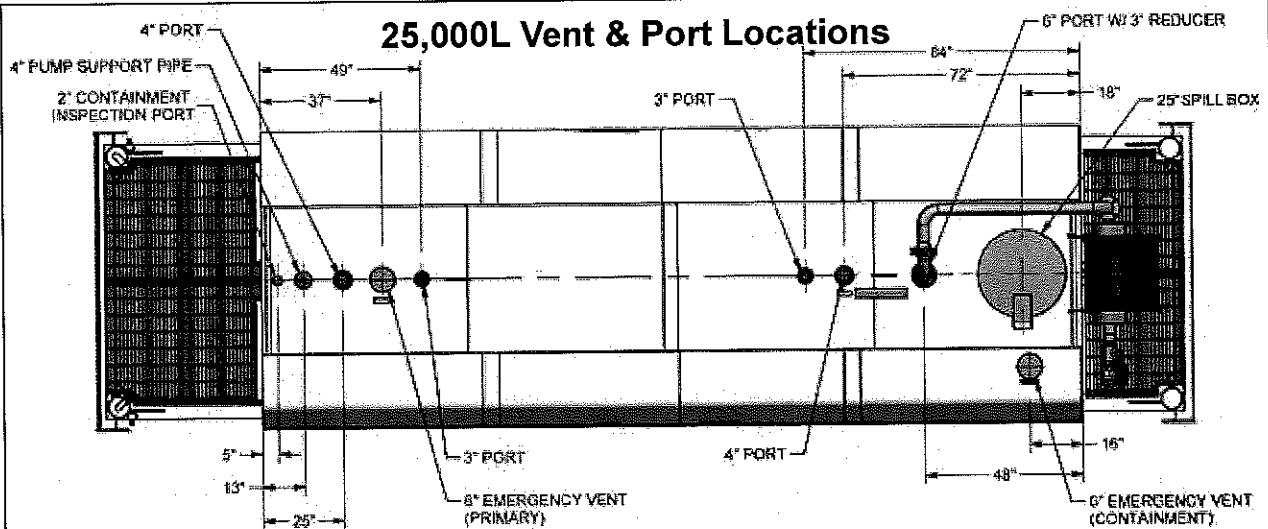
The tank is to be inspected annually and any repairs to the exterior coating shall be made at the time of inspection.

15, 25 & 35,000L DW Fuel Tanks Installing The Tank

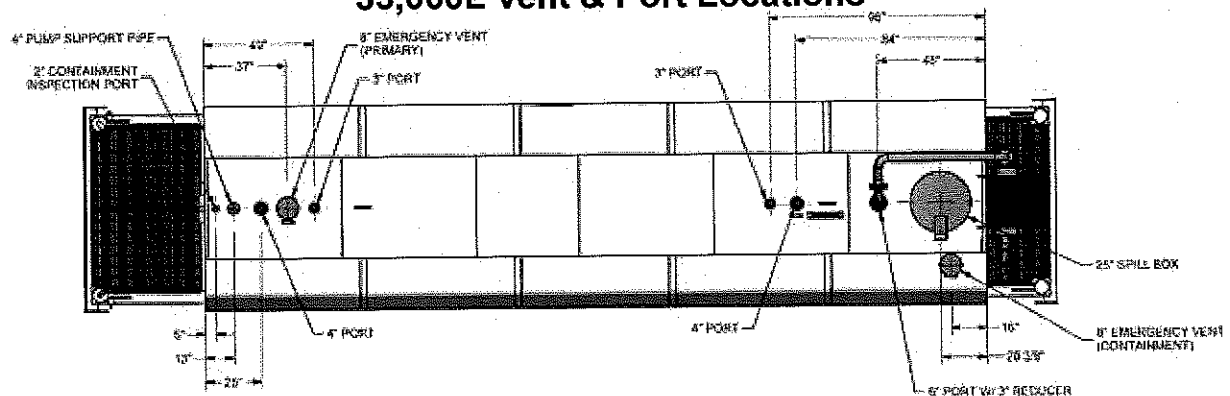
15,000L Vent & Port Locations



25,000L Vent & Port Locations



35,000L Vent & Port Locations



15, 25 & 35,000L DW Fuel Tanks

Fuel Transfer Safety

Fuel Transfer Safety

Transfer procedures are to be used when transferring fuel from a delivery vehicle to the tank. Although some transfer procedures are unique to some facilities the following general safety procedures **MUST ALWAYS BE FOLLOWED**:

- Read the Operator Manual before using the fuel tank.
- DO NOT smoke when operating or refueling the fuel tank.
- Keep sparks, flames & hot material away from the fuel tank.
- Turn Vehicle ignition off and remove key from ignition before refueling.
- Keep vehicles at least 1.5 m (5') away from the fuel tank at all times.
- Never leave the tank unattended while refueling is in process.
- DO NOT overfill. 95% capacity is the maximum legal limit.
- Always turn pump off when finished fueling operations.
- Always store pump nozzle in drip pot when not in operation.



ALWAYS determine how much fuel your tank can safely hold. Over filling the tank will cause spills. Check the fuel level by dip checking the tank prior to any fuel transfer. Instructions on the correct procedure for dip checking a tank can be found in this manual.



ALWAYS start the fuel transfer at a reduced rate. This reduces the potential for the build up of static electricity



DO NOT OVERFILL. Determine a Safe Gauge Height (SGH) this is how much fuel a tank can hold allowing for expansion due to temperature variations. A good rule of thumb is in summer months the tank should not be more than 90% full and in winter the tank should not be more than 95% full.



DO NOT dispense fuel during transfer procedures.



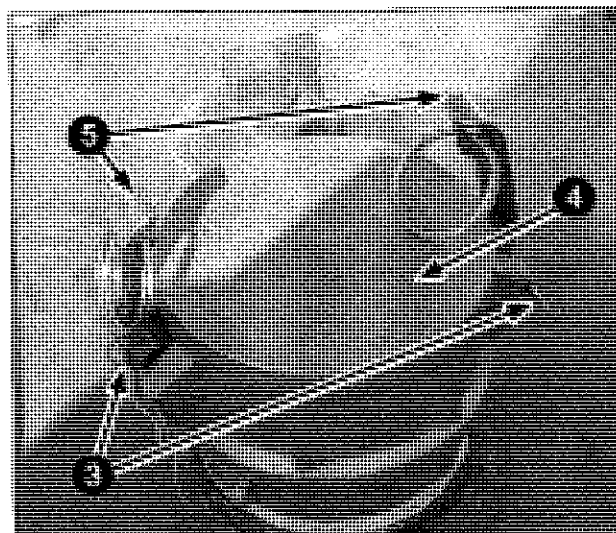
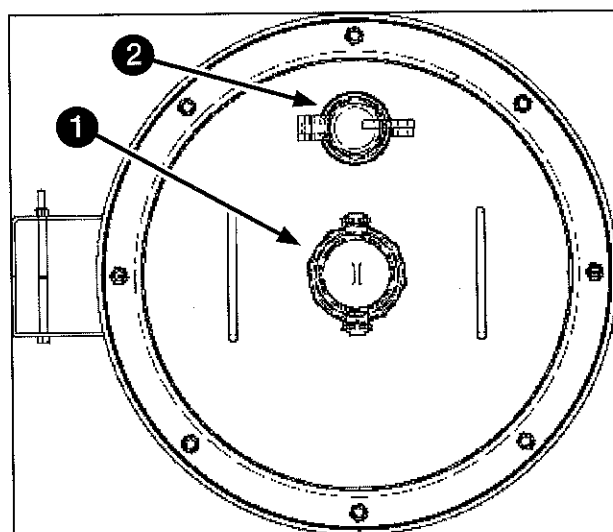
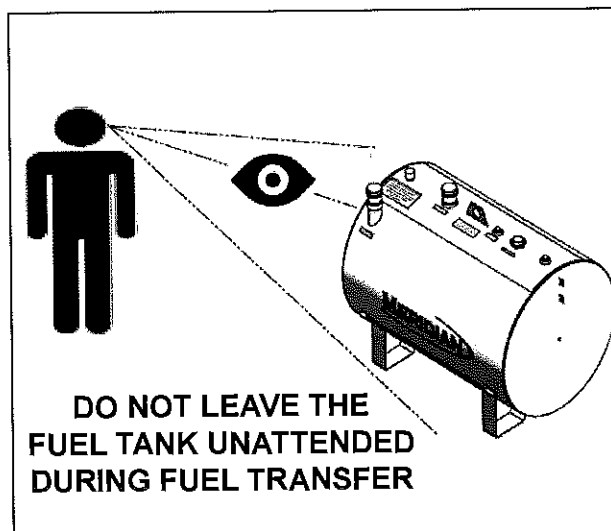
ALWAYS maintain good communications with the driver of the delivery vehicle. Poor communication between the tank operator and the delivery driver often leads to spills and accidents.

Top Fill Procedure

1. Go up the ladder and standing firmly on the platform remove the pin that secures the Spill Box Cover cover and open it.
2. Lift the Spill Box Cover to expose the 3" Male Cam Lock (1) and the 2" Dip Port (2). Ensure area is clean before refueling begins.
3. Remove the two cotter pins (3) on each side of the 3" Male Cam Lock (1) that secure the top cap (4), lower the retraining latches (5) and pull off the top cap.
4. Check the fuel level of the receiving tank through the dip port to determine how much product it can take.
5. Have a pre-transfer meeting with the operator of the delivery vehicle. Determine the correct product is being transferred into the correct tank.
6. Inspect transfer hose for visible leaks, cracks or damage in the line. If leaks are present or later appear do not continue with transfer. Repair as necessary.
7. Attach 3" Female Cam Lock to 3" Male Cam Lock and hand tighten the connection.

NOTE: If the delivery vehicle does not have a matching 3" Female Cam Lock then fill with a nozzle through the 3" fill port.

8. Use the Dip Port (2) to monitor and measure the filling process by removing the single pin. Lift to open lid. Start delivery vehicle pump and slowly begin fuel transfer. Only increase the flow of the product from the delivery vehicle when you are sure there are no problems.
9. Regularly check fuel tank levels and do not over fill the tank. A good rule of thumb is in summer months the tank should not be more than 90% full and in winter the tank should not be more than 95% full.
10. Reduce fuel transfer rates when nearing the top of the tank to avoid overfilling the tanks.
11. Notify the delivery vehicle operator when the transfer procedure is almost complete.
12. Turn off the delivery vehicle delivery pump.
13. Detach delivery hose from the 3" Male Cam Lock (1).
14. Dip tanks, read level on the dip stick and record the amount of fuel delivered.
15. Replace 3" Male Cam Lock Lid (1) and Dip Port Lid (2) and secure with pins.
16. Close and secure the Spill Box Cover.



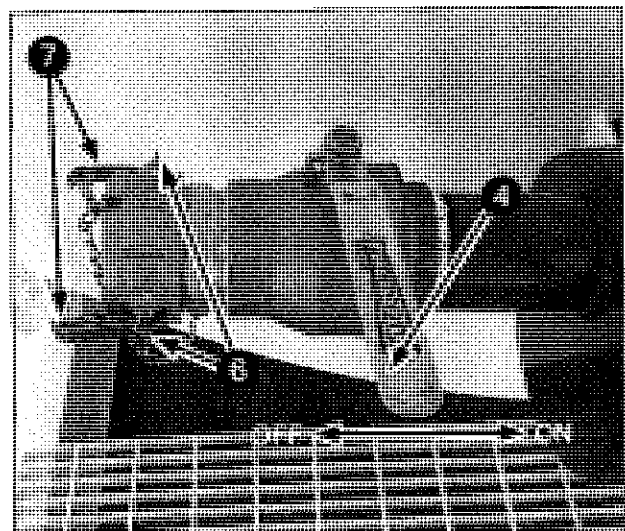
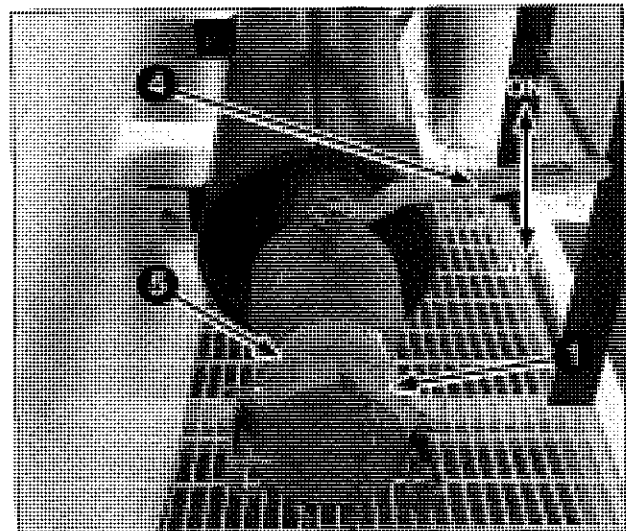
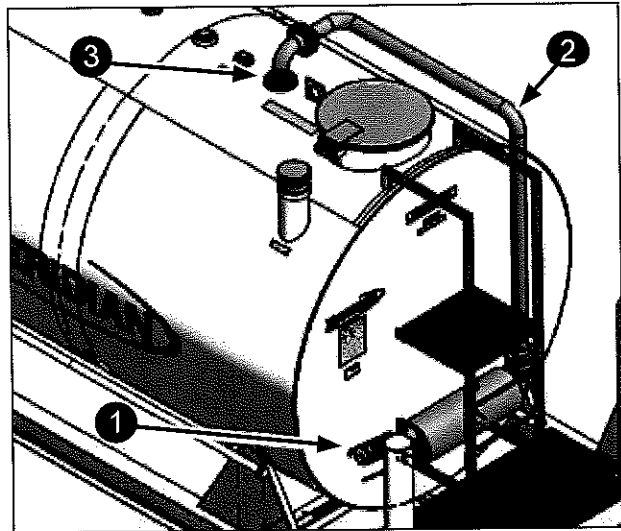
15, 25 & 35,000L DW Fuel Tanks

Bottom Fill Procedure

Bottom Fill Procedure

The bottom fill fuel tank option is a more efficient way of filling large tanks. Fuel is pumped under pressure from the delivery vehicle into the tank using a 3" Male Cam Lock (1) located at the base of the tank platform, through pipes (2) leading to the top of the tank (3).

1. Climb the ladder and standing, with both feet firmly on the platform, remove the pin securing the Spill Box Cover. Open the Spill Box Cover and check the fuel level of the receiving tank to determine how much product it can take. Determine the correct product is being transferred into the correct tank. Use the Dip Port to monitor the filling process.
2. Inspect transfer hose for visible leaks, cracks or damage in the line. If leaks are present or later appear do not continue with transfer. Repair as necessary.
3. Turn the bottom fill valve (4) to the "OFF" position. Wipe the area around the 3" Male Cam Lock (5) to prevent fuel contamination.
4. Remove the two pins (6) securing the Cam Lock Lid. Pull back the retaining levers (7) and remove the Cam Lock Lid.
5. Securely attach the transfer hose to the 3" male Cam Lock.
6. Turn the bottom fill valve (4) to the "ON" position.
7. Start delivery vehicle pump and slowly begin fuel transfer. Only increase the flow of the product from the delivery vehicle when you are sure there are no problems.
8. Regularly check fuel tank levels and do not over fill the tank. A good rule thumb is in summer months the tank should not be more than 90% full and in winter the tank should not be more than 95% full.
9. Reduce fuel transfer rates when nearing the top of the tank to avoid overfilling the tanks.
10. Notify the delivery vehicle operator when the transfer procedure is almost complete.
11. Turn off the delivery vehicle delivery pump.
12. Turn the bottom fill valve to the "OFF" position.
13. Dip tank, read level on the dip stick and record the amount of fuel delivered.
14. Ensure the delivery hose has been detached from the 3" Male Cam Lock (5). Replace 3" Male Cam Lock Lid (5) and Dip Port Lid (6) and secure with pins.
15. Close and secure the Spill Box Cover.



 **DANGER** 

Never smoke around the fuel tank or expose the tank to direct flame!

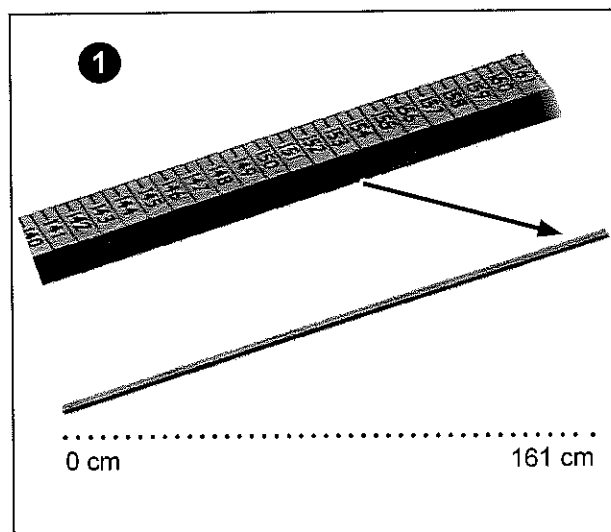
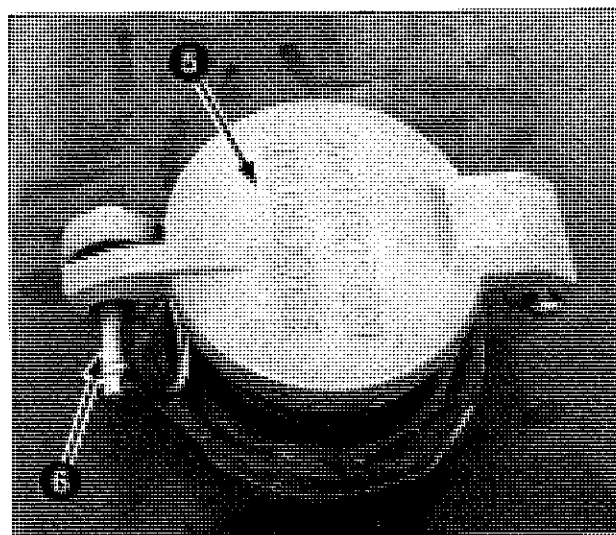
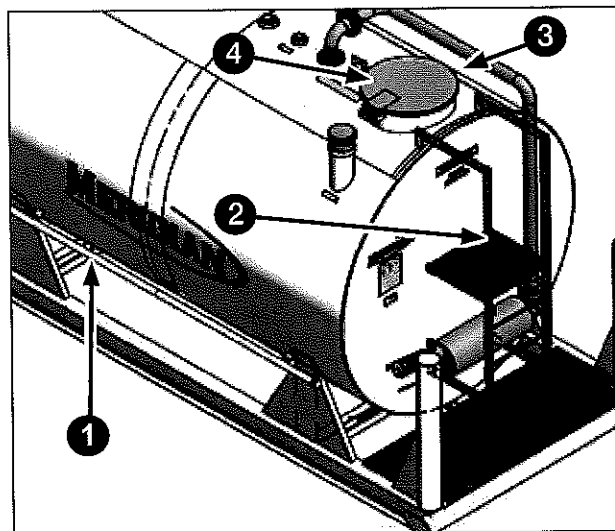
Measuring Fuel Tank Levels

NOTE: After filling the tank wait 30 - 60 mins then dip check the tanks. This allows fuel to settle and will give more accurate readings.

1. Remove the dip stick (1) from its position at the side of the tank.
2. Climb the ladder (2) and standing firmly with both feet on the platform release the pin (3) securing the Spill Box Cover (4) and lift to open.
3. Locate the Dip Port (5) and remove the cotter pin (6) securing the Lid. Lift to open.
4. Insert the dip stick into the tank until it reaches the bottom.

NOTE: Ensure the dip stick is inserted with the lowest number on the dip stick placed toward the bottom of the tank.

5. Remove the dip stick (1) and take note of the amount of fuel in centimeters (cm) that is showing on the stick.
6. Compare the number of centimeters on the dip stick with the Fuel Tank Dip Chart in this manual to determine the amount of fuel in the tank.
7. Close the fill tube lid. Secure with cotter pin (6).
8. Close and secure Spill Box Cover (4).



15, 25 & 35,000L DW Fuel Tanks Limited Warranty

Limited Warranty

Meridian Manufacturing Inc., (hereinafter referred to as the Manufacturer) hereby warrants the tank(s) sold by it to be free from any defect in material or workmanship under normal use and service for a period of two (2) years from the date of shipment. The Manufacturer also warrants the structural integrity of the tanks(s) for a period of ten (10) years from the date of shipment. The Manufacturer's obligation under this warranty shall be limited to the repair or replacement only, FOB the original point of shipment, of any defective parts or portions of the tank or accessories manufactured by Meridian. Any warranty claim must be reported to the Manufacturer within two (2) years for general and coating claims or ten (10) years for structural claims, from the date of shipment and in the manner as referred to in paragraph 2 herein.

THIS WARRANTY IS SUBJECT TO THE FOLLOWING LIMITATIONS, PROVISIONS AND CONDITIONS

1. This warranty does not apply to:
 - a. Any product sold by the Manufacturer where it is used in areas exposed to corrosive or aggressive conditions including salt water, acids, alkaloid, ash, cement dust, animal waste or other corrosive chemicals.
 - b. Failures or defects arising out of damage during shipment or during storage on site.
 - c. Materials replaced or repaired under this warranty except to the extent of the remainder of the applicable warranty.
 - d. Damage resulting from misuse, negligence, accident or improper site preparation by others.
 - e. Products that have been altered or modified by others.
 - f. (in the case of coating failures) failure as the result of damage, lack of proper maintenance or failure to remove road salt or other contaminants that may have come in contact with the tank surface.
 - g. Products that have not been installed strictly in accordance with the Manufacturer's manuals and instructions.
2. The obligation of the Manufacturer under this warranty shall not arise unless the Manufacturer is notified and this warranty is presented together with a written statement specifying the claim or defect within thirty (30) days after the failure is first detected or made known to the owner and within two (2) years for general and coating claims and ten (10) years for structural claims, from the shipment date. The Manufacturer in its sole discretion shall determine if the claim is valid and whether correction of the defect or failure shall be made by repair or replacement of the materials.
3. The coating warranty is based on the Manufacturer's performance specification for polyester powder finishes and does not include repair of minor blemishes or rusting that is normally part of the general maintenance of the tank.
4. The obligation of the Manufacturer hereunder extends only to the original owner and to the Meridian dealer to whom the materials may have been initially sold. This warranty shall not be subject to any assignment or transfer without the written consent of the Manufacturer.
5. The customer shall acknowledge that it has made its own independent decision to approve the use of the supplied materials and also the specific fabrication and construction procedures utilized to complete the tank, and has satisfied itself as to the suitability of these products for this particular application.
6. The foregoing sets forth the only warranties applicable to said materials and said warranties are given expressly and in lieu of all other warranties, expressed or implied, statutory or otherwise, of merchantability or fitness for a particular purpose and all warranties which exceed or differ from said warranties herein are disclaimed by the Manufacturer.
7. The owners sole and exclusive remedy against the Manufacturer shall be limited to the applicable warranty set forth herein and the endorsements, if any, issued together with this document and no other remedy (including but not limited to the recovery of assembly or disassembly costs, shipping costs, direct, incidental, special, indirect or consequential damages for lost profits, lost sales, injury to person or property or any other loss, whether arising from breach of contract, breach of warranty, tort, including negligence, strict liability or otherwise) shall be available to the owner or Meridian Dealer or any other person or entities whether by direct action or for contribution or indemnity or otherwise.
8. The financial obligation of the Manufacturer under this warranty shall be limited to the repair or replacement of the product as originally supplied and in no event shall exceed the original cost of the product supplied.
9. The Manufacturer shall not have any obligation under any warranty herein until all accounts for materials, installation and erection of the said product thereof and for labor and other work performed by the Manufacturer or its dealers have been paid in full by the owner.

Warranty Claim Procedure

- a. Advise the Dealer or Manufacturer immediately upon discovery of any defects.
- b. Complete the Fuel Tank Warranty Order Request found in the back of this manual in its entirety then mail or e-mail the form to tankwarrantyca@meridianmfg.com
- c. When the warranty claim form is received by the Manufacturer you will be contacted by our customer service department.
- d. Claims will be adjudicated at the sole discretion of the Manufacturer and in accordance with the terms and conditions of the applicable limited warranty.

15, 25 & 35,000L DW Fuel Tanks
Warranty Registration Form

The Meridian logo features the word "MERIDIAN" in a bold, sans-serif font. To the right of the text is a stylized oval graphic that resembles a fuel tank or a drop, with a horizontal line passing through its center.

ATTENTION DEALERS:

You can register your products online through the
Dealer Login: <http://dealers.meridianmfg.com/login/>

"Warranty Registration Form":

It is mandatory to complete this form and return to the manufacturer in order to qualify for future warranties that may arise; knowingly falsifying information on this form will result in the voiding of the product warranty.

Dealer Information
Name: _____
Address: _____
City, State, Code: _____
Phone: _____

Customer Information
Name: _____
Address: _____
City, State, Code: _____
Phone: _____

Note; registering a product in multiple entry format is only allowed when; the product has the same Model # and the same dealer, however **each serial number must be legibly listed for each unit.** Delivery dates for a multiple entry must be within a 1 month time frame.

Product Information: _____

Model #: _____

Serial #: _____

Invoice Date: _____

***Warranty Acknowledgement ***

The **"Product Warranty"** along with the **"Operator's Manual"** for this product purchase has been reviewed and understood by the end user.

Date: _____

Signature: _____

Important: Please send this form to the Meridian Manufacturing Location which built this product being registered; if you require further assistance call your Dealer or the Meridian Manufacturing outlet nearest to your location.

We want to thank you for purchasing a Meridian manufactured product. Whether this is your first Meridian purchase or you have been a customer for years; you are now part of the Meridian community of customers and we appreciate your business.

It is important that you now complete the product registration information and this form indicating you have received delivery. This registration and information is necessary to ensure you have access to warranty and product updates in the event it be required in the future.

Registration can be completed by using this form or visiting your dealer who will complete the form online. You will be given access to the Meridian Community and become eligible for updates, special offers and prizes.

Again thank you for choosing Meridian.

15, 25 & 35,000L DW Fuel Tanks
Warranty Registration Form

This page intentionally left blank.

15,000L Dip Chart (100% Compartment)

Depth	Vol	Depth	Vol	Depth	Vol	Depth	Vol	Depth	Vol	Depth	Vol
cm	L	cm	L	cm	L	cm	L	cm	L	cm	L
1	7	39	1718	77	4483	115	7621	153	10736	191	13423
2	21	40	1782	78	4562	116	7705	154	10814	192	13483
3	39	41	1846	79	4642	117	7788	155	10892	193	13543
4	59	42	1911	80	4723	118	7872	156	10970	194	13601
5	83	43	1977	81	4803	119	7956	157	11047	195	13659
6	109	44	2043	82	4884	120	8040	158	11124	196	13716
7	137	45	2110	83	4965	121	8124	159	11201	197	13772
8	167	46	2177	84	5046	122	8207	160	11277	198	13827
9	199	47	2245	85	5127	123	8291	161	11353	199	13882
10	233	48	2313	86	5208	124	8374	162	11429	200	13935
11	268	49	2382	87	5290	125	8458	163	11504	201	13988
12	305	50	2452	88	5372	126	8541	164	11579	202	14039
13	343	51	2522	89	5454	127	8625	165	11654	203	14090
14	383	52	2592	90	5536	128	8708	166	11728	204	14140
15	424	53	2663	91	5618	129	8791	167	11802	205	14189
16	467	54	2735	92	5700	130	8874	168	11875	206	14236
17	510	55	2806	93	5783	131	8957	169	11948	207	14283
18	555	56	2879	94	5866	132	9039	170	12020	208	14328
19	601	57	2952	95	5949	133	9122	171	12092	209	14372
20	649	58	3025	96	6031	134	9204	172	12164	210	14415
21	697	59	3098	97	6114	135	9287	173	12235	211	14457
22	746	60	3172	98	6198	136	9369	174	12306	212	14498
23	796	61	3247	99	6281	137	9451	175	12376	213	14537
24	848	62	3321	100	6364	138	9533	176	12446	214	14574
25	900	63	3396	101	6448	139	9615	177	12515	215	14610
26	953	64	3472	102	6531	140	9696	178	12584	216	14645
27	1007	65	3548	103	6615	141	9777	179	12652	217	14677
28	1062	66	3624	104	6698	142	9859	180	12719	218	14708
29	1118	67	3701	105	6782	143	9939	181	12786	219	14737
30	1174	68	3777	106	6866	144	10020	182	12853	220	14764
31	1232	69	3855	107	6950	145	10101	183	12919	221	14789
32	1290	70	3932	108	7033	146	10181	184	12984	222	14810
33	1349	71	4010	109	7117	147	10261	185	13049	223	14829
34	1409	72	4088	110	7201	148	10341	186	13113	224	14845
35	1469	73	4166	111	7285	149	10420	187	13176	225	14855
36	1530	74	4245	112	7369	150	10500	188	13239		
37	1592	75	4324	113	7453	151	10579	189	13301		
38	1655	76	4403	114	7537	152	10658	190	13363		

15, 25 & 35,000L DW Fuel Tanks
Depth Chart

25,000L Dip Chart (100% Compartment)

Depth	Vol
cm	L
1	13
2	35
3	65
4	100
5	139
6	183
7	230
8	281
9	334
10	391
11	451
12	513
13	577
14	644
15	714
16	785
17	859
18	934
19	1012
20	1091
21	1172
22	1255
23	1340
24	1426
25	1514
26	1603
27	1694
28	1787
29	1880
30	1976
31	2072
32	2170
33	2269
34	2370
35	2471
36	2574
37	2678
38	2783

Depth	Vol
cm	L
39	2889
40	2997
41	3105
42	3215
43	3325
44	3436
45	3549
46	3662
47	3776
48	3892
49	4008
50	4124
51	4242
52	4361
53	4480
54	4600
55	4721
56	4843
57	4965
58	5088
59	5212
60	5336
61	5461
62	5587
63	5713
64	5840
65	5968
66	6096
67	6225
68	6354
69	6484
70	6615
71	6745
72	6877
73	7009
74	7141
75	7274
76	7407

Depth	Vol
cm	L
77	7541
78	7675
79	7809
80	7944
81	8080
82	8215
83	8351
84	8488
85	8624
86	8761
87	8898
88	9036
89	9174
90	9312
91	9450
92	9589
93	9728
94	9867
95	10006
96	10146
97	10286
98	10425
99	10565
100	10706
101	10846
102	10986
103	11127
104	11268
105	11409
106	11549
107	11690
108	11831
109	11972
110	12114
111	12255
112	12396
113	12537
114	12678

Depth	Vol
cm	L
115	12819
116	12960
117	13102
118	13243
119	13384
120	13524
121	13665
122	13806
123	13947
124	14087
125	14228
126	14368
127	14508
128	14648
129	14788
130	14927
131	15067
132	15206
133	15345
134	15483
135	15622
136	15760
137	15898
138	16036
139	16173
140	16310
141	16447
142	16584
143	16720
144	16856
145	16991
146	17126
147	17261
148	17395
149	17529
150	17662
151	17795
152	17928

Depth	Vol
cm	L
153	18060
154	18192
155	18323
156	18453
157	18583
158	18713
159	18842
160	18970
161	19098
162	19225
163	19352
164	19478
165	19603
166	19728
167	19852
168	19976
169	20098
170	20220
171	20341
172	20462
173	20582
174	20700
175	20818
176	20936
177	21052
178	21168
179	21282
180	21396
181	21509
182	21621
183	21731
184	21841
185	21950
186	22058
187	22165
188	22270
189	22375
190	22478

Depth	Vol
cm	L
191	22580
192	22681
193	22781
194	22879
195	22976
196	23072
197	23167
198	23260
199	23351
200	23441
201	23530
202	23617
203	23702
204	23786
205	23868
206	23948
207	24026
208	24102
209	24177
210	24249
211	24319
212	24387
213	24453
214	24516
215	24577
216	24635
217	24690
218	24742
219	24790
220	24836
221	24877
222	24914
223	24946
224	24972
225	24989

35,000L Dip Chart (100% Compartment)

Depth	Vol	Depth	Vol	Depth	Vol	Depth	Vol	Depth	Vol	Depth	Vol
cm	L	cm	L	cm	L	cm	L	cm	L	cm	L
1	18	42	4509	83	11714	124	19759	165	27497	206	33590
2	50	43	4664	84	11905	125	19956	166	27672	207	33700
3	91	44	4820	85	12097	126	20153	167	27846	208	33807
4	140	45	4978	86	12289	127	20350	168	28019	209	33912
5	195	46	5137	87	12481	128	20546	169	28191	210	34013
6	256	47	5297	88	12674	129	20742	170	28362	211	34112
7	323	48	5458	89	12868	130	20938	171	28532	212	34207
8	394	49	5621	90	13062	131	21133	172	28701	213	34299
9	469	50	5785	91	13256	132	21328	173	28869	214	34388
10	549	51	5950	92	13450	133	21523	174	29036	215	34473
11	632	52	6117	93	13645	134	21718	175	29201	216	34554
12	719	53	6284	94	13840	135	21912	176	29366	217	34631
13	810	54	6452	95	14036	136	22106	177	29529	218	34704
14	904	55	6622	96	14231	137	22300	178	29691	219	34772
15	1001	56	6793	97	14427	138	22493	179	29852	220	34836
16	1101	57	6964	98	14623	139	22686	180	30011	221	34894
17	1204	58	7137	99	14820	140	22878	181	30169	222	34945
18	1310	59	7310	100	15016	141	23070	182	30326	223	34990
19	1419	60	7485	101	15213	142	23261	183	30482	224	35026
20	1530	61	7660	102	15410	143	23452	184	30636	225	35051
21	1644	62	7837	103	15607	144	23643	185	30788		
22	1760	63	8014	104	15805	145	23833	186	30940		
23	1879	64	8192	105	16002	146	24022	187	31089		
24	2000	65	8371	106	16200	147	24211	188	31237		
25	2123	66	8551	107	16398	148	24399	189	31384		
26	2249	67	8732	108	16595	149	24587	190	31529		
27	2376	68	8913	109	16793	150	24774	191	31672		
28	2506	69	9095	110	16991	151	24961	192	31814		
29	2638	70	9278	111	17189	152	25147	193	31954		
30	2771	71	9462	112	17387	153	25332	194	32092		
31	2907	72	9646	113	17585	154	25517	195	32228		
32	3044	73	9831	114	17783	155	25700	196	32362		
33	3183	74	10016	115	17981	156	25884	197	32495		
34	3324	75	10203	116	18179	157	26066	198	32625		
35	3466	76	10390	117	18377	158	26248	199	32754		
36	3611	77	10577	118	18575	159	26429	200	32880		
37	3756	78	10765	119	18772	160	26609	201	33004		
38	3904	79	10954	120	18970	161	26788	202	33126		
39	4053	80	11143	121	19168	162	26967	203	33246		
40	4204	81	11333	122	19365	163	27144	204	33363		
41	4356	82	11523	123	19562	164	27321	205	33478		

15, 25 & 35,000L DW Fuel Tanks

Index

Index	
Bottom Fill Procedures	14
Bottom Fill Weight	4, 5
CAN/ULC-S601-07	9
Climbing Ladder	4, 8
Coating Warranty	16
Codes	2
Containment Inspection Warning	7
Containment System	4
Danger Safety Decal	8
Decals	6, 7
Diameter	4, 5
Dip Charts	15, 5, 6
Dip Stick	15
Drop Tube	15
Emergency Vent Warning	7
Fill Warning	7
Fuel Transfer Safety	12
Guidelines	2
Installation	9
Jurisdictional Warning	8
Length (without Skid)	4, 5
Length (with Skid)	4, 5
Lifting Lug	4, 7
Lifting Lug Warning	7
Limited Warranty	16
Machine Safety	3
Measuring Fuel Tank Levels	15
Personal Safety	3
Qualified Installer	9
Regulations	2
Safety Decals	6
Serial Number	7
Skid Weight	4, 5
Specifications	4
Standard Features	4
Structural Integrity	16
ULC Plate	7
Vent & Port Locations	11
Volume	4, 5
Warning Falling Hazard	8
Warranty	16
Warranty Order Request	16
Weight (empty)	4, 5

This page intentionally left blank.

MERIDIAN MANUFACTURING INC.

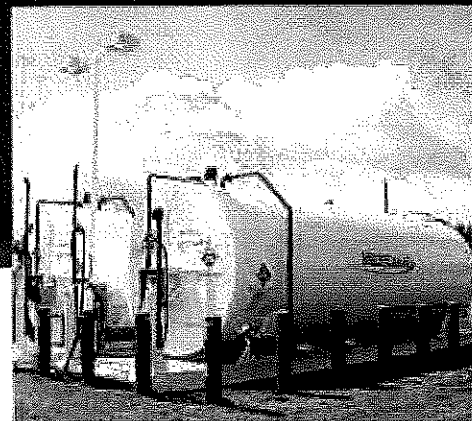
With over 65 years of experience,
Meridian is your storage and handling expert.



AGRICULTURAL



INDUSTRIAL



OIL & GAS

Cambridge Office
605 Sheldon Drive
Cambridge, ON N1T 2K1
PH: 519.620.6004
TF: 855.346.3712
FX: 519.620.6041

Camrose Office
4232 - 38 St.
Camrose, AB T4V 4B2
PH: 780.672.4516
TF: 800.830.2467
FX: 780.672.4759

Lethbridge Office
3125 - 24 Ave. N.
Lethbridge, AB T1H 5G2
PH: 403.320.7070
TF: 800.661.1436
FX: 403.320.7579

Regina Office
PO Box 1996
Regina, SK S4P 3E1
PH: 306.545.4044
TF: 800.667.5904
FX: 306.545.4216

Storm Lake Office
2902 Expansion Blvd.
Storm Lake, IA 50568
PH: 712.732.1780
TF: 800.437.2334
FX: 712.732.1028

Winkler Office
Box 760, 275 Hespler Ave.
Winkler, MB R6W 4A8
PH: 204.325.7883
TF: 800.665.7259
FX: 204.325.5556

MERIDIAN

www.meridianmfg.com

Fuel Tank related websites for information:

<http://www.ptmaa.ab.ca/index.php>

<http://www.ul.com/>

**NATIONAL
STANDARD
OF CANADA**

CAN/ULC-S677-14

**STANDARD FOR FIRE TESTED ABOVEGROUND TANK
ASSEMBLIES FOR FLAMMABLE AND COMBUSTIBLE
LIQUIDS**



ULC Standards
Normes ULC



Standards Council of Canada
Conseil canadien des normes

Underwriters Laboratories of Canada (ULC) was established in 1920 by letters patent issued by the Canadian Government. It maintains and operates laboratories and certification services for the examination, testing and certification of appliances, equipment, materials, constructions and systems to determine their relation to life, fire and property hazards as well providing inspection services.

Underwriters Laboratories of Canada is accredited by the Standards Council of Canada as a Certification Organization, a Testing Organization, and an Inspection Body under the National Standards System of Canada.

ULC Standards develops and publishes standards and other related publications for building construction, security and burglar protection, environmental safety, electrical equipment, fire protection equipment, gas and oil equipment, thermal insulation products, materials and systems, energy use in the built environment and electrical utility safety.

ULC Standards is a not-for-profit organization and is accredited by the Standards Council of Canada as a Standards Development Organization.

National Standards of Canada developed by ULC Standards conform to the criteria and procedures established by the Standards Council of Canada. Such standards are prepared using the consensus principle by individuals who provide a balanced representation of interests relevant to the subject area on a national basis.

ULC is represented across Canada as well as many countries worldwide. For further information on ULC services, please contact:

Customer Service: 1-866-937-3852

CORPORATE HEADQUARTERS

Underwriters Laboratories of Canada
7 Underwriters Road
Toronto, Ontario M1R 3A9
Telephone: (416) 757-3611
Fax: (416) 757-9540

REGIONAL OFFICES

PACIFIC OFFICE

13775 Commerce Parkway, Suite 130
Richmond, British Columbia V6V 2V4
Telephone: (604) 214-9555
Fax: (604) 214-9550

EASTERN OFFICE

6505, Rte Transcanadienne, Suite 330
St-Laurent, Québec H4T 1S3
Telephone: (514) 363-5941
Fax: (514) 363-7014

The Standards Council of Canada (SCC) is the coordinating body of the Canadian standardization network, which is composed of people and organizations involved in the development, promotion and implementation of standards. Through the collaborative efforts of Canadian standardization network members, standardization is helping to advance the social and economic well-being of Canada and to safeguard the health and safety of Canadians. The network's efforts are overseen by SCC.

The principal objectives of SCC are to foster and promote voluntary standardization as a means of advancing the national economy, supporting sustainable development, benefiting the health, safety and welfare of workers and the public, assisting and protecting the consumer, facilitating domestic and international trade, and furthering international cooperation in relation to standardization.

An important facet of the Canadian standards development system is the use of the following principles: consensus; equal access and effective participation by concerned interests; respect for diverse interests and identification of those who should be afforded access to provide the needed balance of interests; mechanism for dispute resolution; openness and transparency; open access by interested parties to the procedures guiding the standards development process; clarity with respect to the processes; and Canadian interest consideration as the initial basis for the development of standards.

A National Standard of Canada (NSC) is a standard prepared or reviewed by an SCC-accredited SDO and approved by the SCC according to NSC approval requirements. Approval does not refer to the technical content of the standard, as this remains the responsibility of the SDO. An NSC reflects a consensus of a number of capable individuals whose collective interests provide, to the greatest practicable extent, a balance of representation of general interests, producers, regulators, users (including consumers) and others with relevant interests, as may be appropriate to the subject at hand. NSCs are intended to make a significant and timely contribution to the Canadian interest.

Those who have a need to apply standards are encouraged to use NSCs. These standards are subject to periodic review. Users of NSCs are cautioned to obtain the latest edition from the SDO that publishes the standard.

The responsibility for approving standards as NSCs rests with:

Standards Council of Canada
270 Albert Street
Suite 200
Ottawa, Ontario
K1P 6N7
Telephone: (613) 238-3222

For further information on ULC standards, please contact:

ULC STANDARDS

171 Nepean Street, Suite 400
Ottawa, Ontario K2P 0B4
Telephone: (613) 755-2729
Fax: (613) 231-5977

E-mail: customerservice@ulc.ca
Web site: www.ulc.ca

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for this particular application.

Copies of this National Standard of Canada may be ordered from ULC Standards.

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE

**NATIONAL
STANDARD
OF CANADA**

CAN/ULC-S677-14

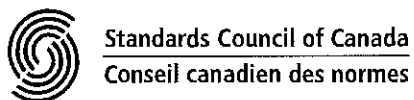
**STANDARD FOR FIRE TESTED ABOVEGROUND TANK ASSEMBLIES
FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS**

ICS 23.020.10, 75.200

Prepared and Published by



Approved by



FIRST EDITION OCTOBER 2014

Copyright © 2014

ULC Standards

All rights reserved. No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without prior permission.

TABLE OF CONTENTS

ULC STANDARDS COMMITTEE ON STATIONARY STEEL STORAGE CONTAINERS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS	i
ULC STANDARDS TASK GROUP ON STANDARD FOR FIRE TESTED ABOVEGROUND TANK ASSEMBLIES FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS	ii
PREFACE	iii
1 SCOPE	1
2 REFERENCE PUBLICATIONS	1
3 GLOSSARY	3
4 CONSTRUCTION	3
4.1 GENERAL	3
4.2 THE PRIMARY TANK	3
4.3 SECONDARY CONTAINMENT	4
4.4 INTERSTITIAL MONITORING	4
4.5 WELDING	4
4.6 NORMAL AND EMERGENCY VENTING	5
5 PERFORMANCE	5
5.1 GENERAL	5
5.2 PIPE-FITTING, TORQUE STRENGTH TEST	5
5.3 PIPE-FITTING, BENDING-MOMENT STRENGTH TEST	5
5.4 LIFT-FITTING STRENGTH TEST	6
5.5 BALL IMPACT TEST	6
5.6 LOAD TEST	6
5.7 TANK SUPPORT LOAD TEST	6
5.8 ENVIRONMENTAL EXPOSURE	6
5.8.1 PERFORMANCE CRITERIA	6
5.8.2 SIMULATED ENVIRONMENTAL EXPOSURES	7
5.9 INTERSTITIAL COMMUNICATION TEST	7
5.10 HYDROSTATIC STRENGTH TEST OF TANK ASSEMBLY	8
5.11 PRESSURE SURGE TEST (VENTING BY FORM OF CONSTRUCTION)	8
5.12 FIRE TEST	8
6 MARKING	9
7 INSTALLATION INSTRUCTIONS	9
TABLES	11

**ULC STANDARDS COMMITTEE ON STATIONARY STEEL STORAGE CONTAINERS FOR
FLAMMABLE AND COMBUSTIBLE LIQUIDS**

NAME	AFFILIATION	REGION	CATEGORY
J. Dutton (Chair)	Department of Environment and Conservation	Newfoundland and Labrador	Regulator
A. Barker	Technical Standards & Safety Authority	Ontario	Regulator
E. Bourassa	Granby Industries L.P.	Quebec	Producer
R. Cox	Alberta Municipal Affairs	Alberta	Regulator
A. Crimi	AC Consulting Solutions Inc.	Ontario	General Interest
W. Doppler	Westeel	Saskatchewan	Producer
A. Dornan	Environment Canada	Canada	Regulator
E. Fernandes	Ontario Petroleum Contractors Association	Ontario	User
T. Gilbertson	Manitoba Conservation	Manitoba	Regulator
L. Grainawi	Steel Tank Institute	U.S.A.	User
D. Hall	Steelcraft, Inc.	Ontario	Producer
S. Hyde-Clarke	National Research Council of Canada	Canada	General Interest
S. Jones	J and B Engineering, Inc.	Canada	User
N. Klassen	Steel Tank Institute - Canadian Representative	Canada	Producer
P. Legault	Department of National Defense	Canada	Regulator
D. Lenart	Imperial Oil	Canada	User
M. Mallvaganam	Consultant	Ontario	General Interest
G. Nikolic	MHCC Consultants, Inc.	Ontario	General Interest
D. Northcotte	North Waterloo Farmers Mutual Insurance	Ontario	General Interest
B. Smith	Canadian Oil Heat Association	Canada	User
D. Snider	AGI Envirotank	Saskatchewan	Producer
C. Stevenson	Apex Corrosion	Canada	General Interest
H. Sukhu	DTE Industries	Ontario	Producer
T. Tidy	Tidy Steel / Regal Tanks	British Columbia	Producer
W. Trussler	Ship's Point Consulting	Canada	User
E. Beaulieu (Associate Member)	Les Industries Desjardins Ltee.	Québec	(Non-Voting)
S. Corbett (Associate Member)	Calgary Fire Department	Alberta	(Non-Voting)
D. Edgecombe (Associate Member)	Petroleum Tank Management Association	Alberta	(Non-Voting)
M. Modéry (Associate Member)	Environment Canada	Canada	(Non-Voting)
J. Wade (Associate Member)	ULC Standards	Canada	(Non-Voting)
A. Tai Sue (Associate Member)	Underwriters Laboratories of Canada	Canada	(Non-Voting)
B. Murphy (Associate Member)	ULC Standards	Canada	(Non-Voting)
T. Espejo (Secretary)	ULC Standards	Canada	(Non-Voting)

This list represents the membership at the time the Committee balloted on the final text of this edition. Since that time, changes in the membership may have occurred.

**ULC STANDARDS TASK GROUP ON STANDARD FOR FIRE TESTED ABOVEGROUND TANK
ASSEMBLIES FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS**

MEMBER

REPRESENTING

J. Dutton	Department of Environment and Conservation, Newfoundland and Labrador
L. Grainawi	Steel Tank Institute, U.S.A.
N. Klassen	Westeel, Canada
M. Mailvaganam	Consultant, Ontario
G. Nikolic	MHCC Consultants Inc., Ontario
D. Schmidt	Steel Tank Institute, U.S.A.
D. Snider	AGI Envirotank, Saskatchewan
C. Stevenson	APEX Corrosion, Canada
T. Tidy	Tidy Steel / Regal Tanks, British Columbia
B. Murphy	ULC Standards, Canada

STANDARD FOR FIRE TESTED ABOVEGROUND TANK ASSEMBLIES FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS

PREFACE

This is the First Edition of the Standard for Fire Tested Aboveground Tank Assemblies for Flammable and Combustible Liquids, CAN/ULC-S677.

This Edition of the Standard was developed by the ULC Standards Task Group on CAN/ULC-S677 and was formally approved by the ULC Standards Committee on Stationary Steel Storage Containers for Flammable and Combustible Liquids.

Only metric SI units of measurement are used in this Standard. If a value for measurement is followed by a value in other units in parentheses, the second value may be approximate. The first stated value is the requirement.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

This First Edition National Standard of Canada is based on, and now supersedes, the First Edition, ULC/ORD-C142.5, Concrete Encased Steel Aboveground Tank Assemblies for Flammable and Combustible Liquids.

Attention is drawn to the possibility that some of the elements of this Canadian standard may be the subject of patent rights. ULC Standards shall not be held responsible for identifying any or all such patent rights.

Requests for interpretation of this Standard should be sent to ULC Standards. The requests should be worded in such a manner as to permit a "yes" or "no" answer based on the literal text of the requirement concerned.

The initiation of the review of this Standard will commence within 5 years of the date of publication, unless the Standard is identified as fitting within a stabilized category, whereby the review will commence within the appropriate time frame set out by ULC Standards.

This Standard is intended to be used for conformity assessment.

1 SCOPE

1.1 This Standard covers minimum requirements for shop fabricated, aboveground fire tested *tank assemblies* intended for storage of *flammable and combustible liquids* that have a specific gravity not greater than 1.0 and that are compatible with the material of the tank.

1.2 *Tank assemblies* constructed to meet this standard are intended to withstand exposure to a 1 h hydrocarbon pool fire.

1.3 These *tank assemblies* are intended for stationary installation and use in accordance with the following:

- A National Fire Code of Canada, Part 4;
- B CSA B139, Installation Code for Oil Burning Equipment;
- C PN1326, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products;
- D The Requirements of the Authority Having Jurisdiction.

1.4 *Tank assemblies* covered by these requirements are fabricated, inspected, and tested for leakage before shipment from the factory as completely assembled units.

1.5 These requirements do not address methods of anchoring which may be required to prevent uplift from flooding or movement due to wind or seismic forces.

1.6 These requirements do not address either the construction, or attachment means of ladders, stairs, runways, guardrails, platforms, or equipment supports.

2 REFERENCE PUBLICATIONS

2.1 The documents shown below are referenced in the text of this Standard. Unless otherwise stated elsewhere in this Standard such reference shall be considered to indicate the edition and/or revisions of the document available at the date on which the Committee approved this ULC Standard. All undated references shall be interpreted as referring to the latest edition of that document.

Document Published by the American Society of Mechanical Engineers (ASME)
3 Park Avenue, M/S 10 E, New York, NY 10016-5990, U.S.A.,
Telephone: (212) 705-8562
www.asme.org

- ANSI/ASME B36.10M-2004 (R2010), Standard for Welded and Seamless Wrought Steel Pipe

Documents Published by the American Society for Testing and Materials (ASTM)
100 Barr Harbor Drive, West Conshohocken, PA 19428-2959
Telephone: (610) 832-9585
www.astm.org

- ASTM A36/A36M-12, Standard Specification for Carbon Structural Steel
- ASTM B117-11, Standard Practice for Operating Salt Spray (Fog) Apparatus

- ASTM E96/E96M-13, Standard Test Methods for Water Vapor Transmission of Materials
 - ASTM G153-13, Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Non-metallic Materials
 - ASTM G155-13, Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-metallic Materials
-

Document Published by the Canadian Council of Ministers of the Environment
CCME Publications c/o Manitoba Statutory Publications, Lower Level, 200 Vaughan Street, Winnipeg, MB
R3C 1T5,
Telephone: (204) 945-4664; (800) 805-3025
www.ccme.ca

- PN1326-2003, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products - 2003
-

Documents Published by the Canadian General Standards Board (CGSB)
11 Laurier Street, Hull, Quebec K1A 0S5
Telephone: (819) 956-0425
www.pwgsc.gc.ca

- CAN/CGSB-3.2-2013, Heating Fuel Oil
-

Standards Published by the CSA Group
5060 Spectrum Way, Mississauga, ON L4W 5N6
Telephone: (800) 469-6727, (416) 747-4000
www.csagroup.ca

- CAN/CSA-B139-09, Installation Code for Oil Burning Equipment
 - CAN/CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel
-

Codes Published by National Research Council of Canada (NRC)
1200 Montreal Rd, Bldg. M-58, Ottawa, ON K1A 0R6
Telephone: (800) 672 7990
www.nrc-cnrc.gc.ca

- National Fire Code of Canada, 2010
-

Documents Published by Underwriters Laboratories of Canada (ULC)
7 Underwriters Road, Toronto, ON M1R 3A9 Canada
Telephone: (416) 757-3611
www.ulc.ca

- CAN/ULC-S602-07, Aboveground Steel Tanks for Fuel Oil and Lubricating Oil
-

Documents Published by ULC Standards

171 Nepean Street, Suite 400, Ottawa, ON K2P 0B4 Canada
Telephone: (416) 757-3611, ext. 61744; Fax (613) 231-5977, "ATTN: Publications"
E-mail: publications@ulc.ca
www.ulc.ca

- CAN/ULC-S601-14, Standard for Shop Fabricated Steel Aboveground Tanks for Flammable and Combustible Liquids
- CAN/ULC-S603.1-11, Standard for External Corrosion Protection Systems for Steel Underground Tanks for Flammable and Combustible Liquids

3 GLOSSARY

NOTE: Terms used in this Standard that are in *italic* print are defined as follows:

3.1 *COMBUSTIBLE LIQUID* — Any liquid having a flash point at or above 37.8°C and below 93.3°C and as defined in the National Fire Code of Canada.

3.2 *FLAMMABLE LIQUID* — Any liquid having a flash point below 37.8°C and a vapour pressure not exceeding 276 kPa (absolute) at 37.8°C and as defined in the National Fire Code of Canada.

3.3 *INTERSTICE / INTERSTITIAL SPACE* — The space between the *primary tank* and the *secondary containment* of a tank assembly that is capable of being monitored for leakage.

3.4 *NON-PRESSURE TANK* — A tank that is normally vented to atmosphere and is not intended to accommodate internal pressures at the top of the tank greater than 7 kPa (gauge) nor internal vacuum greater than 300 Pa (gauge).

3.5 *PRIMARY TANK(S)* — The product storage tank.

3.6 *SECONDARY CONTAINMENT / CONTAINMENT* — Construction, external to the *primary tank* designed to contain leakage.

3.7 *TANK ASSEMBLY* — *Non-pressure tank* consisting of a *primary tank*, a *secondary containment* and an *interstice* which meets the requirements of this standard. Insulation may be utilized in the *tank assembly*.

4 CONSTRUCTION

4.1 GENERAL

4.1.1 A *tank assembly* shall consist of a *primary tank*, a *secondary containment*, and an *interstice* which is capable of being monitored and which will meet the performance requirements of this Standard.

4.1.2 All structural stiffening members for *tank assemblies* shall be fabricated from Steel in accordance with CAN/CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel, ASTM A36/A36M, Standard Specification for Carbon Structural Steel, or equivalent.

4.2 THE PRIMARY TANK

4.2.1 The *primary tank* shall meet the requirements of the:

- A CAN/ULC-S601, Standard for Shop Fabricated Steel Aboveground Tanks for Flammable and Combustible Liquids; or

B CAN/ULC-S602, Standard for Aboveground Steel Tanks For Fuel Oil and Lubricating Oil.

NOTE: In certain combinations of design life and environment, the application of a corrosion protection system (notably an industrial coating) to the exterior of the primary steel tank would be considered essential. Such coating would have to be applied during the construction of the *tank assembly*. The selection and specification of a suitable system falls outside the scope of this standard.

4.3 SECONDARY CONTAINMENT

4.3.1 *Secondary containment* shall be constructed to catch a leak from any location of the *primary tank* and contain the entire contents in the event that a leak occurs.

4.3.2 *Secondary containment* materials shall have a permeability of not more than 1.0×10^{-7} cm/s with the stored fluids as determined using the ASTM E96/E96M, Standard Test Methods for Water Vapor Transmission of Materials.

4.3.3 *Secondary containment* shall be compatible with the stored product. Compatibility of the *secondary containment* shall be determined by the resistance to the internal fluids test in Section 7 of CAN/ULC-S603.1, Standard for External Corrosion Protection Systems for Steel Underground Tanks for Flammable and Combustible Liquids.

4.3.4 *Secondary containment* shall be constructed to prevent rain or debris from entering the *interstitial space*.

4.3.5 *Secondary containment* shall be constructed so that it provides for the emergency venting of the *interstitial space*

4.3.6 *Secondary containment* shall either be provided with an emergency vent device or a form of construction that relieves excessive *interstitial space* pressure.

4.3.7 All fittings that penetrate the *secondary containment* structure shall be permanent and terminate above the maximum liquid level.

4.4 INTERSTITIAL MONITORING

4.4.1 The *secondary containment* shall be provided with a means for monitoring leakage into the *interstice*. The *interstice* shall be designed so that liquid can flow freely to the point of monitoring.

4.4.2 All enclosed spaces that could contain leakage from the *primary tank* shall be evaluated as *interstitial spaces* for *secondary containment*.

4.4.3 The *interstitial space* shall have provisions for monitoring leaks from the *primary tank* and for detecting *secondary containment* loss of integrity.

4.4.4 The continuity of, and the freedom of communication through, the *interstitial space* shall be verified as described in Subsection 5.9, Interstitial Communication Test.

4.5 WELDING

4.5.1 Each manufacturing facility shall have a written welding procedure recognized by a third-party certifier and shall ensure that each operator doing the work shall be duly trained and qualified.

NOTE: In Canada, a third-party certifier may be, but is not limited to, the Canadian Welding Bureau or the authority having jurisdiction.

4.5.2 Each manufacturer shall have and maintain records of trained and qualified welders with respect to the manufacturer's written welding procedure.

4.5.3 Welding slag shall be removed from all internal and external welds prior to performing production testing.

4.6 NORMAL AND EMERGENCY VENTING

4.6.1 Venting devices for normal and emergency venting of the *primary tank* and emergency venting of the *secondary containment* shall be provided. If the *primary tank* has two or more compartments, each compartment shall be provided with a normal and emergency vent device.

4.6.2 Normal and emergency vents shall be sized in accordance with the standard to which the tank has been constructed.

4.6.3 A long-bolt manway shall not be used for emergency venting in lieu of an emergency vent device.

4.6.4 A weak shell to roof seam shall not be used for emergency venting of the *primary tank*.

4.6.5 *Tank assemblies* which employ venting by form of construction for the *secondary containment* shall be tested in accordance with Subsection 5.11, Pressure Surge Test.

5 PERFORMANCE

5.1 GENERAL

5.1.1 Except as described in Clause 5.1.2, each *tank assembly* shall be tested for compliance with the requirements of:

- A Subsection 5.5, Ball Impact Test, and
- B Subsection 5.8, Environmental Exposure.

5.1.2 The tests described in Clause 5.1.1 are not required for *tank assemblies* that use a minimum of 150 mm of concrete as the insulation or an external steel wall that provides protection for the insulation.

5.2 PIPE-FITTING, TORQUE STRENGTH TEST

5.2.1 Where fittings and their method of attachment differ from those described in the applicable standard specified in Clause 4.2.1, each fitting construction shall be subjected to this test. The fitting shall not crack or split, the threads shall not strip, and the *tank assembly* shall show no signs of damage.

5.2.2 A length of Schedule 40 pipe is to be threaded into a fitting for the pipe connection and tightened to the torque specified in Table 1.

5.3 PIPE-FITTING, BENDING-MOMENT STRENGTH TEST

5.3.1 Where fittings and their method of attachment differ from those described in the applicable standard specified in Clause 4.2.1, each fitting construction shall be subjected to this test. The fitting shall not crack or split, and the *tank assembly* shall show no signs of damage.

5.3.2 A 1.2 m length of Schedule 40 steel pipe is to be threaded into the fitting. A force is then to be applied to the top of the pipe. The force is to be first applied parallel to the longitudinal axis of the *tank assembly* and then transverse to the longitudinal axis of the *tank assembly*. The applied force is to be

increased so that the bending moment is increased from zero to 2712 N•m in 339 N•m increments. Whenever the Schedule 40 pipe bends before the required bending moment is reached, the test is to be stopped and the fitting, and *tank assembly* examined for compliance with the requirements in Clause 5.3.1.

5.4 LIFT-FITTING STRENGTH TEST

5.4.1 Each fitting or device intended to be used to lift and move a *tank assembly* shall be subjected to this test. The fitting or device shall withstand a load equal to twice that imposed by lifting the empty *tank assembly* for 1 min. When more than one fitting is provided on a *tank assembly*, the load is to be divided between the fittings in proportion to the load to which they are subjected by lifting the *tank assembly* as intended. Neither the fitting nor the *tank assembly* shall be damaged.

5.5 BALL IMPACT TEST

5.5.1 The *tank assembly* is to be subjected to six impacts from a 102 mm diameter steel ball having an impact energy of 98 N•m. The top, sides, corners, and fittings of the *tank assembly* are to be tested with no two impacts on the same point. The *tank assembly* shall show no visible signs of cracking or damage.

5.6 LOAD TEST

5.6.1 For flat-top *tank assembly* constructions, a 454 kg load is to be applied over a 305 x 305 mm surface at various places on the top surface of the *tank assembly* near the center of the longest unsupported span to determine the worst case condition. The load is to be sustained for 1 min at each location. The *tank assembly* surface shall not show signs of permanent deformation as a result of this test.

5.7 TANK SUPPORT LOAD TEST

5.7.1 Where the mass of the *tank assembly* is greater than those described in the applicable standard specified in Clause 4.2.1, a *tank assembly* provided with integral supports shall show no evidence of permanent deformation to the *tank assembly* or damage to the supports when tested as described in Clause 5.7.2.

5.7.2 The *tank assembly* is to be completely filled with water. An evenly distributed load equal to the mass of the filled *tank assembly* is to be placed across the top of the filled *tank assembly* on a line parallel to the longitudinal axis of the *tank assembly*. The *tank assembly* and supports shall withstand this load for 2 min.

5.8 ENVIRONMENTAL EXPOSURE

5.8.1 PERFORMANCE CRITERIA

5.8.1.1 Test samples are to consist of 610 by 152 by 152 mm structural steel tubes with 4.8 mm wall thickness. The steel tubes are to be provided with steel caps and covered with the insulation material in the minimum thickness being investigated.

5.8.1.2 A separate set of three samples shall be subjected to each of the exposures described in Clauses 5.8.2.1- 5.8.2.7. Each shall be provided with the insulation thickness established in Clause 5.8.1.1.

5.8.1.3 Samples shall show no visible signs of cracking or damage of the insulation.

5.8.2 SIMULATED ENVIRONMENTAL EXPOSURES

5.8.2.1 Cold Exposure - Samples are to be conditioned for a minimum of 16 h in a cold box maintained at $-40 \pm 2^{\circ}\text{C}$. Immediately upon removal from the cold chamber, these samples and three additional unconditioned samples are to be subjected to a 9.6 N•m impact from a 50.8 mm diameter steel ball on the surface of the sample.

5.8.2.2 UV Light and Water - Three test samples shall be subjected to simulated UV light types and exposure times listed below:

- A 360 h (Indoor rating) or 720 h (Outdoor rating) according to the requirements of ASTM G153, Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Non-metallic Materials; or
- B 500 h (Indoor rating) or 1000 h (Outdoor rating) according to the requirements of ASTM G155, Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-metallic Materials.

The cycle rate shall be light for 17 min and light and water for 3 min.

5.8.2.3 Aging - Accelerated aging of the protective material is to be simulated by placing samples in a circulating air-oven at $66 \pm 3^{\circ}\text{C}$ for 270 days.

5.8.2.4 High Humidity - A high humidity condition is to be simulated by placing samples in a controlled humidity of 97 - 100 percent at $35 \pm 2^{\circ}\text{C}$ for 180 days.

5.8.2.5 Industrial Atmosphere - The sulfur dioxide (SO_2) content and carbon dioxide (CO_2) content of an industrial atmosphere is to be simulated by exposing the samples for 30 days to an amount of SO_2 equivalent to 1 percent of the volume of the test chamber, and an equal volume of CO_2 . The test chamber is to be maintained at $35 \pm 2^{\circ}\text{C}$ and a small amount of water is to be maintained at the bottom of the chamber.

5.8.2.6 Salt Spray - A corrosive atmosphere is to be simulated by exposing samples to a salt spray for 90 days as described in ASTM B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.

5.8.2.7 Combination Wet, Freeze, and Dry Cycling- The freeze-thaw action is to be simulated by exposing samples to a cycle consisting of the equivalent of rainfall at the rate of 0.005 mm/s of water for 72 h, followed by a temperature of $-40 \pm 3^{\circ}\text{C}$ for 24 h, and then a dry atmosphere of $60 \pm 3^{\circ}\text{C}$ for 72 h. This cycle is to be repeated twelve times.

5.9 INTERSTITIAL COMMUNICATION TEST

5.9.1 The continuity of and the freedom of communication through the interstitial space shall be verified as described in Clauses 5.9.2 through 5.9.6.

5.9.2 At the furthest point from the interstitial monitoring location, a tank fitting shall be installed, if necessary, from the exterior of the tank to facilitate an interstitial leak simulation.

5.9.3 The *primary tank* shall be filled to capacity with water.

5.9.4 A monitoring system shall be installed.

5.9.5 At the furthest point from the interstitial monitoring location, water, rated air pressure or rated vacuum shall be applied to the *interstitial space*.

5.9.6 The time taken to indicate the presence of water, air pressure or vacuum at the monitoring location shall not exceed 24 h.

5.10 HYDROSTATIC STRENGTH TEST OF TANK ASSEMBLY

5.10.1 A *tank assembly* shall be subjected to this test when the *secondary containment* does not comply with the applicable standard specified in Clause 4.2.1. Both the *primary tank* and the *secondary containment* shall remain leak tight following the test.

Exception: In cases where the secondary containment provides venting by a form of construction, the Pressure Surge Test (Venting by Form of Construction) Subsection 5.11 shall be conducted.

5.10.2 The source of water pressure shall be capable of maintaining a pressure of at least 207 kPa for a period of not less than 2 min. The pressure gauges are to be calibrated and have a dial range of 0 - 345 kPa or 0 - 415 kPa, a face size of at least 89 mm in diameter, graduations of 10 kPa maximum, and an accuracy of ± 1 percent of the full scale reading.

5.10.3 The *primary tank* and the *interstitial space* are to be filled with water. The *primary tank* is to be manifolded to the *interstitial space*. The pressure is to be applied gradually to the combined space in increments of 35 kPa at a rate not exceeding 14 kPa per minute. The pressure is to be held for 2 min after each increment of 35 kPa until the test pressure of 172 kPa is attained. Once the pressure is attained, it is to be held for a minimum of 20 min and the overall structure examined for visible signs of leakage or damage.

Exception: A test pressure of 100 kPa is to be used for tanks with a specified maximum production leakage test pressure of 20 kPa.

5.11 PRESSURE SURGE TEST (VENTING BY FORM OF CONSTRUCTION)

5.11.1 *Secondary containment* structures that provide emergency venting by a form-of construction, such as a frangible joint where the top is designed to be weaker than the walls, shall be subjected to this test.

5.11.2 The test shall be conducted on the manufacturer's tank configuration with the largest length to width ratio.

5.11.3 The vent openings are to be provided with the intended venting devices. The *interstitial space* is to be completely filled with water. The *interstitial space* is to be subjected to surge pressure of not more than 14 kPa.

5.11.4 Venting shall be such that only the seams of the *secondary containment* above the maximum normal liquid level fail. The internal pressure shall be directed upward at the moment of release, and there shall be no resulting projectiles. In addition, the *primary tank* shall be pressure tested for leakage in accordance with Clause 5.11.5 and examined for buckling. No leakage nor buckling shall be permitted.

5.11.5 A representative *tank assembly* shall be subjected to an air pressure of 35 kPa. The *primary tank* shall not show any deformation nor leakage.

5.12 FIRE TEST

5.12.1 A representative *tank assembly* shall be empty and exposed to a hydrocarbon pool fire for 1 h.

5.12.2 The test is to be conducted outdoors under conditions of essentially still air (5 km/h or less) and no precipitation. The ambient temperature shall be above 0°C.

5.12.3 Where the structural supports are 305 mm or more above grade, the temperature recorded on the supports shall not exceed a temperature of 540°C. Supports of any height shall not collapse.

5.12.4 The emergency venting shall not be impaired as a result of the fire exposure. This shall be determined by visual examination after the test.

5.12.5 The *tank assembly* shall be placed centrally in a pan measuring 300 mm in depth and 1200 mm greater in length and breadth than the outside dimensions of the *tank assembly*. Sufficient No. 2 fuel oil in accordance with CAN/CGSB-3.2, Heating Fuel Oil to provide a continuous burn for 1 h shall be placed in or continuously fed to the pan.

5.12.6 The fuel shall be ignited and allowed to burn freely for 1 h.

5.12.7 At the conclusion of the fire test, a leakage test is to be conducted on the *primary tank*. The *primary tank* shall be completely filled with water and subjected to a 35 kPa hydrostatic pressure for 1 h. The *tank assembly* is to be tested in the position in which it will be installed. The pressure is not to decrease during the 1 h period. The *primary tank* shall not leak.

6 MARKING

6.1 The following information shall be permanently attached to the tank assembly and located so as to be readily visible when installed:

- A Name of manufacturer;
- B Year of manufacture;
- C Capacity, L;
- D Maximum Pressure 7 kPa;
- E Maximum Vacuum 300 Pa;
- F Resistant to a fire exposure of 1 h; and
- G All additional marking information required by the Standard to which the *primary tank* has been constructed.

NOTE: Manufacturers should be aware that the authority having jurisdiction may also require that the mark of certifying agency be included on each tank.

7 INSTALLATION INSTRUCTIONS

7.1 Each tank shall be provided with a full set of installation instructions including at least the following:

- A Instruction that the tank installer shall consult with the authority having jurisdiction to ensure that the requirements of this Standard and all Federal, Provincial, and Local Codes are met prior to installation;
- B Location;
- C Base Preparation;
- D Lifting and handling instructions;

- E Instructions for the piping of the vent to a remote location when required; and
- F A description of vehicle barrier when the assemblies are accessible by, or adjacent to traffic.

TABLES

TABLE 1
Torques on Pipe Fittings
(Reference: Subsection 5.2.2)

Nominal pipe size, NPS ^a	Torque, N.m
3/4	226
1	271
1-1/4	328
1-1/2	350
2	373
2-1/2	395
3	407
3-1/2	418
4	429
6	475
8	520
^a Nominal pipe size specifications are in accordance with the ANSI/ASME B36.10M, Standard for Welded and Seamless Wrought Steel Pipe.	



**NATIONAL
STANDARD
OF CANADA**

CAN/ULC-S675.2-14

**STANDARD FOR NONVOLUMETRIC PRECISION LEAK
DETECTION DEVICES FOR UNDERGROUND AND
ABOVEGROUND STORAGE TANKS AND PIPING FOR
FLAMMABLE AND COMBUSTIBLE LIQUIDS**



ULC Standards
Normes ULC



Standards Council of Canada
Conseil canadien des normes

Underwriters Laboratories of Canada (ULC) was established in 1920 by letters patent issued by the Canadian Government. It maintains and operates laboratories and certification services for the examination, testing and certification of appliances, equipment, materials, constructions and systems to determine their relation to life, fire and property hazards as well providing inspection services.

Underwriters Laboratories of Canada is accredited by the Standards Council of Canada as a Certification Organization, a Testing Organization, and an Inspection Body under the National Standards System of Canada.

ULC Standards develops and publishes standards and other related publications for building construction, security and burglar protection, environmental safety, electrical equipment, fire protection equipment, gas and oil equipment, thermal insulation products, materials and systems, energy use in the built environment and electrical utility safety.

ULC Standards is a not-for-profit organization and is accredited by the Standards Council of Canada as a Standards Development Organization.

National Standards of Canada developed by ULC Standards conform to the criteria and procedures established by the Standards Council of Canada. Such standards are prepared using the consensus principle by individuals who provide a balanced representation of interests relevant to the subject area on a national basis.

ULC is represented across Canada as well as many countries worldwide. For further information on ULC services, please contact:

Customer Service: 1-866-937-3852

CORPORATE HEADQUARTERS

Underwriters Laboratories of Canada
7 Underwriters Road
Toronto, Ontario M1R 3A9
Telephone: (416) 757-3611
Fax: (416) 757-9540

REGIONAL OFFICES

PACIFIC OFFICE

13775 Commerce Parkway, Suite 130
Richmond, British Columbia V6V 2V4
Telephone: (604) 214-9555
Fax: (604) 214-9550

EASTERN OFFICE

6505, Rte Transcanadienne, Suite 330
St-Laurent, Québec H4T 1S3
Telephone: (514) 363-5941
Fax: (514) 363-7014

The Standards Council of Canada (SCC) is the coordinating body of the Canadian standardization network, which is composed of people and organizations involved in the development, promotion and implementation of standards. Through the collaborative efforts of Canadian standardization network members, standardization is helping to advance the social and economic well-being of Canada and to safeguard the health and safety of Canadians. The network's efforts are overseen by SCC.

The principal objectives of SCC are to foster and promote voluntary standardization as a means of advancing the national economy, supporting sustainable development, benefiting the health, safety and welfare of workers and the public, assisting and protecting the consumer, facilitating domestic and international trade, and furthering international cooperation in relation to standardization.

An important facet of the Canadian standards development system is the use of the following principles: consensus; equal access and effective participation by concerned interests; respect for diverse interests and identification of those who should be afforded access to provide the needed balance of interests; mechanism for dispute resolution; openness and transparency; open access by interested parties to the procedures guiding the standards development process; clarity with respect to the processes; and Canadian interest consideration as the initial basis for the development of standards.

A National Standard of Canada (NSC) is a standard prepared or reviewed by an SCC-accredited SDO and approved by the SCC according to NSC approval requirements. Approval does not refer to the technical content of the standard, as this remains the responsibility of the SDO. An NSC reflects a consensus of a number of capable individuals whose collective interests provide, to the greatest practicable extent, a balance of representation of general interests, producers, regulators, users (including consumers) and others with relevant interests, as may be appropriate to the subject at hand. NSCs are intended to make a significant and timely contribution to the Canadian interest.

Those who have a need to apply standards are encouraged to use NSCs. These standards are subject to periodic review. Users of NSCs are cautioned to obtain the latest edition from the SDO that publishes the standard.

The responsibility for approving standards as NSCs rests with:

Standards Council of Canada
270 Albert Street
Suite 200
Ottawa, Ontario
K1P 6N7
Telephone: (613) 238-3222

For further information on ULC standards, please contact:

ULC STANDARDS

171 Nepean Street, Suite 400
Ottawa, Ontario K2P 0B4
Telephone: (613) 755-2729
Fax: (613) 231-5977

E-mail: customerservice@ulc.ca
Web site: www.ulc.ca

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for this particular application.

Copies of this National Standard of Canada may be ordered from ULC Standards.

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE

**NATIONAL
STANDARD
OF CANADA**

CAN/ULC-S675.2-14

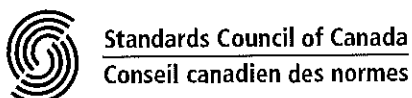
**STANDARD FOR NONVOLUMETRIC PRECISION LEAK DETECTION
DEVICES FOR UNDERGROUND AND ABOVEGROUND STORAGE
TANKS AND PIPING FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS**

ICS 75.180.01; 75.200

Prepared and Published by



Approved by



FIRST EDITION OCTOBER 2014

Copyright © 2014

ULC Standards

All rights reserved. No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without prior permission.

TABLE OF CONTENTS

ULC STANDARDS COMMITTEE ON FITTINGS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS . . .	i
ULC STANDARDS TASK GROUP ON NONVOLUMETRIC PRECISION LEAK DETECTION	ii
PREFACE	iii
1 SCOPE	1
2 REFERENCE PUBLICATIONS	1
3 GLOSSARY	4
4 MATERIALS, WORKMANSHIP AND CONSTRUCTION	5
4.1 GENERAL	5
4.2 ELECTRICAL FEATURES	5
4.2.1 General	5
4.3 NONMETALLIC MATERIALS	6
5 PERFORMANCE REQUIREMENTS	6
5.1 PRECISION LEAK DETECTION	6
6 PERFORMANCE TESTS	6
6.1 GENERAL	6
6.2 ACCELERATED AGING TEST	6
6.3 EXTERNAL LEAKAGE TEST	6
6.4 REPORTING REQUIREMENTS, EXCLUDING LEAK DETECTION	7
6.4.1 General	7
6.5 LEAK DETECTION PERFORMANCE TESTS	7
6.5.1 Leak Detection Performance Test Requirements	7
6.5.2 Reporting Requirements for Leak Detection Tests	11
7 INSTALLATION AND OPERATING INSTRUCTIONS	11
8 MARKING	11
APPENDIX A - ACOUSTICAL METHODS AND TRACER METHODS (INFORMATIVE)	13
APPENDIX B - PROCESS OF CERTIFICATION AGAINST THE STANDARD (INFORMATIVE)	15

ULC STANDARDS COMMITTEE ON FITTINGS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS

NAME	AFFILIATION	REGION	CATEGORY
M. Mailvaganam(Chair)	Consultant	Ontario	General Interest
B. Andrew	Veeder-Root	U.S.A.	Producer
B. Armstrong	AT Monitors	U.S.A.	Producer
A. Barker	Technical Standards & Safety Authority	Ontario	Regulator
M. Bishoff	Lorax Systems, Inc.	Canada	Producer
W. Boyd	Emco Wheaton Retail Corp.	U.S.A.	Producer
A. Dornan	Environment Canada	Canada	Regulator
J. Dutton	Department of Environment and Conservation	Newfoundland and Labrador	Regulator
D. Edgecombe	Petroleum Tank Management Association	Alberta	Regulator
E. Fernandes	Ontario Petroleum Contractors Association	Ontario	User
S. Hyde-Clarke	National Research Council	Canada	General Interest
S. Jones	J and B Engineering, Inc.	Canada	General Interest
P. Legault	Department of National Defence	Canada	Regulator
D. Lenart	Imperial Oil (Esso)	Canada	User
B. Nelson	Franklin Fueling Systems, Inc.	U.S.A.	Producer
G. Nikolic	MHCC Consultants, Inc.	Ontario	General Interest
D. Northcotte	North Waterloo Farmers Mutual Insurance	Ontario	General Interest
R. Stephenson	Chevron	Canada	User
B. Trussler	Ship's Point Consulting	Canada	User
C. Vassos	Waleco, Inc.	Canada	Producer
S. Villeneuve	Vilco, Ltd.	Nova Scotia	User
K. Webster	OPW Fueling Containment Systems, Inc.	U.S.A.	Producer
K. Wilcox	Ken Wilcox Associates, Inc.	U.S.A.	User
J. Bablo (Associate Member)	UL LLC	U.S.A.	(Non-Voting)
T. Espejo (Associate Member)	ULC Standards	Canada	(Non-Voting)
M. Modéry (Associate Member)	Environment Canada	Canada	(Non-Voting)
P. Neil (Associate Member)	OPW Fueling Containment Systems, Inc.	U.S.A.	(Non-Voting)
R. Sculthorp (Associate Member)	Underwriters Laboratories of Canada	Canada	(Non-Voting)
J. Wade (Project Manager)	ULC Standards	Canada	(Non-Voting)
S. Anderson (Secretary)	ULC Standards	Canada	(Non-Voting)

This list represents the membership at the time the Committee balloted on the final text of this edition. Since that time, changes in the membership may have occurred.

ULC STANDARDS TASK GROUP ON NONVOLUMETRIC PRECISION LEAK DETECTION**MEMBER****REPRESENTING**

G. Nikolic (Chair)	MHCC Consultants, Inc.
B. Armstrong	AT Monitors
B. Andrew	Veeder-Root
M. Bishoff	Lorax Systems, Inc.
E. Bourassa	Granby Industries, Inc.
W. Boyd	Emco Wheaton Retail Corp.
J. Dutton	Environment and Conservation, Newfoundland and Labrador
D. Edgecombe	Petroleum Tank Management Association of Alberta
E. Fernandes	Elfent, Ltd.
M. Mailvaganam	Consultant
P. Neil	OPW Fueling Containment Systems, Inc.
B. Nelson	Franklin Fueling Systems, Inc.
B. Trussler	Ship's Point Consulting
C. Vassos	Waleco, Inc.
K. Webster	OPW Fueling Containment Systems, Inc.
J. Wade (Secretary)	ULC Standards

**STANDARD FOR NONVOLUMETRIC PRECISION LEAK DETECTION DEVICES FOR
UNDERGROUND AND ABOVEGROUND STORAGE TANKS AND PIPING FOR FLAMMABLE AND
COMBUSTIBLE LIQUIDS**

PREFACE

This is the First Edition of the Standard for Nonvolumetric Precision Leak Detection Devices for Underground and Aboveground Storage Tanks and Piping for Flammable and Combustible Liquids, CAN/ULC-S675.2.

This Edition of the Standard has been formally approved by the ULC Standards Committee on Fittings for Flammable and Combustible Liquids.

Only metric SI units of measurement are used in this Standard. If a value for measurement is followed by a value in other units in parentheses, the second value may be approximate. The first stated value is the requirement.

Appendices A and B, identified as Informative, are for information purposes only.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

This First Edition National Standard of Canada is based on, and now supersedes, ULC/ORD-C58.14.

Attention is drawn to the possibility that some of the elements of this Canadian Standard may be the subject of patent rights. ULC Standards shall not be held responsible for identifying any or all such patent rights.

Requests for interpretation of this Standard should be sent to ULC Standards. The requests should be worded in such a manner as to permit a "yes" or "no" answer based on the literal text of the requirement concerned.

The initiation of the review of this Standard will commence within 5 years of the date of publication, unless the Standard is identified as fitting within a stabilized category, whereby the review will commence within the appropriate time frame set out by ULC Standards.

This Standard is intended to be used for conformity assessment.

1 SCOPE

1.1 This Standard provides minimum requirements for primary containment leak detection that uses qualitative characteristics to detect leaks in the primary containment.

NOTE: Depending on the design of the tank system, and the capabilities of the leak detection devices, leaks from the tank alone, and/or from other parts of the tank system, may be detected.

1.2 Nonvolumetric leak detection devices may be categorized, but not restricted to, one of the following types:

- A Internal Devices designed to operate within a primary containment to assess one or more physical characteristics that would indicate a leak in the primary containment;
- B External Devices designed to operate outside of a primary containment to assess physical characteristics that would indicate a leak in the primary containment; and
- C Interstitial Devices designed to operate within a secondary containment interstice to assess physical characteristics that indicate a leak in the primary containment.

NOTE: The requirements of this Standard apply to products that may be used in static or mobile leak detection applications.

1.3 These requirements do not cover quantitative volumetric leak detection devices.

1.4 The requirements of this Standard apply to newly manufactured products. The requirements of this Standard do not apply to installation and monitoring procedures.

NOTE: The identifier "leak detection device" used throughout this document applies to the sensor, plus any cables, connected equipment, software, and display necessary to detect and declare a leak. Since the elements of a particular product may range from all of these items, to a sensor with an integrated display alone, the requirements for marking permit the product elements to be marked "leak detection device" or "leak detection equipment" as appropriate.

2 REFERENCE PUBLICATIONS

2.1 The documents shown below are referenced in the text of this Standard. Unless otherwise stated elsewhere in this Standard such reference shall be considered to indicate the edition and/or revisions of the document available at the date on which the Committee approved this ULC Standard.

Documents Published by the American Society for Testing and Materials (ASTM)
100 Barr Harbour Drive, PO Box C700, West Conshohocken, PA 19428-2959 U.S.A.
Telephone: (610) 832-9585
www.astm.org

- ASTM D56-05 (R 2010), Standard Test Method for Flash Point by Tag Closed Cup Tester
- ASTM D93-13, Standard Test Method for Flash Point by Pensky-Martens Closed Cup Tester
- ASTM D471-12 (Rev A), Standard Test Method for Rubber Property - Effect of Liquids
- ASTM D3828-12, Standard Test Method for Flash Point by Small Scale Closed Cup Tester

- ASTM E1003-95 (R 2006), Standard Practice for Hydrostatic Leak Testing
-

Document Published by European Committee for Standardization (CEN) available from:
Standards Council of Canada (SCC)
270 Albert Street, Suite 200, Ottawa, Ontario K1P 6N7 Canada
Telephone: (613) 238-3222, Fax: (613) 569-7808 www.scc.ca

- CEN EN 13160-2:2003, Leak Detection Systems - Part 2, Pressure and Vacuum Systems
-

Documents Published by CSA Group
5060 Spectrum Way, Suite 100, Mississauga, Ontario L4W 5N6 Canada
Telephone: 1-800-463-6727, Fax: (416) 747-2473
www.csagroup.org

- CSA C22.1-12, Canadian Electrical Code, Part I, Safety Standard for Electrical Installations
 - CSA C22.2 No. 0.15-01, Adhesive Labels
 - CSA C22.2 No. 22-86 (R2013), Electrical Equipment for Flammable and Combustible Fuel Dispensers
 - CSA C22.2 No. 30-86 (R2012), Explosion-Proof Enclosures for Use in Class I Hazardous Locations
 - CSA C22.2 No. 142-87 (R2009), Process Control Equipment Industrial Products
 - CSA C22.2 No. 157-92 (R2012), Intrinsically Safe and Non-Incendive Equipment for Use in Hazardous Locations
-

Documents Published by the Environmental Protection Agency (EPA)
1200 Pennsylvania Ave N.W., Washington , DC 20460 U.S.A.
Telephone: (703) 603-8399
www.epa.gov

- EPA/350/UST-90-006, March 1990, Standard Test Procedures For Evaluating Leak Detection Methods - Automatic Tank Gauging Systems
 - EPA/530/UST-90-005, March 1990, Standard Test Procedures For Evaluating Leak Detection Methods - Nonvolumetric Tank Tightness Testing Methods
 - EPA/530/UST-90-008, March 1990, Standard Test Procedures For Evaluating Leak Detection Methods - Vapor-phase Out-of-tank Product Detectors
 - EPA/530/UST-90-009, March 1990, Standard Test Procedures For Evaluating Leak Detection Methods - Liquid-phase Out-of-tank Product Detectors
 - EPA/530/UST-90-010, March 1990, Standard Test Procedures for Evaluating Leak Detection Methods - Pipeline Leak Detection Systems
-

Document Published by the National Research Council of Canada (NRC)
1200 Montreal Road, Bldg. M58, Ottawa, ON, K1A 0R6, Canada

Telephone: 1-800-672-7990
www.nrc-cnrc.gc.ca

- National Fire Code of Canada, 2010
-

Documents Published by the National Working Group on Leak Detection Evaluations (NWGLDE)
www.nwglde.org

- Alternative Test Procedures for Evaluating Leak Detection Methods - Evaluation of Liquid Level Sensors, September 1996, Ken Wilcox Associates
- Alternative Test Procedures for Evaluating Leak Detection Methods - Evaluation of Vacuum Interstitial Monitoring Methods, September 1996, Ken Wilcox Associates
- Alternative Test Procedures for Evaluating Leak Detection Methods - Mass-based and Volumetric Leak Detection Systems for Bulk Field-constructed Tanks, November 2000, Ken Wilcox Associates
- Alternative Test Procedures for Evaluating Leak Detection Methods - Mass-Based Leak Detection Systems for Aboveground Storage Tanks, November 2002, Ken Wilcox Associates
- Amendment to EPA ATG and Non Volumetric TTT Protocols for Water Sensor Testing, December 17, 2008, Jairus D. Flora Jr. Ph.D.
- ATG/CITLDS Water Detection Testing In Ethanol or Blends Greater Than 10% Ethanol, NWGLDE addendum to EPA/350/UST-90/006, December 2007, Jairus D. Flora, Jr. Ph.D.
- Development of Procedures to Assess the Performance of External Leak Detection Devices - Liquid-Phase ASTM-Formatted Methods - Revised Draft to Include JP-4 Jet Fuel, June 29, 1990, Radian Corporation
- Development of Procedures to Assess the Performance of External Leak Detection Devices - Vapor-Phase ASTM-Formatted Methods, June 6, 1990, Radian Corporation
- Development of Procedures to Assess the Performance of External Leak Detection Devices - Vapor-Phase ASTM-Formatted Methods, June 29, 1990, Radian Corporation
- Evaluation Protocol for Continuous In-Tank Leak Detection Systems, April 7, 1995, Midwest Research Institute
- Evaluation Protocol for Continuous In-Tank Leak Detection Systems, January 7, 2000, Jairus D. Flora, Jr. Ph.D.
- Evaluation Protocol for Vacuum-Wrapped Pressurized Portions of a Fuel Containment and Dispensing System, December 15, 2006, Revision 3A, Jairus D. Flora, Jr., Ph.D.
- Modified Third party Testing Protocol for Large Pipeline Leak Detection, August 1995, EFA Technologies, Inc.
- Proposed Protocol for the Performance Evaluation of the MALT and MALTtm Plus, February 9, 1996, Ken Wilcox Associates

- Protocol for Determining Applicability of a SIR Method for Manifolder Tanks and Determining Size Limitation, November 1996, Developed under coordination by the SIR team of the National Work Group on Leak Detection Evaluations
 - Protocol for Reduced Testing Evaluations for Extending Line Volume or Additional Types of Line Construction Materials, March 8, 2011, Ken Wilcox Associates
 - Test Procedures for Comparison of Different ATG Probes, March 27, 2000, Ken Wilcox Associates
 - Test Procedures for Comparison of Different Automatic Tank Gauge Consoles, October 4, 2010, Ken Wilcox Associates
 - Test Procedure for the Evaluation of Double-Wall Pipe with Liquid Filled Interstice for Loss Prevention, May 21, 2004, Ken Wilcox Associates
 - Test Procedures for Third-party Evaluation of Leak Detection Methods - Cable Sensor Liquid Contact Leak Detection Systems, November 11, 1991, Carnegie Mellon Research Institute
 - Test Procedures for Third-party Evaluation of Leak Detection Methods - Point Sensor Liquid Contact Leak Detection Systems, November 11, 1991, Carnegie Mellon Research Institute - Advanced Devices and Materials Group
-

Documents Published by Underwriters Laboratories Inc.

Available from COMM 2000, 1414 Brook Drive, Downers Grove, IL, U.S.A 60515

Telephone: 1-888-853-3503

www.comm-2000.com

- UL 913:2011, Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, Hazardous (Classified) Locations
- UL 969:1995 (R2008), Standard for Marking and Labelling Systems
- ANSI/UL 1238:2013, Standard for Control Equipment for Use with Flammable Liquid Dispensing Devices

3 GLOSSARY

NOTE: Terms used in this Standard that are in *italic* print are defined as follows:

3.1 *ASTM IRM 903 / IRM 903* — A high swelling petroleum based oil described in ASTM D471, Standard Test Method for Rubber Property-Effect of Liquids.

3.2 *AUTHORITY HAVING JURISDICTION (AHJ)* - The governmental body responsible for the enforcement of any part of this Standard or the official or agency designated by that body to exercise such a function.

3.3 *COMBUSTIBLE LIQUID* - Any liquid having a flash point at or above 37.8 °C and below 93.3 °C and as defined in the National Fire Code of Canada.

NOTE: Sentence 4.1.3 of the 2010 Edition of the National Fire Code of Canada specifies the following test methods: ASTM D56, Flash Point by Closed Cup Tester, for liquids with a kinematic viscosity less than 6 cSt; ASTM D93, Flash Point by Pensky-Martens Closed Cup Tester, for liquids with a kinematic viscosity of 6 cSt or more; ASTM D3828, Flash Point by Small-Scale Closed Cup Tester, as an optional alternative for aviation turbine fuels.

3.4 **FALSE ALARM** — An indication that a tank is *leaking* when it is not.

3.5 **FLAMMABLE LIQUID** — Any liquid having a flash point below 37.8 °C and vapour pressure not exceeding 276 kPa (absolute) at 37.8 °C and as defined in the National Fire Code of Canada.

3.6 **INDUCED LEAK RATE** — The actual *leak rate*, expressed in litres per hour, used during testing, against which the results from a given leak detection device under test will be compared.

3.7 **LEAKAGE, LEAK OR LEAKING** — Any unplanned flow of fluid in or out of the primary containment.

3.8 **LEAK RATE (R)** — The amount of product loss per unit time, expressed in litres per hour.

3.9 **PROBABILITY OF DETECTION, P(D)** — The probability of detecting a *leak* in a primary containment of a given size, expressed as a decimal, fraction or percentage.

3.10 **PROBABILITY OF FALSE ALARM, P(FA)** — The probability of declaring a leak in a non-leaking primary containment of a given size expressed as a decimal, fraction or percentage.

4 MATERIALS, WORKMANSHIP AND CONSTRUCTION

4.1 GENERAL

4.1.1 The manufacturer shall state the limiting operating and service conditions, such as humidity, temperature, jarring and vibration, for which the leak detection device meets the requirements of this Standard.

4.1.2 The manufacturer shall define the *flammable liquids* and *combustible liquids* with which the leak detection devices are compatible.

4.2 ELECTRICAL FEATURES

4.2.1 General

4.2.1.1 The electrical features of unenclosed leak detection devices shall meet the applicable requirements of:

- A CSA C22.1, Canadian Electrical Code, Part I, Safety Standard for Electrical Installations;
- B CSA C22.2 No. 142, Process Control Equipment, or ANSI/UL 1238, Standard for Control Equipment for Use with Flammable Liquid Dispensing Devices;
- C CSA C22.2 No. 22, Electrical Equipment for Flammable and Combustible Fuel Dispensers;
- D UL 913, Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, Hazardous (Classified) Locations; or
- E CSA C22.2 No. 157, Intrinsically Safe and Non-Incendive Equipment for Use in Hazardous Locations.

4.2.1.2 Leak detection devices not meeting the requirements of Clause 4.2.1.1, and which are to be used in a hazardous area, shall be protected in enclosures meeting the requirements of CSA C22.2 No. 30, Explosion-Proof Enclosures for Use in Class I Hazardous Locations. Such electrical devices or equipment shall meet the requirements of the appropriate CSA Standards for electrical safety and performance.

4.3 NONMETALLIC MATERIALS

4.3.1 Nonmetallic materials, which are immersed in, or exposed to, *flammable liquids* or *combustible liquids*, or vapours, shall not be affected by such liquids or vapours in a manner as to cause a failure of the leak detection devices or to cause a hazardous condition to occur. The manufacturer shall specify the *flammable liquids* or *combustible liquids* for which their product meets this requirement.

5 PERFORMANCE REQUIREMENTS

NOTE: Products meeting the applicable requirements as defined in this Standard may be identified by a manufacturer as capable of precision leak detection, interstitial monitoring, or both.

5.1 PRECISION LEAK DETECTION

5.1.1 The leak detection devices shall be capable of detecting a *leak rate* of 0.38 L/h with a *probability of detection* equal to or greater than 0.95 and a *probability of false alarm* equal to or less than 0.05.

5.1.2 The time delay between the initiation of a test leak under controlled test conditions and the response by the leak detection device shall not exceed 24 h.

6 PERFORMANCE TESTS

6.1 GENERAL

6.1.1 Samples that are fully representative of the leak detection devices shall be submitted for test.

6.1.2 Tests as described under Subsection 6.2, Accelerated Aging Test, shall be performed where the failure, or change in characteristics, of the materials would affect the safety or operation of the leak detection devices, as determined by a Failure Modes and Effects Analysis performed by the proponent.

6.2 ACCELERATED AGING TEST

6.2.1 Representative samples of elastomers shall be subjected to an accelerated oxygen pressure aging test for a minimum of 96 h in oxygen at a temperature of 70 ± 2 °C and at a pressure of 200 ± 10 kPa. The samples shall be subjected to tensile and hardness determination before and after the aging.

6.2.2 The samples shall retain not less than 75 % of their original properties after the aging.

6.3 EXTERNAL LEAKAGE TEST

6.3.1 Samples of the assemblies or components subject to liquid or vapour pressure shall be leak tested at a pressure of 35 ± 2 kPa.

6.3.2 The samples shall withstand the applied pressure for 5 min without *leakage* or measurable permanent distortion.

NOTE: Proponents and testing laboratories are referred to the Visual Inspection Method of ASTM E1003, Standard Practice for Hydrostatic Leak Testing.

6.4 REPORTING REQUIREMENTS, EXCLUDING LEAK DETECTION

6.4.1 General

6.4.1.1 In addition to the information specified in the individual test methods, all reports describing the testing of the leak detection devices according to this Standard shall include the following information:

- A The proponent's name and address;
- B The general description, drawings and schematics of the leak detection devices;
- C The descriptions of test apparatus, calibration standards and their source(s);
- D The name and location of the laboratory performing the tests and, if applicable, the accreditation agency for the laboratory;
- E A summary of measured results (preferably in a table) compared to the requirements of this Standard with indication that the leak detection devices have passed/failed for each requirement; and
- F An appendix to the report containing the test data used to generate the above items.

6.5 LEAK DETECTION PERFORMANCE TESTS

6.5.1 Leak Detection Performance Test Requirements

6.5.1.1 The leak detection device shall conform to the applicable requirements of one or more of the following documents:

- A Aboveground Storage Tank Leak Detection Method
 - (i) Alternative Test Procedures for Evaluating Leak Detection Methods - Mass-based Leak Detection Systems for Aboveground Storage Tanks,
 - (ii) EPA/530/UST-90-005, Standard Test Procedures For Evaluating Leak Detection Methods - Nonvolumetric Tank Tightness Testing Methods;
- B Automatic Electronic Line Leak Detector
 - (i) EPA/530/UST-90-010, Standard Test Procedures for Evaluating Leak Detection Methods - Pipeline Leak Detection Systems,
 - (ii) Protocol for Reduced Testing Evaluations for Extending Line volume or Additional Types of Line Construction Materials;
- C Automatic Tank Gauging Method
 - (i) EPA/350/UST-90-006, Standard Test Procedures For Evaluating Leak Detection Methods - Automatic Tank Gauging Systems,
 - (ii) Test Procedures for Comparison of Different ATG Probes,

(With acceptable modification, this method is also applicable to comparisons of different ATG controllers.),

- (iii) ATG/CITLDS Water Detection Testing In Ethanol or Blends Greater Than 10% Ethanol, NWGLDE addendum to EPA/350/UST-90/006,
- (iv) Amendment to EPA ATG and Non Volumetric TTT Protocols for Water Sensor Testing,
- (v) Test Procedures for Comparison of Different ATG Probes;

D Continuous In-Tank Leak Detection Method

- (i) Evaluation Protocol for Continuous In-Tank Leak Detection Systems, April 7, 1995,
- (ii) Evaluation Protocol for Continuous In-Tank Leak Detection Systems, January 7, 2000,
- (iii) ATG/CITLDS Water Detection Testing In Ethanol or Blends Greater Than 10% Ethanol, NWGLDE addendum to EPA/350/UST-90/006,
- (iv) Amendment to EPA ATG and Non Volumetric TTT Protocols for Water Sensor Testing;

E Continuous Interstitial Monitoring Method (Liquid Filled)

- (i) Test Procedure for the Evaluation of Double-Wall Pipe with Liquid Filled Interstice for Loss Prevention,
- (ii) Alternative Test Procedures for Evaluating Leak Detection Methods - Evaluation of Liquid Level Sensors,
- (iii) EPA/350/UST-90-006, Standard Test Procedures For Evaluating Leak Detection Methods - Automatic Tank Gauging Systems,
- (iv) EPA/530/UST-90-005, Standard Test Procedures For Evaluating Leak Detection Methods - Nonvolumetric Tank Tightness Testing Methods;

F Continuous Interstitial Line Monitoring Method (Pressure/Vacuum Decay)

- (i) Alternative Test Procedures for Evaluating Leak Detection Methods - Evaluation of Vacuum Interstitial Monitoring Methods,
- (ii) CEN EN 13160-2, Leak Detection Systems - Part 2, Pressure and Vacuum Systems,
- (iii) Evaluation Protocol for Vacuum-Wrapped Pressurized Portions of a Fuel Containment and Dispensing System;

G Continuous Interstitial Tank System Monitoring Method (Pressure/Vacuum Decay)

- (i) Alternative Test Procedures for Evaluating Leak Detection Methods - Evaluation of Vacuum Interstitial Monitoring Methods,
- (ii) CEN EN 13160-2, Leak Detection Systems - Part 2, Pressure and Vacuum Systems;

NOTE: Acceptance also applies to sections of the other 6 parts of EN 13160 which are referenced within Part 2.

H Interstitial Product Detectors (Liquid-Phase)

- (i) EPA/530/UST-90-009, Standard Test Procedures For Evaluating Leak Detection Methods – Liquid-phase Out-of-tank Product Detectors,
- (ii) Development of Procedures to Assess the Performance of External Leak Detection Devices - Liquid-Phase ASTM-Formatted Methods - Revised Draft to Include JP-4 Jet Fuel,
- (iii) Test Procedures for Third-party Evaluation of Leak Detection Methods - Cable Sensor Liquid Contact Leak Detection Systems,
- (iv) Test Procedures for Third-party Evaluation of Leak Detection Methods - Point Sensor Liquid Contact Leak Detection Systems,
- (v) Alternative Test Procedures for Evaluating Leak Detection Methods - Evaluation of Liquid Level Sensors;

I Interstitial Tank Tightness Test Method

- (i) EPA/530/UST-90-005, Standard Test Procedures For Evaluating Leak Detection Methods - Nonvolumetric Tank Tightness Testing Methods,
- (ii) Alternative Test Procedures for Evaluating Leak Detection Methods - Evaluation of Vacuum Interstitial Monitoring Methods;

J Large Diameter Line Leak Detection Method (150 mm [6 in] Diameter or Above)

- (i) Modified Third party Testing Protocol for Large Pipeline Leak Detection,
- (ii) Proposed Protocol for the Performance Evaluation of the MALT and MALTtm Plus,
- (iii) EPA/530/UST-90-010, Standard Test Procedures for Evaluating Leak Detection Methods - Pipeline Leak Detection Systems,
- (iv) Protocol for Reduced Testing Evaluations for Extending Line Volume or Additional Types of Line Construction Materials,
- (v) EPA/530/UST-90-005, March 1990, Standard Test Procedures For Evaluating Leak Detection Methods - Nonvolumetric Tank Tightness Testing Methods;

K Line Tightness Test Method

- (i) EPA/530/UST-90-010, Standard Test Procedures for Evaluating Leak Detection Methods - Pipeline Leak Detection Systems,
- (ii) Protocol for Reduced Testing Evaluations for Extending Line Volume or Additional Types of Line Construction Materials,
- (iii) EPA/530/UST-90-005, March 1990, Standard Test Procedures For Evaluating Leak Detection Methods - Nonvolumetric Tank Tightness Testing Methods;

L Non-Volumetric Tank Tightness Test Method (Tracer, Ullage, Vacuum Induced Acoustic Signal)

- (i) EPA/530/UST-90-005, March 1990, Standard Test Procedures For Evaluating Leak Detection Methods - Nonvolumetric Tank Tightness Testing Methods,

- (ii) Amendment to EPA ATG and Non Volumetric TTT Protocols for Water Sensor Testing;

M Out-of-Tank Product Detectors (Liquid-Phase)

- (i) EPA/530/UST-90-009, Standard Test Procedures For Evaluating Leak Detection Methods – Liquid-phase Out-of-tank Product Detectors,
- (ii) Development of Procedures to Assess the Performance of External Leak Detection Devices - Liquid-Phase ASTM-Formatted Methods - Revised Draft to Include JP-4 Jet Fuel,
- (iii) Test Procedures for Third-party Evaluation of Leak Detection Methods - Cable Sensor Liquid Contact Leak Detection Systems,
- (iv) Test Procedures for Third-party Evaluation of Leak Detection Methods - Point Sensor Liquid Contact Leak Detection Systems;

N Out-of-Tank Product Detectors (Vapour-Phase)

- (i) EPA/530/UST-90-008, March 1990, Standard Test Procedures For Evaluating Leak Detection Methods – Vapor-phase Out-of-tank Product Detectors,
- (ii) Development of Procedures to Assess the Performance of External Leak Detection Devices - Vapor-Phase ASTM-Formatted Methods, June 6, 1990,
- (iii) Development of Procedures to Assess the Performance of External Leak Detection Devices - Vapor-Phase ASTM-Formatted Methods, June 29, 1990;

O Secondary and Spill Containment Test Methods

- (i) EPA/530/UST-90-005, Standard Test Procedures For Evaluating Leak Detection Methods - Nonvolumetric Tank Tightness Testing Methods,
- (ii) EPA/350/UST-90-006, Standard Test Procedures For Evaluating Leak Detection Methods - Automatic Tank Gauging Systems,
- (iii) Amendment to EPA ATG and Non Volumetric TTT Protocols for Water Sensor Testing;

P Statistical Inventory Reconciliation Test Method (Qualitative)

- (i) EPA/530/UST-90-007, Standard Test Procedures for Evaluating Leak Detection Methods - Statistical Inventory Reconciliation Methods,
- (ii) Protocol for Determining Applicability of a SIR Method for Manifolded Tanks and Determining Size Limitation;

NOTE: Some of these documents describe alternative methods that *authorities having jurisdiction (AHJs)* may regard as equally applicable to a given leak detection device or installation. The proponent, the testing laboratory and the *AHJ* are to agree on the applicable document(s) for any leak detection device proposed for certification.

6.5.2 Reporting Requirements for Leak Detection Tests

6.5.2.1 In addition to the information specified in the individual test methods, all reports describing the testing of the leak detection devices according to this Standard shall include the following information:

- A The proponent's name and address;
- B The general description, drawings and schematics of the leak detection devices;
- C The name and location of the laboratory performing the tests and, if applicable, the accreditation agency for the laboratory;
- D A summary of measured results (preferably in a table) compared to the requirements of this standard with indication that the property has passed or failed; and
- E An appendix to the report containing the test data in accordance with specific EPA/NWGLDE test procedures used to evaluate the leak detection device, including the volume of the test tank(s), if applicable.

7 INSTALLATION AND OPERATING INSTRUCTIONS

7.1 The manufacturer's installation and operating instructions shall accompany each device or equipment.

7.2 The instructions shall include such directions and information as deemed by the manufacturer to be adequate for attaining proper and safe installation, maintenance, and use of the product and include as a minimum the following information:

- A Safety requirements;
- B Calibration techniques and frequency;
- C Maintenance/cleaning methods and frequency;
- D Best practices to promote measurement accuracy; and
- E Notification that *Authority Having Jurisdiction (AHJ)* requirements may specify that a leak from an installed tank be reported within a defined time limit after occurrence/detection.

8 MARKING

8.1 Each leak detection device shall be legibly marked with the following information:

- A The manufacturer's name or logo;
- B The model number;
- C A date code or serial number;
- D Electrical ratings, where applicable;
- E The designation:

"Precision Leak Detection Device" or "Interstitial Leak Detection Device"

or

"Precision Leak Detection Equipment" or "Interstitial Leak Detection Equipment"

F The rating stated as "Capability of Detection - 0.38 L/h";

G The statement:

"Refer to operating instructions for compatibility with stored products";

H "CAN/ULC-S675.2"; and

I Identification of the model number for associated hardware to which the device or equipment must be connected so as to match the leak detection performance verified by the testing laboratory.

NOTE 1: For smaller leak detection devices, it is acceptable to mark a tag attached to the leak detection device. In this case the tests of Section 6, Performance Tests, and Appendix A, Acoustical Methods and Tracer Methods, should be performed with the tag attached. Any machine-readable method acceptable to the *AHJ* may be used as an alternative to physical marking.

NOTE 2: Manufacturers should be aware that the *AHJ* may also require that the mark of the certifying agency be included on each leak detection device. All marking is to be accessible for inspection subsequent to installation.

8.2 The markings shall be distinct, legible and shall be engraved or stamped on a metal label or other material of equivalent durability permanently attached to the leak detection device.

8.3 Alternate methods of attachment are permissible provided that the label is affixed to the leak detection device in a manner that will destroy the label if it is removed from the leak detection device. If a pressure sensitive label, ink, paint-stencilling or other method is used, it shall comply with the requirements of CSA 22.2 No. 015, Adhesive Labels, or UL 969, Standard for Marking and Labelling Systems.

APPENDIX A - ACOUSTICAL METHODS AND TRACER METHODS (INFORMATIVE)

(Reference: Clause 8.1)

A1 APPLICATION OF THE REQUIREMENTS TO ACOUSTICAL METHODS

A1.1 One class of commercially available nonvolumetric test methods is based on acoustical principles.

A1.2 Acoustical methods use sensitive hydrophones to detect an acoustical signal from the tank. This signal is recorded and is analyzed to identify a specific characteristic associated with a *leak*. One such method places the tank under a partial vacuum and investigates the acoustical signal for a characteristic "bubble" signature induced when air bubbles are drawn from outside the tank (in an unobstructed backfill zone) into a liquid through a hole in the tank. *Leaks* in the ullage are identified by a particular frequency or "whistle" of air ingressing into the ullage space. Another approach analyzes the acoustical signal for a characteristic sound of fluid flowing out of an orifice in the tank.

A1.3 While these methods have been called "acoustical", they typically have additional modes of detecting *leaks* that are used in conditions of a high ground water level. Generally they rely on identification of water ingress to detect *leaks* in the presence of a high ground water level. The evaluation must test all modes of *leak* detection used by the method to "detect *leaks* from any portion of the tank that normally contains product".

NOTE: The accuracy of acoustical methods for the detection of water ingress involving tanks containing ethanol blend fuels should be specifically assessed.

A1.4 Acoustical methods can be used with a fairly wide range of product levels in the tank. The deformation caused by filling the tank would not affect these methods, nor would the temperature of the product in the tank. Consequently, the sequence of temperature and filling conditions does not need to be considered with these tests. The tank should be filled to a level in the range specified by the method.

A1.5 To induce a *leak* for the acoustical methods, it is necessary to use a leak inducing device that will create the same signal that a real *leak* would create. One way to do this is to use an orifice-type *leak* simulator. This consists of a pipe inserted into the tank through one of the tank openings. The pipe is sealed to the tank. The bottom of the pipe is fitted with a cap that contains a calibrated orifice to allow product to *leak* into the pipe at the desired *leak* rate under a standard head. This simulator will work for either type of acoustical signal. Flow of liquid through the orifice would produce the signal typical of liquid flow. If the tank is under partial vacuum, air will be drawn into the tank through the orifice below the liquid level and will produce bubbles. A means of closing the orifice is needed so that a zero *leak rate* can be induced and kept blind to the test personnel.

A2 TRACER METHOD TEST PROCEDURE

A2.1 There are many variables present in external monitoring that are difficult to predict or control. These include the nature of the backfill material, moisture content of the soil, size of the excavation, type of soil surrounding the excavation, the ground water level, position of a *leak* relative to the sampling locations, and whether the method is aspirated or passive. In general, some minimum threshold concentration of tracer must be reached before a signal is generated. The lower the threshold, the more sensitive the method, but the more susceptible it will be to *false alarms*.

A2.2 For test methods that involve the loss of product from the tank, the *induced leak rates* should be designed to introduce the amount of tracer material into the soil that would be released by *leak rates* of the specified size over the test period. Methods that add liquid tracer to the product specify a concentration of the tracer in the product. Using this concentration (e.g., 10 ppm), a *leak rate* (e.g., 6 mL/min) and a test and waiting time after introducing the tracer into the tank (e.g., 24 h), one can calculate the amount of tracer that would be released. This is the amount that should be released during the *leak* simulation.

A2.3 If the method uses gas tracers, they can be introduced into the ground to simulate *leaks* by using a flowmeter to allow the gas to flow at the rate that would occur under the testing conditions, e.g., in a tank at 14 kPa and through a small orifice, representing a hole that would *leak* liquid product at the designated *leak rates* (less than 6 mL/min).

NOTE: Once a tracer, gas or liquid, has been introduced into the soil in a test, the testing laboratory must determine what measures are necessary to address background noise issues in subsequent measurements.

APPENDIX B - PROCESS OF CERTIFICATION AGAINST THE STANDARD (INFORMATIVE)

(Reference: Clause TBD)

B1 INTRODUCTION

B1.1 As of the 2014 publication date of the First Edition of this Standard, there has not been a formal product certification and listing service for leak detection products for *flammable liquids* or *combustible liquids* by an accredited certification organization in North America for many years. In the USA, an independent organization comprising representatives of the regulatory bodies of 10 States and the Federal Government, the National Working Group on Leak Detection Evaluations (NWGLDE), have operated a *de facto* listing service based on third-party testing to published protocols, and most *AHJs* in the USA have verified conformance of products to regulatory requirements by reference to the NWGLDE lists. In Canada, some jurisdictions verify product conformance in an identical fashion, whilst others operate a case-by-case evaluation process that also includes reference to the NWGLDE lists.

B2 PRODUCT DURABILITY, SAFETY AND PERFORMANCE RELIABILITY

B2.1 The partial certification processes identified in Clause B1.1, whilst not ideal, have nevertheless met the needs of the stakeholders to date in that, combined with safety regulations, they have ensured that newly-installed products are operating safely and determining the occurrences of *leaks* within acceptable error levels. Given that most of the products currently operating in the North American market have a proven track record of operating safety and reliability, and given that electrical products apply 'intrinsically safe' design methods, there is currently little concern that the lack of durability testing in the protocols applied by NWGLDE for listing products may result in safety hazards or increasing leak detection error levels as a result of in-service failures of these mature products.

B2.2 Some stakeholders have expressed concerns, however, that products from new manufacturers, or products that apply entirely new measurement or detection methods or technologies, may be evaluated, listed and put into service under the current partial system without the same, in effect, assurance of durability as are provided by the current mature product technologies and/or manufacturers, with consequent risks to life, property and environmental safety. The counter-argument has also been advanced that these concerns should not result in new durability requirements included in this Standard being imposed on mature products where no such concern exists, with the corresponding increase in product costs ultimately being born by the consumer. A need has also been identified to determine what types and levels of exposure testing provide adequate assurance of durability against actual leak detection service conditions, without imposing excessive stress levels that may result in failures of samples of existing products that are, in fact, adequately durable for actual service.

B2.3 Users of this Standard are recommended to develop verification and maintenance schedules for leak detection devices placed into service that include identified end-of-life dates for replacement of the leak detection devices, taking into account the service conditions in each case.

B2.4 In considering the foregoing points, the Task Group developed the material that follows in the rest of this Appendix.

B3 CERTIFICATION PROCESS APPLYING NWGLDE LISTINGS

B3.1 For mature product technologies, it is suggested that the certification organization determine that a specific leak detection device is acceptable by assembling and verifying the following:

- A The information identified in Section 7 of this Standard;
- B The protocol(s) against which the product was tested (selected from the NWGLDE list of protocols);
- C All of the results of the protocol tests;
- D A list of all the operating limitations, including those noted in the third party protocol test;
- E Confirmation that the device/equipment is listed on the NWGLDE website;
- F A field procedure and operating manual for the device/equipment;
- G Testing and certification documentation for hazardous location installation, or intrinsic safety, of any electrical elements of the product.

B3.2 For products from new manufacturers, or products that apply entirely new measurement or detection methods or technologies, in addition to the material identified in Clause B3.1, it is recommended that the certification organization determine whether there is a need to address the issue of safety hazards or increasing leak detection error levels as a result of in-service failures and, if so, propose additional durability testing to be carried out on the product prior to completion of the certification and listing service.

B4 CERTIFICATION OF SOFTWARE INCLUDED IN LEAK DETECTION PRODUCTS

B4.1 It is recommended that software be addressed in the same fashion as the hardware components of a product. Control by the manufacturer of consistent software function despite changes in version numbers, etc., may be addressed in the same fashion as control of ongoing hardware component quality and reliability despite changes in part numbers or suppliers by periodic testing of the product for operation within the established control parameters.



**NATIONAL
STANDARD
OF CANADA**

CAN/ULC-S675.1-14

**STANDARD FOR VOLUMETRIC LEAK DETECTION DEVICES
FOR UNDERGROUND AND ABOVEGROUND STORAGE
TANKS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS**



ULC Standards
Normes ULC



Standards Council of Canada
Conseil canadien des normes

Underwriters Laboratories of Canada (ULC) was established in 1920 by letters patent issued by the Canadian Government. It maintains and operates laboratories and certification services for the examination, testing and certification of appliances, equipment, materials, constructions and systems to determine their relation to life, fire and property hazards as well providing inspection services.

Underwriters Laboratories of Canada is accredited by the Standards Council of Canada as a Certification Organization, a Testing Organization, and an Inspection Body under the National Standards System of Canada.

ULC Standards develops and publishes standards and other related publications for building construction, security and burglar protection, environmental safety, electrical equipment, fire protection equipment, gas and oil equipment, thermal insulation products, materials and systems, energy use in the built environment and electrical utility safety.

ULC Standards is a not-for-profit organization and is accredited by the Standards Council of Canada as a Standards Development Organization.

National Standards of Canada developed by ULC Standards conform to the criteria and procedures established by the Standards Council of Canada. Such standards are prepared using the consensus principle by individuals who provide a balanced representation of interests relevant to the subject area on a national basis.

ULC is represented across Canada as well as many countries worldwide. For further information on ULC services, please contact:

Customer Service: 1-866-937-3852

CORPORATE HEADQUARTERS

Underwriters Laboratories of Canada
7 Underwriters Road
Toronto, Ontario M1R 3A9
Telephone: (416) 757-3611
Fax: (416) 757-9540

REGIONAL OFFICES

PACIFIC OFFICE

13775 Commerce Parkway, Suite 130
Richmond, British Columbia V6V 2V4
Telephone: (604) 214-9555
Fax: (604) 214-9550

EASTERN OFFICE

6505, Rte Transcanadienne, Suite 330
St-Laurent, Québec H4T 1S3
Telephone: (514) 363-5941
Fax: (514) 363-7014

The Standards Council of Canada (SCC) is the coordinating body of the Canadian standardization network, which is composed of people and organizations involved in the development, promotion and implementation of standards. Through the collaborative efforts of Canadian standardization network members, standardization is helping to advance the social and economic well-being of Canada and to safeguard the health and safety of Canadians. The network's efforts are overseen by SCC.

The principal objectives of SCC are to foster and promote voluntary standardization as a means of advancing the national economy, supporting sustainable development, benefiting the health, safety and welfare of workers and the public, assisting and protecting the consumer, facilitating domestic and international trade, and furthering international cooperation in relation to standardization.

An important facet of the Canadian standards development system is the use of the following principles: consensus; equal access and effective participation by concerned interests; respect for diverse interests and identification of those who should be afforded access to provide the needed balance of interests; mechanism for dispute resolution; openness and transparency; open access by interested parties to the procedures guiding the standards development process; clarity with respect to the processes; and Canadian interest consideration as the initial basis for the development of standards.

A National Standard of Canada (NSC) is a standard prepared or reviewed by an SCC-accredited SDO and approved by the SCC according to NSC approval requirements. Approval does not refer to the technical content of the standard, as this remains the responsibility of the SDO. An NSC reflects a consensus of a number of capable individuals whose collective interests provide, to the greatest practicable extent, a balance of representation of general interests, producers, regulators, users (including consumers) and others with relevant interests, as may be appropriate to the subject at hand. NSCs are intended to make a significant and timely contribution to the Canadian interest.

Those who have a need to apply standards are encouraged to use NSCs. These standards are subject to periodic review. Users of NSCs are cautioned to obtain the latest edition from the SDO that publishes the standard.

The responsibility for approving standards as NSCs rests with:

Standards Council of Canada
270 Albert Street
Suite 200
Ottawa, Ontario
K1P 6N7
Telephone: (613) 238-3222

For further information on ULC standards, please contact:

ULC STANDARDS

171 Nepean Street, Suite 400
Ottawa, Ontario K2P 0B4
Telephone: (613) 755-2729
Fax: (613) 231-5977

E-mail: customerservice@ulc.ca
Web site: www.ulc.ca

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for this particular application.

Copies of this National Standard of Canada may be ordered from ULC Standards.

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE

**NATIONAL
STANDARD
OF CANADA**

CAN/ULC-S675.1-14

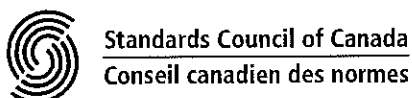
**STANDARD FOR VOLUMETRIC LEAK DETECTION DEVICES FOR
UNDERGROUND AND ABOVEGROUND STORAGE TANKS FOR
FLAMMABLE AND COMBUSTIBLE LIQUIDS**

ICS 75.180.01; 75.200

Prepared and Published by



Approved by



FIRST EDITION OCTOBER 2014

Copyright © 2014

ULC Standards

All rights reserved. No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without prior permission.

TABLE OF CONTENTS

ULC STANDARDS COMMITTEE ON FITTINGS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS ..	I
ULC STANDARDS TASK GROUP ON VOLUMETRIC LEAK DETECTION	II
PREFACE	III
1 SCOPE	1
2 REFERENCE PUBLICATIONS	1
3 GLOSSARY	3
4 MATERIALS, WORKMANSHIP AND CONSTRUCTION	4
4.1 GENERAL	4
4.2 ELECTRICAL FEATURES	4
4.2.1 General	4
4.3 NONMETALLIC MATERIALS	5
5 PERFORMANCE REQUIREMENTS	5
5.1 PRECISION LEAK DETECTION	5
5.2 CONTINUOUS LEAK MONITORING	5
5.3 PRECISION LEAK MONITORING	5
5.4 TANK PRODUCT LEVEL MEASUREMENT CRITERIA	5
5.5 TANK WATER LEVEL MEASUREMENT CRITERIA	5
6 PERFORMANCE TESTS	5
6.1 GENERAL	5
6.2 ACCELERATED AGING TEST	6
6.3 EXTERNAL LEAKAGE TEST	6
6.4 REPORTING REQUIREMENTS, EXCLUDING LEAK DETECTION	6
6.4.1 General	6
6.5 LEAK DETECTION PERFORMANCE TESTS	6
6.5.1 Leak Detection Performance Test Requirements	6
6.5.2 Reporting Requirements for Leak Detection Tests	8
7 INSTALLATION AND OPERATING INSTRUCTIONS	8
8 MARKING	8
APPENDIX A - PROBABILITY OF DETECTION AND PROBABILITY OF FALSE ALARM (INFORMATIVE)	10
APPENDIX B - PROCESS OF CERTIFICATION AGAINST THE STANDARD (INFORMATIVE)	14

ULC STANDARDS COMMITTEE ON FITTINGS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS

NAME	AFFILIATION	REGION	CATEGORY
M. Mailvaganam(Chair)	Consultant	Ontario	General Interest
B. Andrew	Veeder-Root	U.S.A.	Producer
B. Armstrong	AT Monitors	U.S.A.	Producer
A. Barker	Technical Standards & Safety Authority	Ontario	Regulator
M. Bishoff	Lorax Systems, Inc.	Canada	Producer
W. Boyd	Emco Wheaton Retail Corp.	U.S.A.	Producer
A. Dornan	Environment Canada	Canada	Regulator
J. Dutton	Department of Environment and Conservation	Newfoundland and Labrador	Regulator
D. Edgecombe	Petroleum Tank Management Association	Alberta	Regulator
E. Fernandes	Ontario Petroleum Contractors Association	Ontario	User
S. Hyde-Clarke	National Research Council	Canada	General Interest
S. Jones	J and B Engineering, Inc.	Canada	General Interest
P. Legault	Department of National Defence	Canada	Regulator
D. Lenart	Imperial Oil (Esso)	Canada	User
B. Nelson	Franklin Fuelling Systems, Inc.	U.S.A.	Producer
G. Nikolic	MHCC Consultants, Inc.	Ontario	General Interest
D. Northcotte	North Waterloo Farmers Mutual Insurance	Ontario	General Interest
R. Stephenson	Chevron	Canada	User
B. Trussler	Ship's Point Consulting	Canada	User
C. Vassos	Waleco, Inc.	Canada	Producer
S. Villeneuve	Vilco, Ltd.	Nova Scotia	User
K. Webster	OPW Fueling Containment Systems, Inc.	U.S.A.	Producer
K. Wilcox	Ken Wilcox Associates, Inc.	U.S.A.	User
J. Bablo (Associate Member)	UL LLC	U.S.A.	(Non-Voting)
T. Espejo (Associate Member)	ULC Standards	Canada	(Non-Voting)
M. Modéry (Associate Member)	Environment Canada	Canada	(Non-Voting)
P. Neil (Associate Member)	OPW Fueling Containment Systems, Inc.	U.S.A.	(Non-Voting)
R. Sculthorp (Associate Member)	Underwriters Laboratories of Canada	Canada	(Non-Voting)
J. Wade (Project Manager)	ULC Standards	Canada	(Non-Voting)
S. Anderson (Secretary)	ULC Standards	Canada	(Non-Voting)

This list represents the membership at the time the Committee balloted on the final text of this edition. Since that time, changes in the membership may have occurred.

ULC STANDARDS TASK GROUP ON VOLUMETRIC LEAK DETECTION**MEMBER****REPRESENTING**

D. Lenart (Chair).....	Imperial Oil (Esso)
B. Andrew	Veeder-Root
B. Armstrong	AT Monitors
A. Barker	Technical Standards & Safety Authority
M. Bishoff	Lorax Systems, Inc.
W. Boyd.....	Emco Wheaton Retail Corp.
J. Dutton	Environment and Conservation, Newfoundland and Labrador
D. Edgecombe	Petroleum Tank Management Association of Alberta
S. Jones	J and B Engineering, Inc.
P. Neil.....	OPW Fueling Containment Systems, Inc.
B. Nelson.....	Franklin Fueling Systems, Inc.
P. Sutherland	Tanknology Canada
B. Trussler	Ship's Point Consulting
C. Vassos	Waleco, Inc.
K. Webster.....	OPW Fueling Containment Systems, Inc.
J. Wade (Secretary).....	ULC Standards

STANDARD FOR VOLUMETRIC LEAK DETECTION DEVICES FOR UNDERGROUND AND ABOVEGROUND STORAGE TANKS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS

PREFACE

This is the First Edition of the Standard for Volumetric Leak Detection Devices for Underground and Aboveground Storage Tanks for Flammable and Combustible Liquids, CAN/ULC-S675.1.

This Edition of the Standard has been formally approved by the ULC Standards Committee on Fittings for Flammable and Combustible Liquids.

Only metric SI units of measurement are used in this Standard. If a value for measurement is followed by a value in other units in parentheses, the second value may be approximate. The first stated value is the requirement.

Appendices A and B, identified as Informative, are for information purposes only.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

This First Edition National Standard of Canada is based on, and now supersedes, ULC/ORD-C58.12.

Attention is drawn to the possibility that some of the elements of this Canadian standard may be the subject of patent rights. ULC Standards shall not be held responsible for identifying any or all such patent rights.

Requests for interpretation of this Standard should be sent to ULC Standards. The requests should be worded in such a manner as to permit a "yes" or "no" answer based on the literal text of the requirement concerned.

The initiation of the review of this Standard will commence within 5 years of the date of publication, unless the Standard is identified as fitting within a stabilized category, whereby the review will commence within the appropriate time frame set out by ULC Standards.

This Standard is intended to be used for conformity assessment.

1 SCOPE

1.1 This Standard provides minimum requirements for primary containment leak detection that uses quantitative assessment of physical characteristics to detect leaks in the primary containment.

1.2 These requirements do not cover qualitative nonvolumetric leak detection devices.

1.3 The requirements of this Standard apply to newly-manufactured products. The requirements of this Standard do not apply to installation and monitoring procedures.

NOTE: The identifier "leak detection device" used throughout this document applies to the sensor, plus any cables, connected equipment, software, and display necessary to detect and declare a leak. Since the elements of a particular product may range from all of these items, to a sensor with an integrated display alone, the requirements for marking permit the product elements to be marked "leak detection device" or "leak detection equipment" as appropriate.

2 REFERENCE PUBLICATIONS

2.1 The documents shown below are referenced in the text of this Standard. Unless otherwise stated elsewhere in this Standard such reference shall be considered to indicate the edition and/or revisions of the document available at the date on which the Committee approved this ULC Standard.

Documents Published by the American Society for Testing and Materials (ASTM)
100 Barr Harbour Drive, PO Box C700, West Conshohocken, PA 19428-2959 U.S.A.
Telephone: (610) 832-9585
www.astm.org

- ASTM D56-05 (R 2010), Standard Test Method for Flash Point by Tag Closed Cup Tester
- ASTM D93-13, Standard Test Method for Flash Point by Pensky-Martens Closed Cup Tester
- ASTM D471-12 (Rev A), Standard Test Method for Rubber Property - Effect of Liquids
- ASTM D3828-12, Standard Test Method for Flash Point by Small Scale Closed Cup Tester
- ASTM E1003-95 (R 2006), Standard Practice for Hydrostatic Leak Testing

Documents Published by CSA Group
5060 Spectrum Way, Suite 100, Mississauga, Ontario L4W 5N6 Canada
Telephone: 1-800-463-6727, Fax: (416) 747-2473
www.csagroup.org

- CSA C22.1-12, Canadian Electrical Code, Part I, Safety Standard for Electrical Installations
- CSA C22.2 No. 0.15-01, Adhesive Labels
- CSA C22.2 No. 22-86 (R2013), Electrical Equipment for Flammable and Combustible Fuel Dispensers
- CSA C22.2 No. 30-86 (R2012), Explosion-Proof Enclosures for Use in Class I Hazardous Locations
- CSA C22.2 No. 142-87 (R2009), Process Control Equipment Industrial Products

- CSA C22.2 No. 157-92 (R2012), Intrinsically Safe and Non-Incendive Equipment for Use in Hazardous Locations
-

Documents Published by the Environmental Protection Agency (EPA)
1200 Pennsylvania Ave N.W., Washington, DC 20460 U.S.A.
Telephone: (703) 603-8399
www.epa.gov

- EPA/350/UST-90-006, March 1990, Standard Test Procedures For Evaluating Leak Detection Methods - Automatic Tank Gauging Systems
 - EPA/530/UST-90-004, March 1990, Standard Test Procedures For Evaluating Leak Detection Methods - Volumetric Tank Tightness Testing Methods
 - EPA/530/UST-90-007, June 1990, Standard Test Procedures For Evaluating Leak Detection Methods - Statistical Inventory Reconciliation Methods
-

Document Published by the National Research Council of Canada (NRC)
1200 Montreal Road, Bldg. M58, Ottawa, ON, K1A 0R6, Canada
Telephone: 1-800-672-7990
www.nrc-cnrc.gc.ca

- National Fire Code of Canada, 2010
-

Documents Published by the National Working Group on Leak Detection Evaluations (NWGLDE)
www.nwglde.org

- Alternative Test procedures for Evaluating Leak Detection Methods - Volumetric Leak Detection Systems for Aboveground Storage Tanks, December, 2009, Ken Wilcox Associates
- Amendment to EPA ATG and Non Volumetric TTT Protocols for Water Sensor Testing, December 17, 2008, Jairus D. Flora Jr. Ph.D.
- ATG/CITLDS Water Detection Testing In Ethanol or Blends Greater Than 10% Ethanol, NWGLDE addendum to EPA/350/UST-90/006, December 2007, Jairus D. Flora, Jr. Ph.D
- Evaluation Protocol for Continuous In-Tank Leak Detection Systems, April 7, 1995, Midwest Research Institute.
- Evaluation Protocol for Continuous In-Tank Leak Detection Systems, January 7, 2000, Jairus D. Flora, Jr. Ph.D.
- Protocol for Determining Applicability of a SIR Method for Manifolded Tanks and Determining Size Limitation, November 1996, Developed under coordination by the SIR team of the National Work Group on Leak Detection Evaluations
- Test Procedures for Comparison of Different ATG Probes, March 27, 2000, Ken Wilcox Associates

- Test Procedures for Comparison of Different Automatic Tank Gauge Consoles, October 4, 2010, Ken Wilcox Associates

Documents Published by Underwriters Laboratories Inc.
Available from COMM 2000, 1414 Brook Drive, Downers Grove, IL, U.S.A 60515
Telephone: 1-888-853-3503
www.comm-2000.com

- UL 913:2011, Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, Hazardous (Classified) Locations
- UL 969:1995 (R2008), Standard for Marking and Labelling Systems
- ANSI/UL 1238:2013, Standard for Control Equipment for Use with Flammable Liquid Dispensing Devices

3 GLOSSARY

NOTE: Terms used in this Standard that are in *italic* print are defined as follows:

3.1 **ACCURACY** — The degree to which the *measured leak rate* agrees with the *induced leak rate* on the average. If a leak detection device is accurate, it has a very small or zero *bias*.

3.2 **AUTHORITY HAVING JURISDICTION (AHJ)** — The governmental body responsible for the enforcement of any part of this Standard or the official or agency designated by that body to exercise such a function.

3.3 **BIAS (DEVICE BIAS), B** — The average difference between measured and *induced leak rates*, in litres per hour (L/h). It is an indication of whether the leak detection device being evaluated consistently overestimates (positive *bias*) or underestimates (negative *bias*) the *induced leak rate*.

3.4 **COMBUSTIBLE LIQUID** — Any liquid having a flash point at or above 37.8 °C and below 93.3 °C and as defined in the National Fire Code of Canada.

NOTE: Sentence 4.1.3 of the 2010 Edition of the National Fire Code of Canada specifies the following test methods: ASTM D56, Standard Test Method for Flash Point by Closed Cup Tester, for liquids with a kinematic viscosity less than 6 cSt; ASTM D93, Standard Test Method for Flash Point by Pensky-Martens Closed Cup Tester, for liquids with a kinematic viscosity of 6 cSt or more; ASTM D3828, Standard Test Methods for Flash Point by Small-Scale Closed Cup Tester, as an optional alternative for aviation turbine fuels.

3.5 **FALSE ALARM** — An indication that a tank is *leaking* when it is not.

3.6 **FLAMMABLE LIQUID** — Any liquid having a flash point below 37.8 °C and vapour pressure not exceeding 276 kPa (absolute) at 37.8 °C and as defined in the National Fire Code of Canada.

3.7 **INDUCED LEAK RATE** — The *leak rate*, expressed in litres per hour, used during testing, against which the results from a given leak detection device under test will be compared.

3.8 **LEAKAGE, LEAK OR LEAKING** — Any unplanned flow of fluid in or out of the primary containment.

3.9 **LEAK MONITORING DEVICE** — A surveillance device to detect *leaks (leakage)* of *flammable liquids* or *combustible liquids* from a primary containment.

3.10 **LEAK RATE (*R*)** — The amount of product loss per unit of time, expressed in litres per hour.

3.11 **MEASURED LEAK RATE** — A number, in litres per hour, measured by the leak detection device under test and indicating the amount of product *leaking* out of the tank. A negative *leak rate* would indicate that a liquid is *leaking* into the tank.

3.12 **PRECISION LEAK DETECTION DEVICE** — A leak detection device that is designed for short-term measurement for potential *leaks* from an installed tank.

3.13 **PROBABILITY OF DETECTION, *P(D)*** — The probability of detecting a *leak* in a primary containment of a given size, stated as a decimal, fraction or percentage.

3.14 **PROBABILITY OF FALSE ALARM, *P(FA)*** — The probability of declaring a *leak* in a non-leaking primary containment of a given size stated as a decimal, fraction or percentage.

4 MATERIALS, WORKMANSHIP AND CONSTRUCTION

4.1 GENERAL

4.1.1 The manufacturer shall state the limiting operating and service conditions, such as humidity, temperature, jarring and vibration, for which the leak detection device meets the requirements of this Standard.

4.1.2 The manufacturer shall define the *flammable liquids* and *combustible liquids* with which the leak detection devices are compatible.

4.2 ELECTRICAL FEATURES

4.2.1 General

4.2.1.1 The electrical features of unenclosed leak detection devices shall meet the applicable requirements of:

- A CSA C22.1, Canadian Electrical Code, Part I, Safety Standard for Electrical Installations;
- B CSA C22.2 No. 142, Process Control Equipment, or ANSI/UL 1238, Standard for Control Equipment for Use with Flammable Liquid Dispensing Devices;
- C CSA C22.2 No. 22, Electrical Equipment for Flammable and Combustible Fuel Dispensers;
- D UL 913, Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, Hazardous (Classified) Locations; or
- E CSA C22.2 No. 157, Intrinsically Safe and Non-Incendive Equipment for Use in Hazardous Locations.

4.2.1.2 Leak detection devices not meeting the requirements of Clause 4.2.1.1, and which are to be used in a hazardous area, shall be protected in enclosures meeting the requirements of CSA C22.2 No. 30, Explosion-Proof Enclosures for Use in Class I Hazardous Locations. Such electrical devices or equipment shall meet the requirements of the appropriate CSA Standards for electrical safety and performance.

4.3 NONMETALLIC MATERIALS

4.3.1 Nonmetallic materials which are immersed in, or exposed to, *flammable liquids* or *combustible liquids* or vapours, shall not be affected by such liquids or vapours in a manner as to cause a failure of the leak detection devices or to cause a hazardous condition to occur. The manufacturer shall specify the *flammable liquids* or *combustible liquids* for which their product meets this requirement.

5 PERFORMANCE REQUIREMENTS

NOTE: Products meeting the applicable requirements as defined in this Standard may be identified by a manufacturer as *precision leak detection devices*, *continuous leak monitoring devices*, *precision leak monitoring devices* or any applicable combination.

5.1 PRECISION LEAK DETECTION

5.1.1 The leak detection device shall be capable of detecting a *leak rate* of 0.38 L/h within a period of 24 hours with a *probability of detection* equal to or greater than 0.95 and a *probability of false alarm* equal to or less than 0.05.

5.2 CONTINUOUS LEAK MONITORING

5.2.1 The leak detection device shall be capable of detecting a *leak rate* of 0.76 L/h within a period of 30 d with a *probability of detection* equal to or greater than 0.95 and a *probability of false alarm* equal to or less than 0.05. For the purposes of this requirement, "leak detection device" shall include Statistical Inventory Reconciliation (SIR) software, if applicable.

5.3 PRECISION LEAK MONITORING

5.3.1 The leak detection device shall be capable of detecting a *leak rate* of 0.38 L/h within a period of 30 d with a *probability of detection* equal to or greater than 0.95 and a *probability of false alarm* equal to or less than 0.05. For the purposes of this requirement, "leak detection device" shall include Statistical Inventory Reconciliation (SIR) software, if applicable.

5.4 TANK PRODUCT LEVEL MEASUREMENT CRITERIA

5.4.1 The leak detection device shall be capable of measuring the tank liquid level to within 3 mm with a probability of 0.99.

5.5 TANK WATER LEVEL MEASUREMENT CRITERIA

5.5.1 The leak detection device shall be capable of measuring the level of water in the tank to within 3 mm with a probability of 0.95.

NOTE: The impact on the capability of the leak detection device to meet this requirement for tanks containing ethanol blend fuels should be considered during certification testing.

6 PERFORMANCE TESTS

6.1 GENERAL

6.1.1 Samples that are fully representative of the leak detection devices shall be submitted for test.

6.1.2 Tests as described under Subsection 6.2, Accelerated Aging Test, shall be performed where the failure, or change in characteristics, of the materials would affect the safety or operation of the leak detection device, as determined by a Failure Modes and Effects Analysis performed by the proponent.

6.2 ACCELERATED AGING TEST

6.2.1 Representative samples of elastomers shall be subjected to an accelerated oxygen pressure aging test for a minimum of 96 h in oxygen at a temperature of 70 ± 2 °C and at a pressure of 200 ± 10 kPa. The samples shall be subjected to tensile and hardness determination before and after the aging.

6.2.2 The samples shall retain not less than 75 % of their original properties after the aging.

6.3 EXTERNAL LEAKAGE TEST

6.3.1 Samples of the assemblies or components subject to liquid or vapour pressure shall be leak tested at a pressure of 35 ± 2 kPa.

6.3.2 The samples shall withstand the applied pressure for 5 min without *leakage* or measurable permanent distortion.

NOTE: Proponents and testing laboratories are referred to the Visual Inspection Method of ASTM E1003, Standard Practice for Hydrostatic Leak Testing.

6.4 REPORTING REQUIREMENTS, EXCLUDING LEAK DETECTION

6.4.1 General

6.4.1.1 In addition to the information specified in the individual test methods, all reports describing the testing of the leak detection devices according to this Standard shall include the following information:

- A The proponent's name and address;
- B The general description, drawings and schematics of the leak detection devices;
- C The descriptions of test apparatus, calibration standards and their source(s);
- D The name and location of the laboratory performing the tests and, if applicable, the accreditation agency for the laboratory;
- E A summary of measured results (preferably in a table) compared to the requirements of this Standard with indication that the leak detection devices have passed/failed for each requirement; and
- F An appendix to the report containing the test data used to generate the above items.

6.5 LEAK DETECTION PERFORMANCE TESTS

6.5.1 Leak Detection Performance Test Requirements

6.5.1.1 The leak detection device shall conform to the requirements of one or more of the following documents:

- A Aboveground Storage Tank Leak Detection Method

- (i) Alternative Test procedures for Evaluating Leak Detection Methods - Volumetric Leak Detection Systems for Aboveground Storage Tanks, Ken Wilcox Associates;

B Automatic Tank Gauging Method

- (i) EPA/350/UST-90-006, Standard Test Procedures For Evaluating Leak Detection Methods - Automatic Tank Gauging Systems,
- (ii) Test Procedures for Comparison of Different ATG Probes, Ken Wilcox Associates
(With acceptable modification, this method is also applicable to comparisons of different ATG controllers.)
- (iii) ATG/CITLDS Water Detection Testing In Ethanol or Blends Greater Than 10% Ethanol, NWGLDE addendum to EPA/350/UST-90/006, Jairus D. Flora, Jr. Ph.D,
- (iv) Test Procedures for Comparison of Different Automatic Tank Gauge Consoles, Ken Wilcox Associates;

C Continuous In-Tank Leak Detection Method

- (i) Evaluation Protocol for Continuous In-Tank Leak Detection Systems, Midwest Research Institute.,
- (ii) Evaluation Protocol for Continuous In-Tank Leak Detection Systems, Jairus D. Flora, Jr. Ph.D.,
- (iii) ATG/CITLDS Water Detection Testing In Ethanol or Blends Greater Than 10% Ethanol, NWGLDE addendum to EPA/350/UST-90/006, Jairus D. Flora, Jr. Ph.D,
- (iv) Amendment to EPA ATG and Non Volumetric TTT Protocols for Water Sensor Testing, Jairus D. Flora Jr. Ph.D.;

D Secondary and Spill Containment Test Methods

- (i) EPA/350/UST-90-006, Standard Test Procedures For Evaluating Leak Detection Methods - Automatic Tank Gauging Systems;

E Statistical Inventory Reconciliation Test Method (Quantitative)

- (i) EPA/530/UST-90-007, Standard Test Procedures For Evaluating Leak Detection Methods - Statistical Inventory Reconciliation Methods,
- (ii) Protocol for Determining Applicability of a SIR Method for Manifolded Tanks and Determining Size Limitation;

F Volumetric Tank Tightness Test Method (Overfill, Underfill)

- (i) EPA/530/UST-90-004, Standard Test Procedures For Evaluating Leak Detection Methods - Volumetric Tank Tightness Testing Methods;

NOTE 1: Some of these documents describe alternative methods that *authorities having jurisdiction (AHJs)* may regard as equally applicable to a given leak detection device or installation. The proponent, the testing laboratory and the *AHJ* are to agree on the applicable document(s) for any leak detection device proposed for certification.

NOTE 2: *AHJs* may determine that the sizes of the test equipment tanks used to evaluate leak detection devices place limits on the applicability of the testing and related certification of the devices with respect to the size of tanks in actual installations.

6.5.2 Reporting Requirements for Leak Detection Tests

6.5.2.1 In addition to the information specified in the individual test methods, all reports describing the testing of the leak detection devices according to this Standard shall include the following information:

- A The proponent's name and address;
- B The general description, drawings and schematics of the leak detection devices;
- C The name and location of the laboratory performing the tests and, if applicable, the accreditation agency for the laboratory;
- D A summary of measured results (preferably in a table) compared to the requirements of this Standard with indication that the property has passed or failed; and
- E An appendix to the report containing the test data in accordance with specific EPA/NWGLDE test procedures used to generate the above items, including the volume of the test tank(s), if applicable.

7 INSTALLATION AND OPERATING INSTRUCTIONS

7.1 The manufacturer's installation and operating instructions shall accompany each device or equipment.

7.2 The instructions shall include such directions and information as deemed by the manufacturer to be adequate for attaining proper and safe installation, maintenance, and use of the product and shall include as a minimum the following information:

- A Safety requirements;
- B Calibration techniques and frequency;
- C Maintenance/cleaning methods and frequency;
- D Best practices to promote measurement *accuracy*; and
- E Notification that *authority having jurisdiction (AHJ)* requirements may specify that a leak from an installed tank be reported within a defined time limit after occurrence/detection.

8 MARKING

8.1 Each leak detection device shall be legibly marked with the following information:

- A The manufacturer's name or logo;
- B The model number;
- C A date code or serial number;
- D Electrical ratings, where applicable;

E The designation:

"Precision Leak Detection Device" or "Precision Leak Detection Equipment"

or

"Leak Monitoring Device" or "Leak Monitoring Equipment"

or

"Precision Leak Monitoring Device" or "Precision Leak Monitoring Equipment";

F The rating stated as:

"Capability of Detection - 0.38* L/h"

* or 0.76 L/h for *leak monitoring* devices;

G The statement:

"Refer to operating instructions for compatibility with stored products";

H "CAN/ULC-S675.1". and

I Identification of the model number for associated hardware to which the device or equipment must be connected so as to match the leak detection performance verified by the testing laboratory.

NOTE 1: For smaller leak detection devices, it is acceptable to mark a tag attached to the leak detection device. In this case the tests of Section 6, Performance Tests, and Appendix A should be performed with the tag attached. Any machine-readable method acceptable to the *authority having jurisdiction (AHJ)* may be used as an alternative to physical marking.

NOTE 2: Manufacturers should be aware that the *AHJ* may also require that the mark of the certifying agency be included on each leak detection device. All marking is to be accessible for inspection subsequent to installation.

8.2 The markings shall be distinct, legible and shall be engraved or stamped on a metal label or other material of equivalent durability permanently attached to the leak detection device.

8.3 Alternate methods of attachment are permissible provided that the label is affixed to the leak detection device in a manner that will destroy the label if it is removed. If a pressure sensitive label, ink, paint-stencilling or other method is used, it shall comply with the requirements of CSA 22.2 No. 015, Adhesive Labels, or UL 969, Standard for Marking and Labelling Systems.

APPENDIX A - PROBABILITY OF DETECTION AND PROBABILITY OF FALSE ALARM (INFORMATIVE)

(Reference: Clause N/A)

A1 GENERAL

A1.1 In this document, *leaks* are viewed as product lost from the tank. As a convention, *leak rates* are positive numbers, representing the amount of product loss per unit time. Thus a larger *leak* represents a greater product loss. Parts of the *leak* detection industry report volume changes per unit time with the sign indicating whether product is lost from the tank (negative sign) or is coming into the tank (positive sign). We emphasize that here, *leaks* refer to the direction out of the tank and the rate to the magnitude of the flow.

A1.2 The performance of a leak detection device is expressed in terms of the *probability of false alarm*, $P(FA)$, and the probability of detecting a *leak* of specified size, $P(D)$. In order to understand these concepts, some explanation is helpful. Generally, for volumetric leak detection devices, either a precision tank test or the *leak* test function of an automatic tank gauging system (ATCS), estimates a *leak rate*. This calculated rate is compared to a criterion or threshold, C , determined by the manufacturer. If the calculated rate is in excess of the criterion, the tank is declared to be *leaking*, otherwise, the tank is called tight.

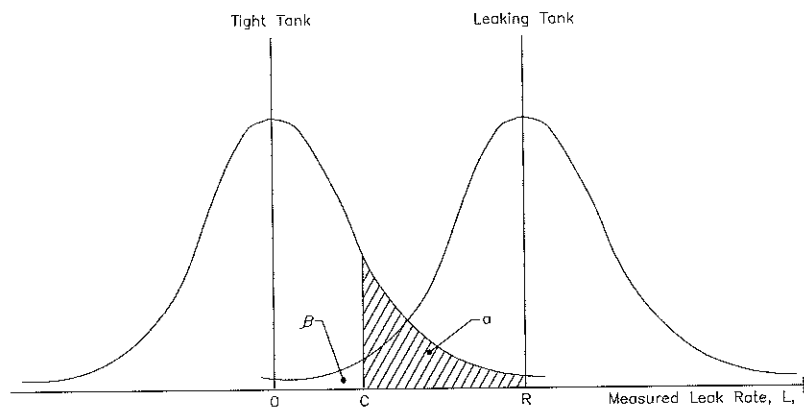
A1.3 Figure A1 represents the process of determining whether a tank is *leaking* or not. The curve on the left represents the inherent variability of the *measured leak rate* on a tight tank (with zero *leak rate*). If the *measured leak rate* exceeds C , the tank is declared to *leak*, a *false alarm*. The chance that this happens is represented by the shaded area under the curve to the right of C , denoted α (alpha).

A1.4 The variability of the *measured leak rates* for a tank that is actually *leaking* at the rate R is represented by the curve on the right in Figure A1. Again, a *leak* is declared if the measured rate exceeds the threshold, C . The probability that the *leaking* tank is correctly identified as *leaking* is the area under the right hand curve to the right of C . The probability of mistakenly declaring the *leaking* tank tight is denoted by β (beta), the area of the left of C under the *leaking* tank curve.

A1.5 Changing the criterion, C , changes both α and β for a fixed *leak rate*. If the *leak rate* is increased, the curve on the right shifts further to the right, decreasing β and increasing the *probability of detection* for a fixed criterion, C . If the precision of a leak detection device is increased, the curve becomes taller and narrower, decreasing both α and β , resulting in improved performance.

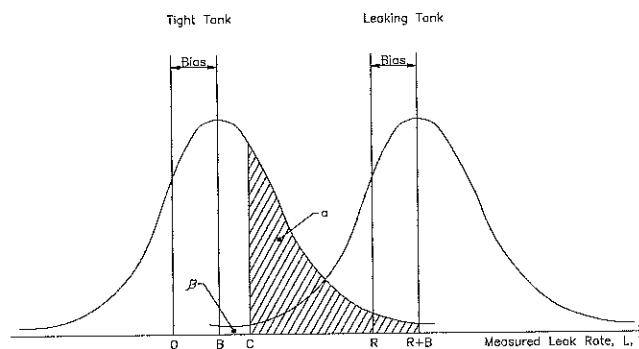
A1.6 A *bias* is a consistent error in one direction. This is illustrated in Figure A2. In it, both curves have been shifted to the right by an amount of *bias*, B . In this illustration, the *bias* indicates a greater *leak rate* than is actually present (the *bias* is positive in this case). This has the effect of increasing the probability of a *false alarm*, while reducing the probability of failing to detect a *leak*. That is, the probability of detecting a *leak* of size R is increased, but so is the chance of a *false alarm*. A *bias* toward underestimating the *leak rate* would have the opposite effect. That is, it would decrease both the *probability of false alarm* and the probability of detecting a *leak*.

FIGURE A1
DISTRIBUTION OF MEASUREMENT ERROR ON A TIGHT AND LEAKING TANK



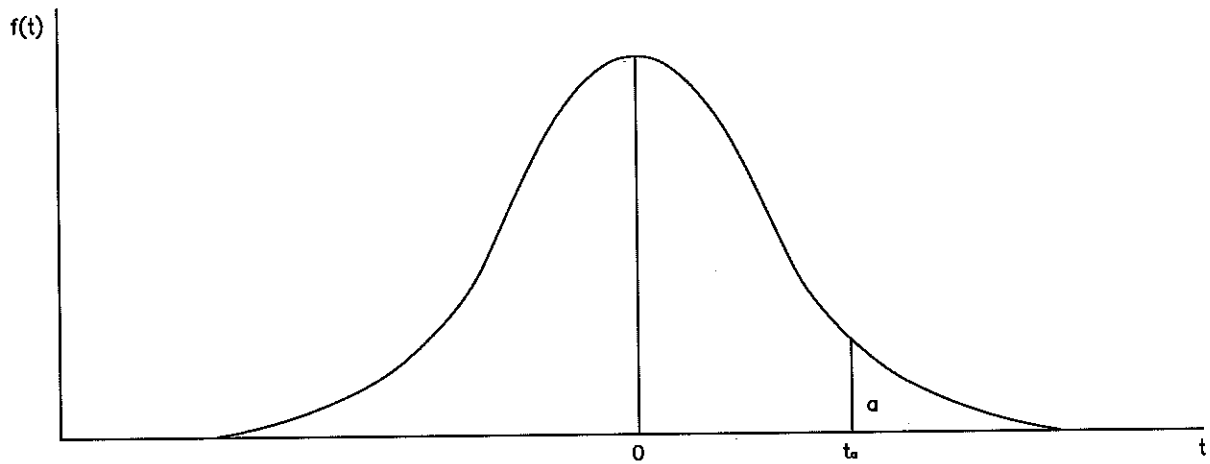
- C Criterion or Threshold for declaring a leak (a leak is declared if the measured rate exceeds C).
 α Probability of False Alarm, P(FA).
 β Probability of not detecting a leak rate R.
 $1 - \beta$ Probability of detecting a leak rate R, P(D).
R Leak Rate.

FIGURE A2
DISTRIBUTION OF MEASUREMENT ERROR ON A TIGHT AND LEAKING TANK IN THE CASE OF A POSITIVE BIAS



- C Criterion or Threshold for declaring a leak (a leak is declared if the measured rate exceeds C).
 α Probability of False Alarm, P(FA).
 β Probability of not detecting a leak rate R.
 $1 - \beta$ Probability of detecting a leak rate R, P(D).
B Bias.

TABLE A1
PERCENTAGE POINTS OF STUDENT'S t-DISTRIBUTION



df	$\alpha = 0.10$	$\alpha = 0.05$	$\alpha = 0.025$	$\alpha = 0.010$	$\alpha = 0.005$
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.333	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831

Table (Continued)

22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
60	1.296	1.671	2.000	2.390	2.660
120	1.289	1.658	1.980	2.358	2.617
inf.	1.282	1.645	1.960	2.326	2.576

APPENDIX B - PROCESS OF CERTIFICATION AGAINST THE STANDARD (INFORMATIVE)

(Reference: Clause N/A)

B1 INTRODUCTION

B1.1 As of the 2014 publication date of the First Edition of this Standard, there has not been a formal product certification and listing service for leak detection products for *flammable liquids* or *combustible liquids* by an accredited certification organization in North America for many years. In the USA, an independent organization comprising representatives of the regulatory bodies of 10 States and the Federal Government, the National Working Group on Leak Detection Evaluations (NWGLDE), have operated a *de facto* listing service based on third-party testing to published protocols, and most AHJs in the USA have verified conformance of products to regulatory requirements by reference to the NWGLDE lists. In Canada, some jurisdictions verify product conformance in an identical fashion, whilst others operate a case-by-case evaluation process that also includes reference to the NWGLDE lists.

B2 PRODUCT DURABILITY, SAFETY AND PERFORMANCE RELIABILITY

B2.1 The partial certification processes identified in Clause B1.1, whilst not ideal, have nevertheless met the needs of the stakeholders to date in that, combined with safety regulations, they have ensured that newly-installed products are operating safely and determining the occurrences of *leaks* within acceptable error levels. Given that most of the products currently operating in the North American market have a proven track record of operating safety and reliability, and given that electrical products apply 'intrinsically safe' design methods, there is currently little concern that the lack of durability testing in the protocols applied by NWGLDE for listing products may result in safety hazards or increasing leak detection error levels as a result of in-service failures of these mature products.

B2.2 Some stakeholders have expressed concerns, however, that products from new manufacturers, or products that apply entirely new measurement or detection methods or technologies, may be evaluated, listed and put into service under the current partial system without the same, in effect, assurance of durability as are provided by the current mature product technologies and/or manufacturers, with consequent risks to life, property and environmental safety. The counter-argument has also been advanced that these concerns should not result in new durability requirements included in this Standard being imposed on mature products where no such concern exists, with the corresponding increase in product costs ultimately being born by the consumer. A need has also been identified to determine what types and levels of exposure testing provide adequate assurance of durability against actual leak detection service conditions, without imposing excessive stress levels that may result in failures of samples of existing products that are, in fact, adequately durable for actual service.

B2.3 Users of this Standard are recommended to develop verification and maintenance schedules for leak detection devices placed into service that include identified end-of-life dates for replacement of the leak detection devices, taking into account the service conditions in each case.

B2.4 In considering the foregoing points, the Task Group developed the material that follows in the rest of this Appendix.

B3 CERTIFICATION PROCESS APPLYING NWGLDE LISTINGS

B3.1 For mature product technologies, it is suggested that the certification organization determine that a specific leak detection device is acceptable by assembling and verifying the following:

- A The information identified in Section 7 of this Standard;
- B The protocol(s) against which the product was tested (selected from the NWGLDE list of protocols);
- C All of the results of the protocol tests;
- D A list of all the operating limitations, including those noted in the third party protocol test;
- E Confirmation that the device/equipment is listed on the NWGLDE website;
- F A field procedure and operating manual for the device/equipment;
- G Testing and certification documentation for hazardous location installation, or intrinsic safety, of any electrical elements of the product.

B3.2 For products from new manufacturers, or products that apply entirely new measurement or detection methods or technologies, in addition to the material identified in Clause B3.1, it is recommended that the certification organization determine whether there is a need to address the issue of safety hazards or increasing leak detection error levels as a result of in-service failures and, if so, propose additional durability testing to be carried out on the product prior to completion of the certification and listing service.

B4 CERTIFICATION OF SOFTWARE INCLUDED IN LEAK DETECTION PRODUCTS

B4.1 It is recommended that software be addressed in the same fashion as the hardware components of a product. Control by the manufacturer of consistent software function despite changes in version numbers, etc., may be addressed in the same fashion as control of ongoing hardware component quality and reliability despite changes in part numbers or suppliers by periodic testing of the product for operation within the established control parameters.



**NATIONAL
STANDARD
OF
CANADA**

CAN/ULC-S676-15

**STANDARD FOR REFURBISHING OF STORAGE TANKS FOR
FLAMMABLE AND COMBUSTIBLE LIQUIDS**



ULC Standards
Normes ULC



Standards Council of Canada
Conseil canadien des normes

Underwriters Laboratories of Canada (ULC) was established in 1920 by letters patent issued by the Canadian Government. It maintains and operates laboratories and certification services for the examination, testing and certification of appliances, equipment, materials, constructions and systems to determine their relation to life, fire and property hazards as well providing inspection services.

Underwriters Laboratories of Canada is accredited by the Standards Council of Canada as a Certification Organization, a Testing Organization, and an Inspection Body under the National Standards System of Canada.

ULC Standards develops and publishes standards and other related publications for building construction, security and burglar protection, environmental safety, electrical equipment, fire protection equipment, gas and oil equipment, thermal insulation products, materials and systems, energy use in the built environment and electrical utility safety.

ULC Standards is a not-for-profit organization and is accredited by the Standards Council of Canada as a Standards Development Organization.

National Standards of Canada developed by ULC Standards conform to the criteria and procedures established by the Standards Council of Canada. Such standards are prepared using the consensus principle by individuals who provide a balanced representation of interests relevant to the subject area on a national basis.

ULC is represented across Canada as well as many countries worldwide. For further information on ULC services, please contact:

Customer Service: 1-866-937-3852

CORPORATE HEADQUARTERS

Underwriters Laboratories of Canada
7 Underwriters Road
Toronto, Ontario M1R 3A9
Telephone: (416) 757-3611
Fax: (416) 757-9540

REGIONAL OFFICES

PACIFIC OFFICE

13775 Commerce Parkway, Suite 130
Richmond, British Columbia V6V 2V4
Telephone: (604) 214-9555
Fax: (604) 214-9550

EASTERN OFFICE

6505, Rte Transcanadienne, Suite 330
St-Laurent, Québec H4T 1S3
Telephone: (514) 363-5941
Fax: (514) 363-7014

The Standards Council of Canada (SCC) is the coordinating body of the Canadian standardization network, which is composed of people and organizations involved in the development, promotion and implementation of standards. Through the collaborative efforts of Canadian standardization network members, standardization is helping to advance the social and economic well-being of Canada and to safeguard the health and safety of Canadians. The network's efforts are overseen by SCC.

The principal objectives of SCC are to foster and promote voluntary standardization as a means of advancing the national economy, supporting sustainable development, benefitting the health, safety and welfare of workers and the public, assisting and protecting the consumer, facilitating domestic and international trade, and furthering international cooperation in relation to standardization.

An important facet of the Canadian standards development system is the use of the following principles: consensus; equal access and effective participation by concerned interests; respect for diverse interests and identification of those who should be afforded access to provide the needed balance of interests; mechanism for dispute resolution; openness and transparency; open access by interested parties to the procedures guiding the standards development process; clarity with respect to the processes; and Canadian interest consideration as the initial basis for the development of standards.

A National Standard of Canada (NSC) is a standard prepared or reviewed by an SCC-accredited SDO and approved by the SCC according to NSC approval requirements. Approval does not refer to the technical content of the standard, as this remains the responsibility of the SDO. An NSC reflects a consensus of a number of capable individuals whose collective interests provide, to the greatest practicable extent, a balance of representation of general interests, producers, regulators, users (including consumers) and others with relevant interests, as may be appropriate to the subject at hand. NSCs are intended to make a significant and timely contribution to the Canadian interest.

Those who have a need to apply standards are encouraged to use NSCs. These standards are subject to periodic review. Users of NSCs are cautioned to obtain the latest edition from the SDO that publishes the standard.

The responsibility for approving standards as NSCs rests with:

Standards Council of Canada
270 Albert Street
Suite 200
Ottawa, Ontario
K1P 6N7
Telephone: (613) 238-3222

For further information on ULC standards, please contact:

ULC STANDARDS

171 Nepean Street, Suite 400
Ottawa, Ontario K2P 0B4
Telephone: (613) 755-2729
Fax: (613) 231-5977

E-mail: customerservice@ulc.ca
Web site: www.ulc.ca

The intended primary application of this standard is stated in its scope. It is important to note that it remains the responsibility of the user of the standard to judge its suitability for this particular application.

Copies of this National Standard of Canada may be ordered from ULC Standards.

CETTE NORME NATIONALE DU CANADA EST DISPONIBLE EN VERSIONS FRANÇAISE ET ANGLAISE

**NATIONAL
STANDARD
OF CANADA**

CAN/ULC-S676-15

**STANDARD FOR REFURBISHING OF STORAGE TANKS FOR
FLAMMABLE AND COMBUSTIBLE LIQUIDS**

ICS 23.020.10; 75.200

Prepared and Published by



Approved by



Standards Council of Canada
Conseil canadien des normes

FIRST EDITION.....JUNE 2015

Copyright © 2015

ULC Standards

All rights reserved. No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without prior permission.

TABLE OF CONTENTS

ULC STANDARDS COMMITTEE ON STATIONARY STEEL STORAGE CONTAINERS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS	i
ULC STANDARDS COMMITTEE ON STATIONARY NONMETALLIC STORAGE CONTAINERS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS	ii
ULC STANDARDS TASK GROUP ON REFURBISHING OF STORAGE TANKS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS	iii
PREFACE	iv
1 SCOPE	1
2 REFERENCE PUBLICATIONS	1
3 GLOSSARY	4
PART I — GENERAL	
4 GENERAL REQUIREMENTS	5
4.1 SAFETY CONSIDERATIONS	5
4.2 REFURBISHING COMPANIES	5
4.3 APPLICABLE TANK STANDARD OR ORD	5
4.4 REFURBISHING COMPANY'S RESPONSIBILITIES	5
4.5 MODIFICATIONS	5
4.6 PRODUCTION TESTING	6
PART II — REFURBISHING AT A FACILITY	
5 GENERAL REQUIREMENTS	6
5.1 CLEANING AND INSPECTION	6
6 STEEL TANKS	6
6.1 PERSONNEL QUALIFICATIONS	6
6.2 TANK ELIGIBILITY	7
6.3 EVALUATION	8
6.4 REPAIRS	8
6.5 CORROSION PROTECTION	9
6.6 INTERSTICE OF DOUBLE WALL TANKS	9
7 FIBRE REINFORCED PLASTIC TANKS	9
7.1 PERSONNEL QUALIFICATIONS	9
7.2 TANK ELIGIBILITY	9
7.3 EVALUATION	9

7.4 REPAIRS	10
7.4.1 General	10
7.4.2 Guidelines for Tank Repairs	10
 PART III — IN-SITU REFURBISHING ACTIVITIES (AT THE TANK INSTALLATION)	
8 CLEANING AND INSPECTION	11
9 GENERAL REQUIREMENTS	11
10 STEEL TANKS	11
10.1 EVALUATION	11
10.2 REPAIRS	11
10.3 EXTERNAL CORROSION PROTECTION SYSTEMS	11
10.4 INTERSTICE OF DOUBLE WALL TANKS	12
11 FIBRE REINFORCED PLASTIC TANKS	12
11.1 EVALUATION	12
11.2 REPAIRS	12
 PART IV — RELOCATION OF STATIONARY ABOVEGROUND TANKS	
12 SCOPE	13
13 INSPECTION	13
14 GENERAL REQUIREMENTS	13
15 STEEL TANKS	13
15.1 EVALUATION	13
15.2 DECISION ON RELOCATION WITH OR WITHOUT REFURBISHMENT	14
15.3 INTERSTICE OF DOUBLE WALL TANKS	14
16 FIBRE REINFORCED PLASTIC TANKS	14
16.1 EVALUATION	14
16.2 DECISION ON RELOCATION WITH OR WITHOUT REFURBISHMENT	14
 PART V — DOCUMENTATION	
17 INSTALLATION INSTRUCTIONS	15
18 MARKING	15
19 RECORDS	15
20 SHIPPING AND INSTALLATION	15

APPENDIX A – EXAMPLE FLOWCHARTS (INFORMATIVE) 16

**ULC STANDARDS COMMITTEE ON STATIONARY STEEL STORAGE CONTAINERS FOR
FLAMMABLE AND COMBUSTIBLE LIQUIDS**

NAME	AFFILIATION	REGION	CATEGORY
J. Dutton (Chair)	Department of Environment and Conservation	Newfoundland and Labrador	Regulator
A. Barker	Technical Standards & Safety Authority	Ontario	Regulator
E. Bourassa	Granby Industries, LP	Québec	Producer
A. Crimi	AC Consulting Solutions Inc.	Ontario	General Interest
C. Deschamps	Régie du bâtiment du Québec	Québec	Regulator
A. Dornan	Environment Canada	Canada	Regulator
D. Edgecombe	Petroleum Tank Management Association	Alberta	Regulator
E. Fernandes	Ontario Petroleum Contractors Association	Ontario	User
T. Gilbertson	Manitoba Conservation	Manitoba	Regulator
L. Grainawi	Steel Tank Institute	U.S.A.	User
D. Hall	Steelcraft, Inc.	Ontario	Producer
S. Hyde-Clarke	National Research Council of Canada	Canada	General Interest
S. Jones	SDJ Associates blueprint2build, Inc.	Canada	User
N. Klassen	Westeel	Saskatchewan	Producer
P. Legault	Department of National Defense	Canada	Regulator
D. Lenart	Imperial Oil	Canada	User
M. Mailvaganam	Consultant	Ontario	General Interest
G. Nikolic	MHCC Consultants, Inc.	Ontario	General Interest
D. Northcotte	North Waterloo Farmers Mutual Insurance	Ontario	General Interest
R. Smith	Canadian Oil Heat Association	Canada	User
D. Snider	AGI Envirotank	Saskatchewan	Producer
R. Stephenson	Chevron	Canada	User
C. Stevenson	Apex Corrosion	Canada	General Interest
H. Sukhu	DTE Industries (2010), Ltd.	Ontario	Producer
T. Tidy	Tidy Steel / Regal Tanks	British Columbia	Producer
W. Trussler	Ship's Point Consulting	Canada	User
E. Beaulieu (Associate Member)	Les Industries Desjardins Ltee.	Québec	(Non-Voting)
M. Modéry (Associate Member)	Environment Canada	Canada	(Non-Voting)
R. Riegel (Associate Member)	UL LLC	U.S.A.	(Non-Voting)
C. Stewart (Associate Member)	Calgary Fire Department	Alberta	(Non-Voting)
J. Wade (Project Manager)	ULC Standards	Canada	(Non-Voting)
T. Espejo (Secretary)	ULC Standards	Canada	(Non-Voting)

This list represents the membership at the time the Committee balloted on the final text of this edition. Since that time, changes in the membership may have occurred.

ULC STANDARDS COMMITTEE ON STATIONARY NONMETALLIC STORAGE CONTAINERS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS

NAME	AFFILIATION	REGION	CATEGORY
A. Crimi (Chair)	AC Consulting Solutions Inc.	Ontario	General Interest
A. Barker	Technical Standards & Safety Authority	Ontario	Regulator
M. Beaulieu	Roth Industries Ltd.	Québec	Producer
E. Bourassa	Granby Industries LP	Québec	Producer
C. Deschamps	Régie du bâtiment du Québec	Québec	Regulator
A. Dornan	Environment Canada	Canada	Regulator
J. Dutton	Department of Environment and Conservation	Newfoundland and Labrador	Regulator
D. Edgecombe	Petroleum Tank Management Association of Alberta	Alberta	Regulator
E. Fernandes	Ontario Petroleum Contractors Association	Ontario	User
L. Grainawi	Steel Tank Institute	U.S.A.	General Interest
S. Hyde-Clarke	National Research Council of Canada	Canada	General Interest
S. Jones	SDJ Associates blueprint2build, Inc.	Canada	General Interest
P. Legault	Department of National Defence	Canada	User
D. Lenart	Imperial Oil	Canada	User
M. Mailvaganam	Consultant	Ontario	General Interest
G. Nikolic	MHCC Consultants Inc.	Ontario	General Interest
W. Schneider	Containment Solutions Inc.	U.S.A.	Producer
R. Scragg	ZCL Composites	Canada	Producer
R. Smith	Canadian Oil Heat Association	Canada	User
R. Stephenson	Chevron	Canada	User
W. Trussler	Ship's Point Consulting	B.C.	User
S. Villeneuve	Vilco Ltd.	Nova Scotia	Producer
M. Modéry (Associate Member)	Environment Canada	Canada	(Non-Voting)
R. Murphy (Associate Member)	Containment Solutions Inc.	Canada	(Non-Voting)
R. Riegel (Associate Member)	UL LLC	U.S.A.	(Non-Voting)
R. Sumabat (Associate Member)	Technical Standards & Safety Authority	Ontario	(Non-Voting)
J. Wade (Project Manager)	ULC Standards	Canada	(Non-Voting)
T. Espejo (Secretary)	ULC Standards	Canada	(Non-Voting)

This list represents the membership at the time the Committee balloted on the final text of this edition. Since that time, changes in the membership may have occurred.

**ULC STANDARDS TASK GROUP ON REFURBISHING OF STORAGE TANKS FOR FLAMMABLE
AND COMBUSTIBLE LIQUIDS**

MEMBER**REPRESENTING**

A. Dornan	Environment Canada, Canada
J. Dutton	Dept. of Environment and Conservation, Newfoundland & Labrador
T. Gilbertson	Manitoba Conservation, Manitoba
D. Hall	Steelcraft Inc., Ontario
S. Hyde-Clarke	National Research Council of Canada, Canada
N. Klassen	Westeel, Saskatchewan
M. Mailvaganam	Consultant, Ontario
G. Nikolic	MHCC Consultants, Inc., Ontario
W. Schneider	Containment Solutions Inc., U.S.A.
R. Scragg	ZCL Composites Inc., Alberta
J. Selann	Environmental Consultant, Nova Scotia
T. Tidy	Tidy Steel Fab Ltd, British Columbia
J. Wade (Secretary)	ULC Standards, Canada

STANDARD FOR REFURBISHING OF STORAGE TANKS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS

PREFACE

This is the First Edition of the Standard for Refurbishing of Storage Tanks for Flammable and Combustible Liquids, CAN/ULC-S676.

This Edition of the Standard has been formally approved by the ULC Standards Committees on Stationary Steel, and Nonmetallic, Storage Containers for Flammable and Combustible Liquids.

Only metric SI units of measurement are used in this Standard. If a value for measurement is followed by a value in other units in parentheses, the second value may be approximate. The first stated value is the requirement.

Appendix A, identified as Informative, is for information purposes only.

In Canada, there are two official languages, English and French. All safety warnings must be in French and English. Attention is drawn to the possibility that some Canadian authorities may require additional markings and/or installation instructions to be in both official languages.

This First Edition National Standard of Canada is based on, and now supersedes, the First Editions of Technical Supplements ULC-S601(A), Refurbishing of Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids, ULC-S603(A), Refurbishing of Steel Underground Tanks for Flammable and Combustible Liquids, ULC-S615(A), Refurbishing of Reinforced Plastic Underground Tanks for Flammable and Combustible Liquids, and ULC-S630(A), Refurbishing of Steel Aboveground Vertical Tanks for Flammable and Combustible Liquids.

NOTE: The four Technical Supplements were collected into a single document and republished without alteration in 2006.

Attention is drawn to the possibility that some of the elements of this Canadian standard may be the subject of patent rights. ULC Standards shall not be held responsible for identifying any or all such patent rights.

Requests for interpretation of this Standard should be sent to ULC Standards. The requests should be worded in such a manner as to permit a "yes" or "no" answer based on the literal text of the requirement concerned.

The initiation of the review of this Standard will commence within 5 years of the date of publication, unless the Standard is identified as fitting within a stabilized category, whereby the review will commence within the appropriate time frame set out by ULC Standards.

This Standard is intended to be used for conformity assessment.

1 SCOPE

1.1 This Standard covers the *refurbishing* of shop fabricated tanks built to nationally recognized Standards listed in Tank Eligibility Subsections 6.2 and 7.2.

NOTE: In the context of this Standard, *refurbishing* refers to *repairs* to, and a limited set of *modifications* of, tanks using materials at least equivalent to those used in the original manufacture and does not include retrofit. Refer to Standard CAN/ULC-S669, Standard for Internal Retrofit Systems for Underground Tanks for Flammable and Combustible Liquids, for requirements applicable to retrofit activities.

1.2 This Standard provides minimum requirements for the inspection, evaluation and *refurbishing* of steel and fibre reinforced plastic underground and aboveground storage tanks for *flammable liquids* and *combustible liquids*. This Standard addresses the *refurbishing* of tanks in a *refurbishing company's* facility in Part II, the *refurbishing* of tanks at their installed location in Part III, and also provides inspection criteria for the frequent *relocation* of *aboveground tanks* in Part IV.

NOTE: Refer to Appendix A for examples of flowcharts applicable to *refurbishing*.

1.3 The installation and use of *refurbished* tanks may be covered by the requirements of the *Authority Having Jurisdiction* and may include by reference, but are not limited to:

- A National Fire Code of Canada, Part 4;
- B CSA B139, Installation Code for Oil Burning Equipment; and
- C CCME PN 1326, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.

1.4 The transport of tanks to a *refurbishing* facility is not within the Scope of this Standard.

NOTE: *Authorities Having Jurisdiction* may have requirements for the cleaning and preparation of tanks for removal from service, prior to transport to the *refurbishing* facility.

1.5 This Standard is intended for use by organizations and/or individuals who are knowledgeable and experienced in *underground tank* or *aboveground tank* fabrication, *repair*, *modification* and inspection.

NOTE: Refer to Personnel Qualifications Subsections 6.1 or 7.1, as applicable.

1.6 These requirements apply to all *repair* activities of storage tanks and integral appurtenances designed to contain *flammable liquids* or *combustible liquids*, under atmospheric pressure.

2 REFERENCE PUBLICATIONS

2.1 The documents shown below are referenced in the text of this Standard. Unless otherwise stated elsewhere in this Standard such reference shall be considered to indicate the edition and/or revisions of the document available at the date on which the Committee approved this ULC Standard.

Document Published by Canadian Council of Ministers of the Environment (CCME)
c/o Manitoba Statutory Publications, Lower Level,
200 Vaughan Street, Winnipeg, MB R3C 1T5
Telephone: (204) 945-4664

- CCME PN 1326 UPD 2013, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products
-

Document Published by CSA Group
5060 Spectrum Way, Mississauga, On L4W 5N6
Telephone: (800) 463-6727
www.csa.ca

- CSA B139-09 (R2014), Installation Code for Oil Burning Equipment
-

Document Published by the National Fire Protection Association (NFPA)
1 Batterymarch Park, Quincy, MA 02169-7471 U.S.A.
Telephone: (617) 770-3000
www.nfpa.org

- NFPA 326:2015, Standard for Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair
-

Codes published by the National Research Council of Canada (NRC)
Publication Sales M20, National Council of Canada, Institute for Research in Construction
Ottawa, ON K1A 0R6
Telephone: (613) 993-2463 or (800) 672-7990
www.nrc-cnrc.gc.ca

- National Fire Code of Canada, 2010
-

Documents Published by ULC Standards (prior to May, 2010, identified as Underwriters Laboratories of Canada)
171 Nepean Street, Suite 400, Ottawa, ON K2P 0B4 Canada
Telephone: (416) 757-3611, ext. 61744; Fax (613) 231-5977, "ATTN: Publications"
E-mail: publications@ulc.ca
www.ulc.ca

NOTE: Superseded editions of ULC Standards and Other Recognized Documents (ORDs) may be purchased from ULC Standards by first requesting a quotation from e-mail address: publications@ulc.ca.

- CAN/ULC-S601-14, Standard for Shop Fabricated Steel Aboveground Tanks for Flammable and Combustible Liquids
- CAN/ULC-S602-14, Aboveground Steel Tanks for Fuel Oil and Lubricating Oil
- CAN/ULC-S603-14, Standard for Steel Underground Tanks for Flammable and Combustible Liquids
- CAN/ULC-S603.1-11, Standard for External Corrosion Protection Systems for Steel Underground Tanks for Flammable and Combustible Liquids
- CAN/ULC-S615-14, Standard for Reinforced Plastic Underground Tanks for Flammable and Combustible Liquids

- CAN/ULC-S630-00, Standard for Shop Fabricated Steel Aboveground Vertical Tanks for Flammable and Combustible Liquids

NOTE: CAN/ULC-S630 was superseded by CAN/ULC-S601-07, and withdrawn when the latter was published. A subsequent edition of CAN-ULC-S601 was published in 2014.

- ULC-S643-00, Standard for Shop Fabricated Steel Aboveground Utility Tanks for Flammable and Combustible Liquids

NOTE: ULC-S643 was superseded by CAN/ULC-S601-07, and withdrawn when the latter was published. A subsequent edition of CAN-ULC-S601 was published in 2014.

- CAN/ULC-S652-08, Standard for Tank Assemblies for Collection and Removal of Used Oil
- CAN/ULC-S653-06, Standard for Aboveground Steel Contained Tank Assemblies for Flammable and Combustible Liquids
- CAN/ULC-S655-98, Standard for Aboveground Protected Tank Assemblies for Flammable and Combustible Liquids
- CAN/ULC-S669-14, Standard for Internal Retrofit Systems for Underground Tanks for Flammable and Combustible Liquids
- CAN/ULC-S670-14, Standard for Aboveground Nonmetallic Tanks for Fuel Oil and Other Combustible Liquids
- CAN/ULC-S677-14, Standard for Fire Tested Aboveground Tank Assemblies for Flammable and Combustible Liquids
- ULC/ORD-C80.1-12, Nonmetallic Tanks for Oil-Burner Fuels and Other Combustible Liquids

NOTE: ULC/ORD-C80.1 was superseded by CAN/ULC-S670-14, and withdrawn when the latter was published.

- ULC/ORD-C142.18-95, Rectangular Steel Aboveground Tanks For Flammable and Combustible Liquids

NOTE: ULC/ORD-C142.18 was superseded by CAN/ULC-S601-07, and withdrawn when the latter was published. A subsequent edition of CAN-ULC-S601 was published in 2014.

- ULC/ORD-C142.22-95, Vertical Steel Aboveground Tank Assemblies For Flammable and Combustible Liquids

NOTE: ULC/ORD-C142.22 was superseded by CAN/ULC-S601-07, and withdrawn when the latter was published. A subsequent edition of CAN-ULC-S601 was published in 2014.

- ULC/ORD-C142.5-92, Concrete Encased Steel Aboveground Tank Assemblies for Flammable and Combustible Liquids

NOTE: ULC/ORD-C142.5 was superseded by CAN/ULC-S677-14, and withdrawn when the latter was published.

3 GLOSSARY

NOTE: Terms used in this Standard that are in *italic* print are defined as follows:

3.1 **ABOVEGROUND TANK** — A storage tank with all of the storage tank volume above grade.

3.2 **ASSESSMENT** — A procedure for determining if a tank is viable for *refurbishing* or fit for service.

NOTE: This procedure includes cleaning, inspection, eligibility and evaluation in accordance with Subsections 5.1, Cleaning and Inspection, and 6.2 or 7.2, Tank Eligibility, and 6.3 or 7.3, Evaluation, as applicable.

3.3 **AUTHORITY HAVING JURISDICTION (AHJ)** — The governmental body responsible for the enforcement of any part of this Standard or the official or agency designated by that body to exercise such a function.

3.4 **COMBUSTIBLE LIQUID** — Any liquid having a flash point at or above 37.8 °C and below 93.3 °C and as defined in the National Fire Code of Canada.

3.5 **DECOMMISSIONING** — A procedure for removing a tank from service such that it may be safely transported and/or have further procedures applied.

3.6 **FLAMMABLE LIQUID** — Any liquid having a flash point below 37.8 °C and a vapour pressure not exceeding 276 kPa (absolute) at 37.8 °C and as defined in the National Fire Code of Canada.

3.7 **MANWAY** — An opening on a tank designed to provide personnel access to the interior of the tank.

3.8 **MODIFICATION** — A procedure for alteration of a tank, compared to its original condition when manufactured, that does not result in a significant change in the *primary tank* volume.

3.9 **PRIMARY TANK** — The product storage tank or compartment.

3.10 **REFURBISH** — A procedure for restoring a tank so that it complies with or exceeds the requirements of the Standard or ORD to which it was originally constructed. *Refurbishing*, *refurbishes* and *refurbished* are associated terms.

3.11 **REFURBISHER** — A person designated by the *refurbishing company* as having the necessary training, education, and competence to perform assigned *underground tank* or *aboveground tank* cleaning, fabrication, *repair*, *modification* and/or inspection in accordance with the tank manufacturer's policy, procedures and programs.

3.12 **REFURBISHING COMPANY** — A company that *refurbishes* tanks in accordance with the requirements of this Standard.

3.13 **RELOCATION** — The installation of a tank in another location.

3.14 **REPAIR** — A procedure for remedying a defect in a tank.

3.15 **SECONDARY CONTAINMENT (CONTAINMENT)** — A construction that is external to the *primary tank* and designed to prevent the contents of the *primary tank* from leaking outside the *containment*.

3.16 **UNDERGROUND TANK** — A storage tank that, when installed, has all of the storage tank volume below grade and the tank completely surrounded by, and in intimate contact with, backfill.

PART I — GENERAL

4 GENERAL REQUIREMENTS

4.1 SAFETY CONSIDERATIONS

4.1.1 All activities, including the *assessment, decommissioning, repair, modification*, testing and marking of the tanks shall conform to the requirements of the *AHJ* and current best practice for safety. Refer to Subsection 5.1, Cleaning and Inspection.

4.2 REFURBISHING COMPANIES

4.2.1 The original manufacturer of the tank to be *refurbished*, or their authorized representative, shall act as a *refurbishing company*.

4.2.2 Alternatively, a tank manufacturer who is recognized by a third party certifier to manufacture a tank to the same Standard, or the authorized representative of the recognized tank manufacturer, may also act as a *refurbishing company*.

NOTE: In Canada, a third party certifier is an organization accredited by the Standards Council of Canada as a certification organization.

4.3 APPLICABLE TANK STANDARD OR ORD

4.3.1 Where the Standard or ORD to which a tank was originally manufactured has been superseded by another Standard or ORD, the *refurbishing company* and the tank owner shall determine which, if any, requirements of the current edition of the Standard or ORD that differ from those of the original Standard or ORD are to apply to the *refurbished* tank, so as to comply with the requirements of the *AHJ*.

4.4 REFURBISHING COMPANY'S RESPONSIBILITIES

4.4.1 A *refurbishing company* shall:

- A Be responsible for the quality of the work done;
- B Formulate a procedure for a given task and have such procedure documented;
- C Ensure that the requirements of Personnel Qualifications Subsection 6.1 or 7.1, as applicable, are met; and
- D Ensure that *refurbishers* are only assigned to perform activities for which they are qualified, in accordance with the requirements of Personnel Qualifications Subsection 6.1 or 7.1, as applicable, and applicable regulatory requirements.

NOTE: Regulatory requirements may address such issues as confined-space entry, tank cleaning, and administrative control procedures.

4.5 MODIFICATIONS

4.5.1 *Modifications* shall be limited to the addition of fittings, *manways*, ladders, and supports, or replacement of sections with new material of similar size.

4.5.2 Except as defined in Clause 4.5.3, changes to the total volume of the tank shall be limited to that resulting from *modifications* only, such as replacing heads.

4.5.3 Bulkheads may be added to the tank to create multiple compartments, in which case the bulkhead design and construction shall conform to the requirements of the applicable tank Standard or ORD listed in Clause 6.2.1 or 7.2.1, as applicable.

4.5.4 The tank shall be modified so as to comply with the requirements of the applicable tank Standard or ORD listed in Clause 6.2.1 or 7.2.1, as applicable.

4.5.5 All *modifications* shall be in accordance with good engineering practice.

4.6 PRODUCTION TESTING

4.6.1 After all *repairs* and/or *modifications*, the tank shall be tested according to the production testing requirements of the applicable tank Standard or ORD listed in Clause 6.2.1 or 7.2.1, as applicable.

4.6.2 Where the original leak test required by Clause 4.6.1 is the air/soap method, and it cannot be performed due to an inability to visually inspect the exterior of the *primary tank* during the *refurbishing* process, it may be replaced by an alternate leak detection process identified in the applicable tank Standard or ORD listed in Clause 6.2.1 or 7.2.1, as applicable, or if this is not practicable, by a method recognized by the *AHJ* and acceptable to the owner and the *refurbishing company*.

PART II — REFURBISHING AT A FACILITY

5 GENERAL REQUIREMENTS

5.1 CLEANING AND INSPECTION

5.1.1 Cleaning and inspection of *underground tanks* and *aboveground tanks* shall be performed in accordance with the applicable requirements of NFPA 326, Standard for Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair, and applicable national or Provincial construction, safety, and environmental codes and regulations.

5.1.2 Cleaning and inspection of *underground tanks* and *aboveground tanks* shall be performed in accordance with the applicable requirements for hazards related to the presence of lead.

NOTE: Safe access procedures are regulated by Workers Compensation Boards of the *AHJs*.

5.1.3 If the tank does not contain a means of access, an access hole may be cut into the tank to facilitate internal inspection.

5.1.4 The internal and external tank surfaces shall be inspected, and all defects that prevent a return of the tank to service identified and recorded.

6 STEEL TANKS

6.1 PERSONNEL QUALIFICATIONS

6.1.1 *Refurbishers* shall be knowledgeable and experienced in *underground tank* or *aboveground tank* cleaning, fabrication, *repair*, *modification* and/or inspection, as applicable to the work to be performed.

NOTE: The qualifications of *refurbishers* may be subject to the requirements and/or approval of the *AHJ*.

6.1.2 *Refurbishers* that perform inspections shall be qualified to the satisfaction of the *refurbishing company* to perform any tests or inspections that may be required to assess the condition of the existing tank surfaces and structure, so as to determine any work necessary in order to bring the tank into compliance with the requirements of the Standard or ORD to which it was originally manufactured.

6.1.3 Each *refurbishing company's* facility shall have a written welding procedure recognized by a third-party certifier and shall ensure that each *refurbisher* doing the work shall be duly trained and qualified.

NOTE: In Canada, a third-party certifier may be, but is not limited to, a professional engineer, the Canadian Welding Bureau or the AHJ.

6.1.4 Each *refurbishing company* shall have and maintain records of trained and qualified *refurbishers* with respect to the *refurbishing company's* written welding procedure.

6.1.5 A *refurbisher* shall only undertake *repairs* requiring welding upon any storage tank when (s)he is duly trained and qualified.

NOTE: Refer to Part III for requirements for personnel *refurbishing* tanks at the installation site.

6.2 TANK ELIGIBILITY

6.2.1 Tanks that are eligible for work according to the requirements of Part II of this Standard shall be verified as originally complying with the requirements of:

- A CAN/ULC-S601, Standard for Shop Fabricated Steel Aboveground Tanks for Flammable and Combustible Liquids ;
- B CAN/ULC-S602, Aboveground Steel Tanks for Fuel Oil and Lubricating Oil;
- C CAN/ULC-S603, Standard for Steel Underground Tanks for Flammable and Combustible Liquids ;
- D CAN/ULC-S630, Standard for Shop Fabricated Steel Aboveground Vertical Tanks for Flammable and Combustible Liquids
- E ULC-S643, Standard for Shop Fabricated Steel Aboveground Utility Tanks for Flammable and Combustible Liquids;
- F CAN/ULC-S652, Standard for Tank Assemblies for the Collection, Storage and Removal of Used Oil;
- G CAN/ULC-S653, Standard for Aboveground Steel Contained Tank Assemblies for Flammable and Combustible Liquids;
- H CAN/ULC-S655, Standard for Aboveground Protected Tank Assemblies for Flammable and Combustible Liquids;
- I CAN/ULC-S677, Standard for Fire Tested Aboveground Tank Assemblies for Flammable and Combustible Liquids;
- J ULC/ORD-C142.18, Rectangular Steel Aboveground Tanks for Flammable and Combustible Liquids;

- K ULC/ORD-C142.22, Contained Vertical Steel Aboveground Tank Assemblies for Flammable and Combustible Liquids ; or
- L ULC/ORD-C142.5, Concrete Encased Steel Aboveground Tank Assemblies for Flammable and Combustible Liquids.

6.3 EVALUATION

6.3.1 Dents in the tank deflecting the surface greater than 30° from the original surface or 35 mm in depth from the normal configuration, or of length or width greater than 0.08 times the circumference, shall require the complete replacement of the affected section (i.e., the individual shell plate and/or the tank head).

6.3.2 Pitting in excess of 3 mm, or 50 % of the original metal thickness, whichever is the lesser in depth, or reduction of thickness of metal to less than the minimum value required in the applicable tank Standard or ORD listed in Clause 6.2.1, shall require the complete replacement of the affected section (i.e., the individual shell plate and/or the tank head).

6.3.3 For vertical *aboveground tanks*, metal thickness measurements shall be taken for each individual shell plate attached to the bottom plate. Several thickness measurements shall be taken in the area of the shell that is within 300 mm of the tank bottom.

6.3.4 For concrete encased tanks, the concrete shall be evaluated.

6.3.5 An evaluation report shall be prepared, containing all observations and measured values, and identifying all defects that have been found.

NOTE: The evaluation report should include an *assessment* of compatibility of the original tank material and the material of the patch or section with respect to approved welding procedures.

6.4 REPAIRS

6.4.1 All *repairs* shall be in accordance with good engineering practice.

6.4.2 The work performed for each item listed in the evaluation report so as to meet the corresponding requirements in the applicable tank Standard or ORD listed in Clause 6.2.1 shall be identified and recorded.

6.4.3 For single wall tanks, the application of patching metal and/or the filling of pitted areas with weld metal shall not be permitted.

6.4.4 For double wall tanks, dents or pitting lesser in extent than described in Clauses 6.3.1 or 6.3.2 may be *repaired* by welding a patch over the affected area. The thickness and alloy composition of the patch shall be in accordance with the requirements of the applicable Standard or ORD listed in Clause 6.2.1.

6.4.5 For concrete encased tanks, all defects in the concrete shall be *repaired* and the *refurbished* systems shall meet the requirements of ULC/ORD-C142.5, Concrete Encased Steel Aboveground Tank Assemblies for Flammable and Combustible Liquids.

NOTE: ULC/ORD-C142.5 was superseded by CAN/ULC-S677-14, and withdrawn when the latter was published.

6.4.6 All welded *repairs* shall be subject to inspections by an inspector appointed by the responsible department of the *AHJ*. The level of inspection may be reduced at the discretion of the inspector depending on the consistent good quality of the welded *repair*.

6.4.7 All materials used in *repair* shall be new, i.e., not from another used tank.

6.4.8 A *repaired* tank shall conform to the requirements contained in the applicable tank Standard or ORD listed in Clause 6.2.1.

6.5 CORROSION PROTECTION

6.5.1 Where tanks are provided with corrosion protection systems conforming to CAN/ULC-S603.1, Standard for External Corrosion Protection Systems for Steel Underground Tanks for Flammable and Combustible Liquids, consumable components of galvanic protection systems shall be replaced, all defects in coatings, claddings or jackets shall be *repaired*, and the *refurbished* system shall meet or exceed the applicable requirements of that Standard.

6.6 INTERSTICE OF DOUBLE WALL TANKS

6.6.1 *Refurbished* double wall tanks shall be shipped to the installation site with a minimum 51 kPa vacuum drawn on the interstice. The vacuum shall register on the vacuum gauge that is supplied with the tank.

7 FIBRE REINFORCED PLASTIC TANKS

7.1 PERSONNEL QUALIFICATIONS

7.1.1 *Refurbishers* shall be knowledgeable and experienced in *underground tank* or *aboveground tank* cleaning, fabrication, *repair*, *modification* and/or inspection, as applicable to the work to be performed.

NOTE: The qualifications of *refurbishers* may be subject to the requirements and/or approval of the AHJ.

7.1.2 *Refurbishers* that perform inspections shall be qualified to the satisfaction of the *refurbishing company* to perform any tests or inspections that may be required to assess the condition of the existing tank surfaces and structure, so as to determine any work necessary in order to bring the tank into compliance with the requirements of the Standard or ORD to which it was originally manufactured.

7.2 TANK ELIGIBILITY

7.2.1 Tanks that are eligible for work according to the requirements of Part II of this Standard shall be verified as originally complying with the requirements of:

- A CAN/ULC-S615, Standard for Reinforced Plastic Underground Tanks for Flammable and Combustible Liquids;
- B CAN/ULC-S670, Standard for Aboveground Nonmetallic Tanks for Fuel Oil and Other Combustible Liquids; or
- C ULC/ORD-C80.1, Nonmetallic Tanks for Oil-Burner Fuels and Other Combustible Liquids.

7.3 EVALUATION

7.3.1 All defects, including the following, shall be addressed as identified in the *refurbishing company's* procedure:

- A Vertical deflection;
- B Bottom flattening;

- C Buckles and local indentations;
- D Cracks or holes;
- E Blisters;
- F Delaminations;
- F Surface Abrasions; and
- G Wall deterioration (e.g., evidence of chemical attack).

7.3.2 An evaluation report shall be prepared, containing all observations and measured values, and identifying all defects that have been found.

NOTE: The evaluation report should include an *assessment* of compatibility of the original tank material and the material of the patch or section with respect to properly bonding to the original tank and providing compatibility with the fluid being stored.

7.4 REPAIRS

7.4.1 General

7.4.1.1 All *repairs* shall be in accordance with good engineering practice.

7.4.1.2 The work performed for each item listed in the evaluation report so as to meet the corresponding requirements in the applicable tank Standard or ORD listed in Clause 7.2.1 shall be identified and recorded.

7.4.1.3 All materials used in *repair* shall be new, i.e., not from another used tank.

7.4.1.4 A *repaired* tank shall conform to the requirements contained in the applicable tank Standard or ORD listed in Clause 7.2.1.

7.4.2 Guidelines for Tank Repairs

7.4.2.1 In making *repairs*, only resins and reinforcement shall be used that are identified in documents applicable to the *refurbishing* work using suitable materials.

7.4.2.2 The area to which the *repair* is to be made shall be clean, dry and rough sanded or otherwise properly prepared for bonding.

7.4.2.3 The *refurbishing company's* procedures for *repair* of each defect type shall address:

- A Limits on what can be *repaired* for each defect type;
- B *Repair* methods and materials for each defect type including surface preparation; and
- C Materials approved for work that are suitable for the fluid to be contained in the tank after *refurbishing*.

7.4.2.4 In cases where the tank wall is being *repaired*, *repairs* shall add sufficient material to:

- A Restore the laminate to meet or exceed its original thickness after the defects are removed; or

- B Overlay the laminate defects with material that meets or exceeds the original laminate thickness.

PART III — IN-SITU REFURBISHING ACTIVITIES (AT THE TANK INSTALLATION)

8 CLEANING AND INSPECTION

8.1 The cleaning and inspection shall conform to the requirements of Subsection 5.1, Cleaning and Inspection.

9 GENERAL REQUIREMENTS

9.1 The qualifications of personnel shall conform to the requirements of Subsection 6.1 or 7.1, Personnel Qualifications, as applicable.

9.2 Tanks that are eligible for work according to the requirements of Part III of this Standard shall be verified as originally complying with the requirements of the applicable tank Standard or ORD listed in Clause 6.2.1 or 7.2.1, as applicable.

10 STEEL TANKS

10.1 EVALUATION

NOTE: Refer to the flowchart of Figure A1. The requirements of this Subsection apply to the flowchart steps prior to the decision point "Repairable on site?". The reference to this Part, at the flowchart step corresponding to a decision to *repair* the tank on site, is not intended to require that the cleaning, inspection and evaluation be repeated.

10.1.1 The evaluation shall conform to the requirements of Subsection 6.3, Evaluation.

10.1.2 It shall be determined whether the work may be performed at the installation site, or the tank must be transported to a *refurbishing* facility. The tank manufacturer shall be consulted for specific instructions as part of the evaluation.

10.1.3 The decision as to whether *repair* can be performed shall be mutually agreed by the manufacturer and the tank owner.

10.2 REPAIRS

10.2.1 *Repairs* shall conform to the requirements of Subsection 6.4, Repairs.

10.2.2 If the *refurbishing* procedure is to be performed outside, *refurbishing* work shall not start until the site is adequately protected from any expected precipitation.

10.2.3 The *refurbisher* shall ensure that all the correct tools, materials, and supplies are available prior to commencing work.

10.2.4 *Repairs* shall be performed in accordance with the recommendations of the tank manufacturer and shall be carried out by a *refurbisher* specifically authorized by the tank manufacturer.

10.3 EXTERNAL CORROSION PROTECTION SYSTEMS

10.3.1 *Refurbished* tanks shall meet the applicable requirements of Subsection 6.5, Corrosion Protection.

10.4 INTERSTICE OF DOUBLE WALL TANKS

10.4.1 It shall be verified that *refurbished* double wall tanks have a minimum 51 kPa vacuum drawn on the interstice. The vacuum shall register on the vacuum gauge that is supplied with the tank.

11 FIBRE REINFORCED PLASTIC TANKS

11.1 EVALUATION

NOTE: Refer to the flowchart of Figure A1. The requirements of this Subsection apply to the flowchart steps prior to the decision point "Repairable on site?". The reference to this Part, at the flowchart step corresponding to a decision to *repair* the tank on site, is not intended to require that the cleaning, inspection and evaluation be repeated.

11.1.1 The evaluation shall conform to the requirements of Subsection 7.3, Evaluation.

11.1.2 It shall be determined whether the work may be performed at the installation site, or the tank must be transported to a *refurbishing* facility. The tank manufacturer shall be consulted for specific instructions as part of the evaluation.

11.1.3 The decision as to whether *repair* can be performed shall be mutually agreed by the manufacturer and the tank owner.

11.1.4 Surface abrasions not exceeding 2 mm penetration need not be *repaired*.

11.2 REPAIRS

11.2.1 *Repairs* shall conform to the requirements of Subsection 7.4, Repairs.

11.2.2 If the *refurbishing* procedure is to be performed outside, *refurbishing* work shall not start until the site is adequately protected from any expected precipitation.

11.2.3 The *refurbisher* shall ensure that all the correct tools, materials, and supplies are available prior to commencing work.

11.2.4 *Repairs* shall be performed in accordance with the recommendations of the tank manufacturer and shall be carried out by a *refurbisher* specifically authorized by the tank manufacturer.

11.2.5 Damage, including fittings or rib damage, shall be *repaired* by the tank *refurbishing company* or by other personnel trained in such *repairs* and acceptable to the tank owner and the manufacturer.

11.2.6 The general appearance of the field work shall be neat and present a good appearance.

PART IV — RELOCATION OF STATIONARY ABOVEGROUND TANKS

12 SCOPE

12.1 The requirements of this Part apply to the practice of *relocating aboveground tanks*, conforming to Standards for stationary designs, to new sites.

NOTE: In general *AHJs* do not permit that tanks for *flammable liquids* or *combustible liquids* may be relocated unless empty and purged of vapours. These tanks are not designed for the transportation of *flammable liquids* or *combustible liquids*, nor are they intended to be transported while containing such liquids.

13 INSPECTION

13.1 External inspection shall be performed before and after each *relocation* of a tank according to the applicable requirements of Subsection 5.1, Cleaning and Inspection.

13.2 Where internal inspections are required by the *AHJ*, they shall be performed according to the applicable requirements of Subsection 5.1, Cleaning and Inspection.

14 GENERAL REQUIREMENTS

14.1 The qualifications of personnel shall conform to the requirements of Subsection 6.1 or 7.1, Personnel Qualifications, as applicable.

14.2 Tanks that are eligible for inspection according to the requirements of Part IV of this Standard shall be verified as originally complying with the requirements of the applicable tank Standard or ORD listed in Clause 6.2.1 or 7.2.1, as applicable.

15 STEEL TANKS

15.1 EVALUATION

NOTE: Refer to the flowchart of Figure A2. The requirements of this Subsection apply to the flowchart steps prior to the decision point "Repairable on site?". The reference to this Part, at the flowchart step corresponding to a decision to *repair* the tank on site, is not intended to require that the inspection and evaluation be repeated.

15.1.1 Single wall tanks shall only be relocated without *repair* when visual inspection indicates that they are free of the following:

- A Visible leaks from, for example, pipes, fittings or weld seams; or
- B Dents in the tank deflecting the surface greater than 30° from the original surface or 35 mm in depth from the normal configuration, or of length or width greater than 0.08 times the circumference.

15.1.2 Double wall tanks shall only be relocated without *repair* when visual inspection indicates that they are free of the following:

- A Water or fuel present in the *secondary containment*;
- B Any vacuum monitor device indicating a pressure outside of the limits specified by the tank manufacturer, or any leak detection system not functional or indicating that a leak has been detected;

- C Visible leaks from, for example, pipes, fittings or weld seams; or
- D Dents in the tank deflecting the surface greater than 30° from the original surface or 35 mm in depth from the normal configuration, or of length or width greater than 0.08 times the circumference.

15.1.3 Tanks shall not exhibit visible excessive damage to any coatings on the storage tank or any integral components of the storage tank that contain, or may contain, *flammable liquids* or *combustible liquids*.

NOTE 1: This requirement is not applicable to components, such as lift lugs or skids, that are not intended to contain liquid products.

NOTE 2: Utility Tanks, described in Standard CAN/ULC-S601, Standard for Shop Fabricated Steel Aboveground Tanks for Flammable and Combustible Liquids, and formerly in ULC-S643, Standard for Shop Fabricated Steel Aboveground Utility Tanks for Flammable and Combustible Liquids, when being evaluated in accordance with the requirements of Subsection 15.1, Evaluation, need only comply with the requirements of Clause items 15.1.1 A and 15.1.2 A, B and C.

15.1.4 Where required by the *AHJ*, tanks shall also pass a leakage test.

15.2 DECISION ON RELOCATION WITH OR WITHOUT REFURBISHMENT

15.2.1 The evaluation report shall include a determination of whether the tank is to be relocated with or without *refurbishing*.

15.3 INTERSTICE OF DOUBLE WALL TANKS

15.3.1 Where a double wall tank is equipped with a monitoring system, the functioning of the system shall be confirmed, and the integrity of the interstice verified, before the tank is returned to service at the new location. Vacuum monitors shall conform to the requirements of Subsection 10.4, Interstice of Double Wall Tanks.

16 FIBRE REINFORCED PLASTIC TANKS

16.1 EVALUATION

NOTE: Refer to the flowchart of Figure A2. The requirements of this Subsection apply to the flowchart steps prior to the decision point "Repairable on site?". The reference to this Part, at the flowchart step corresponding to a decision to *repair* the tank on site, is not intended to require that the cleaning, inspection and evaluation be repeated.

16.1.1 Tanks shall only be relocated without *repair* when visual inspection indicates that any defects present, as listed in Subsection 7.3, Evaluation, do not exceed the limits identified in the *refurbishing company's* procedure.

16.1.2 Where required by the *AHJ*, tanks shall also pass a leakage test.

16.2 DECISION ON RELOCATION WITH OR WITHOUT REFURBISHMENT

16.2.1 The evaluation report shall include a determination of whether the tank is to be relocated with or without *refurbishing*.

PART V — DOCUMENTATION

17 INSTALLATION INSTRUCTIONS

17.1 The installation instructions and any other documentation required by the applicable tank Standard or ORD listed in Clause 6.2.1 or 7.2.1, as applicable, shall accompany each *refurbished* tank.

18 MARKING

18.1 The following information shall be engraved or stamped on a corrosion-resistant nameplate permanently attached to the *refurbished* tank:

- A "Tank originally complying to (original manufactured tank Standard or ORD identifier)";
- B "Refurbished by (Name of *refurbishing company*) according to CAN/ULC-S676";
- C Date of completion of *refurbishing* work;
- D Unique identifier for records of *refurbishing* work;
- E "Primary tank capacity, * L"; and
- F "Compartment Tank - Cap: Comp 1 * L; Comp 2 * L", (where applicable).

*Specify Capacity.

18.2 The *refurbished* tank shall be marked with all applicable warnings in accordance with the current edition of the applicable tank Standard or ORD identified in Clause 6.2.1 or 7.2.1.

NOTE: *Refurbishing companies* should be aware that the *AHJ* may also require that the mark of the certifying agency be included on each tank.

Exception: No marking requirements are applicable to tanks that are only inspected according to the requirements of Part IV.

19 RECORDS

19.1 The evaluation report and records of the *refurbishing* activities, as applicable, shall be provided by the *refurbishing company* and maintained on record by the owner of the *refurbished* tank for 5 years, or the duration that meets the requirements of the *AHJ*, whichever is longer. When a *refurbished* tank will meet any requirements of a current Standard or ORD, as opposed to those of the Standard or ORD to which it was originally manufactured, these shall be recorded.

20 SHIPPING AND INSTALLATION

20.1 The shipping and installation requirements of the applicable tank Standard or ORD identified in Clause 6.2.1 or 7.2.1 shall apply.

Exception: No shipping and installation requirements are applicable to tanks that are refurbished in-situ according to the requirements of Part III.

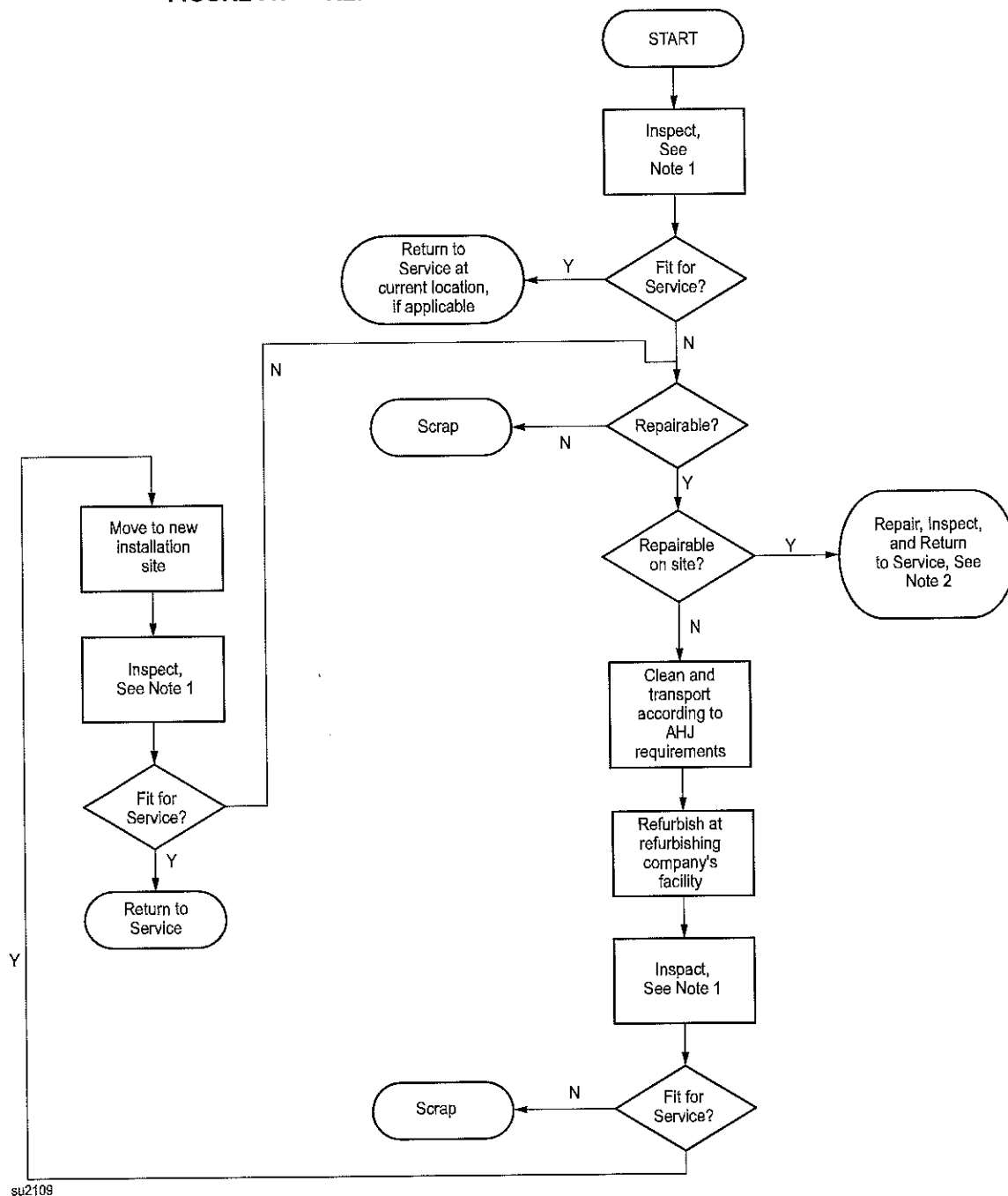
APPENDIX A – EXAMPLE FLOWCHARTS (INFORMATIVE)

(Reference: Clause 1.2 and Subsections 10.1, 11.1, 15.1 and 16.1)

A1 GENERAL

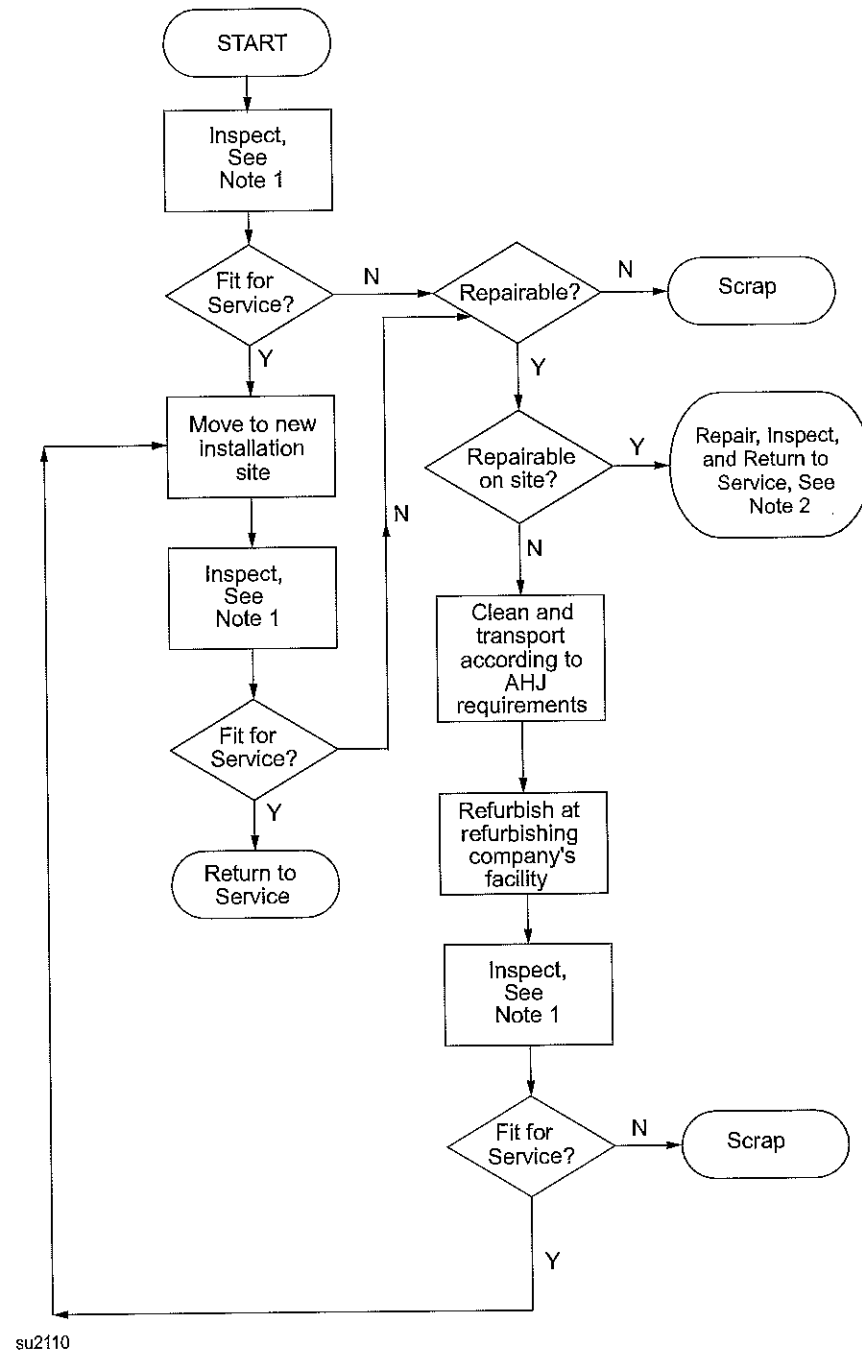
A1.1 The flowcharts shown below provide examples of the type of decision process which is to be documented in the *refurbishing company's* procedures (Figure A1) or the tank owner/operator's procedures (Figure A2).

FIGURE A1 — REFURBISHMENT/MODIFICATION FLOWCHART



NOTE 1: Inspect according to the requirements of Subsection 5.1.

NOTE 2: Repair, Inspect, and Return to Service according to the requirements of Part III. See Note to Subsection 10.1 or 11.1, as applicable.

FIGURE A2 — RELOCATION WITHOUT MODIFICATION FLOWCHART

NOTE 1: Inspect according to the requirements of Subsection 5.1.

NOTE 2: Repair, Inspect, and Return to Service according to the requirements of Part III. See Note to Subsection 15.1 or 16.1, as applicable.

No Text on This Page



Limited Materials and Workmanship Warranty For Commercial Bins and Silos

Meridian Manufacturing Group (hereinafter referred to as the Manufacturer) hereby warrants the commercial bin(s) or silo(s) sold by it to be free from any defect in material or workmanship under normal use and service for a period of one (1) year from the date of shipment. The Manufacturer's obligation under this warranty shall be limited to the repair or replacement only, FOB the original point of shipment, of any defective parts or portions of the tank or accessories manufactured by Meridian. Any warranty claim must be reported to the Manufacturer within one (1) year from the date of shipment and in the manner as referred to in paragraph 2 herein.

THIS WARRANTY IS SUBJECT TO THE FOLLOWING LIMITATIONS, PROVISIONS AND CONDITIONS:

1. This warranty does not apply:
 - a) to any product sold by the Manufacturer where it is used in areas exposed to corrosive or aggressive conditions including salt water, acids, alkaloid, ash, cement dust, animal waste or other corrosive chemicals from either inside or outside the bin.
 - b) for failures or defects arising out of damage during shipment or during storage on site.
 - c) to materials replaced or repaired under this warranty except to the extent of the remainder of the applicable warranty.
 - d) to damage resulting from misuse, negligence, accident or improper site preparation by others.
 - e) if the product has been altered or modified by others.
 - f) if in the case of coating failures the failure is the result of damage, lack of proper maintenance or failure to remove road salt or other contaminants that may have come in contact with the bin surface.
 - g) if the product has not been installed strictly in accordance with the Manufacturer's manuals and instructions.
2. The obligation of the Manufacturer under this warranty shall not arise unless the Manufacturer is notified and this warranty is presented together with a written statement specifying the claim or defect within thirty (30) days after the failure is first detected or made known to the owner and within one (1) year from the shipment date. The Manufacturer in its sole discretion shall determine if the claim is valid and whether correction of the defect or failure shall be made by repair or replacement of the materials.
3. The obligation of the Manufacturer hereunder extends only to the original owner and to the Meridian dealer to whom the materials may have been initially sold. This warranty shall not be subject to any assignment or transfer without the written consent of the Manufacturer.
4. The customer shall acknowledge that it has made its own independent decision to approve the use of the supplied materials and also the specific fabrication and construction procedures utilized to complete the tank, and has satisfied itself as to the suitability of these products for this particular application.
5. The foregoing sets forth the only warranties applicable to said materials and said warranties are given expressly and in lieu of all other warranties, expressed or implied, statutory or otherwise, of merchantability or fitness for a particular purpose and all warranties which exceed or differ from said warranties herein are disclaimed by the Manufacturer.
6. The owners sole and exclusive remedy against the Manufacturer shall be limited to the applicable warranty set forth herein and the endorsements, if any, issued together with this document and no other remedy (including but not limited to the recovery of assembly or disassembly costs, shipping costs, direct, incidental, special, indirect or consequential damages for lost profits, lost sales, injury to person or property or any other loss, whether arising from breach of contract, breach of warranty, tort, including negligence, strict liability or otherwise) shall be available to the owner or Meridian Dealer or any other person or entities whether by direct action or for contribution or indemnity or otherwise.
7. The financial obligation of the Manufacturer under this warranty shall be limited to the repair or replacement of the product as originally supplied and in no event shall exceed the original cost of the product supplied.
8. The Manufacturer shall not have any obligation under any warranty herein until all accounts for materials, installation and erection of the said product thereof and for labor and other work performed by the Manufacturer or its dealers have been paid in full by the owner.

Warranty Claim Procedure

1. Please advise the dealer or manufacturer immediately upon discovery of any defects.
2. You will be supplied with a warranty claim form or will be directed to a customer service representative.
3. The warranty claim form must be completed in its entirety and submitted to the dealer/manufacturer for warranty consideration.
4. When the warranty claim form is received by the manufacturer you will be contacted by our customer service department.
5. Claims will be adjudicated at the sole discretion of the manufacturer and in accordance with the terms and conditions of the applicable limited warranty.



Government
of Canada

Canadian Food
Inspection Agency

Camelot Court
59 Camelot Drive
Nepean, Ontario
K1A 0Y9

Gouvernement
du Canada

Agence canadienne
d'inspection des aliments

Tel: (613) 225-2342
Fax: (613) 228-6633

Your file Votre référence

Our file Notre référence

3100-3/G154

26 April 1999

Charlie Guertin
Vice President
Guertin Bros. Coatings and Sealants Ltd.
50 Panet Road
Winnipeg, Manitoba, Canada
R2J 0R9

RE/OBJET: **G154 Guertin Bros. Coatings and Sealants Ltd.
Winnipeg, Manitoba, Canada**

26/04/99 d6 RDP54A1- Cured Polyester Based Dry Powder
Coating to be Applied to Bulk Storage Bins for
Holding Dry Goods

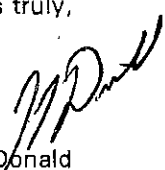
This is in reference to your fax dated March 31, 1999, concerning the aforementioned coating for which you have requested acceptance for use in federally registered food establishments.

Based on the available information, no objection would be taken to the use of the above coating to be applied to bulk storage bins for holding dry goods.

This acceptance is not to be misconstrued as an endorsement for this or similar coatings, and their use in Registered Establishments will depend upon their continued acceptability to all concerned.

Should any changes occur in the chemical formulation of the aforementioned coating, then this acceptance will be considered **NULL** and **VOID**.

Yours truly,


J.J. Donald
Program Officer
Non-Food Chemicals & Container Integrity
Policy, Planning & Coordination Directorate
Science Division

JJD/sb
c.c. S. Beerenfenger

Visit our Reference Listing Website/Visité notre Liste de référence sur le site internet
<http://www.cfia-acia.agr.ca/reference/conteng.html>

Canada 

Recycled Paper / Papier recyclé

INTEGRITY

INNOVATION

PERFORMANCE



TECHNICAL DATA SUPERSHIELD PCE - EPOXY

Description

SUPERSHIELD® PCE EPOXY POWDER coatings are designed for both functional and decorative applications where exposure to ultraviolet degradation is not a critical requirement. Their exceptional mechanical and protective properties can be obtained in a wide variety of colors.

The technical data listed herein is designed to facilitate selection of the appropriate grade of Supershield® powder coating for your application. We advise you to conduct your own testing to determine the suitability of a particular coating to your application and to contact your Guertin Coatings representative for further recommendations.

Coating Properties

Resin Type	Epoxy			
Specific Gravity	1.5 +/- 0.4 (ASTM D792)			
Gloss (60°)	30 - 100% (ASTM D523)			
Impact (Direct)	≤ 160 in/lb. (ASTM D2794)			
Conical Mandrel	1/4" (ASTM D522)			
Hardness	≤ 4H (ASTM D3363)			
Crosshatch adhesion	5B (ASTM D3359)			
Humidity	≥ 1000 Hours (ASTM D2247)			
Salt Spray	≥ 1000 Hours (ASTM B117)			
Cure Schedule	5 minutes	10 minutes	20 minutes	30 minutes
	340°F/170°C	310°F/155°C	285°F/140°C	265°F/130°C
	395°F/200°C	345°F/175°C	310°F/155°C	285°F/140°C
	400°F/205°C	375°F/190°C	355°F/180°C	340°F/170°C
Maximum Storage Temperature	77°F (25°C)			

All tests, unless noted otherwise, were performed on 24 gauge Bonderite 1000® panels sprayed at 1.8 - 2.2 mils DFT.

Precautions

Refer to specific *Material Safety Data Sheet* for applicable Health and Safety Precautions.

WARRANTY

The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and of use are beyond our control, we make no guarantee of results and assume no liability for damages incurred by following these suggestions. Nothing contained herein is to be construed as a recommendation for use in violation of any patents or of applicable laws or regulations. All data, statements, and recommendations made herein are based upon information we believe to be reliable, but are made without any representation, guarantee or warranty of accuracy. Our products are sold on the condition that the user himself will evaluate them, as well as our recommendations, to determine their suitability for his own purpose before adoption. Also, statements regarding the use of our products or processes are not to be construed as recommendations for their use in violation of any patent rights or in violation of any applicable laws or regulations.

April, 2012



Health
Canada

Santé
Canada

Health Products
and Food Branch

Direction générale des produits
de santé et des aliments

Bureau of Chemical Safety
251 Sir Frederick Banting Driveway
Postal Locator: 2201C
Ottawa, ON, K1A 0K9

September 15, 2010

Our files: KS08020106/07

R.G. Tinsley
Technical Director
Guertin Coating, Sealants and Polymers Ltd.
50 Panet Road
Winnipeg, MB
R2J 0R9

Dear Mr. Tinsley:

**RE: PCCF20085
PCCF20097**

This is in reference to your e-mail of March 10, 2009, submitting additional information on the subject products, and followed to our letter of June 12, 2009, wherein we provided the status of the subject materials for use as an interior and exterior coatings of dry grain storage bins.

Based on additional information submitted, we see no reason to object to the use of the subject products as proposed, provided that they are technically suitable for the intended end-uses.

It should be noted that Mr. Dallaire of the Canadian Food Inspection Agency (CFIA) will be advised of our comments by copy of this letter.

We trust that the foregoing will be of use to you.

Yours truly,

Elena Emelianova, Ph.D.
Scientific Evaluator
Food Packaging Materials and
Incidental Additives Section
Chemical Health Hazard Assessment Division

cc Mr. Dallaire (CFIA)

INTEGRITY

INNOVATION

PERFORMANCE



TECHNICAL DATA

SUPERSHIELD PCCF2097L – LOW TEMPERATURE DRY FOOD CONTACT APPROVED POLYESTER

Description

SUPERSHIELD® PCCF2097L LOW TEMPERATURE DRY FOOD CONTACT APPROVED POLYESTER POWDER coating is specifically designed for coating the interiors and exteriors of bins, hoppers and chutes used in grain handling and storage. The coating provides a combination of weather resistance, physical toughness, corrosion resistance and chemical resistance that has been optimized for this type of application. Cure performance has been formulated to allow for applications where low curing temperatures or fast cure speeds are required; while maintaining excellent color retention on over-bake.

Coating Properties

Resin Type	Polyester
Color	Grain Hopper White (also available as PCCF20085 'Frontier White')
Specific Gravity	1.745 +/- 0.005 (ASTM D792)
Gloss (60°)	85 - 90% (ASTM D523)
Impact (Direct)	≤160 in/lb. (ASTM D2794)
Impact (Reverse)	≤110 in/lb. (ASTM D2794)
Conical Mandrel	1/4" (ASTM D522)
Hardness	≥H (ASTM D3363)
Crosshatch adhesion	5B (ASTM D3359)
Humidity	≥1000 Hours (ASTM D2247)
Salt Spray	≥2000 Hours (ASTM B117)
Cure Schedule	5 minutes @ 355°F / 180°C 10 minutes @ 320°F / 160°C 20 minutes @ 300°F / 150°C 30 minutes @ 285°F / 140°C
Maximum Storage Temperature	77°F (25°C)
Health Canada Approval; File Number	KS08020106/07

All tests, unless noted otherwise, were performed on 24 gauge Bonderite 1000® panels sprayed at 1.8 - 2.2 mils DFT.

Precautions

Refer to specific *Material Safety Data Sheet* for applicable Health and Safety Precautions.

WARRANTY

The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and of use are beyond our control, we make no guarantee of results and assume no liability for damages incurred by following these suggestions. Nothing contained herein is to be construed as a recommendation for use in violation of any patents or of applicable laws or regulations. All data, statements, and recommendations made herein are based upon information we believe to be reliable, but are made without any representation, guarantee or warranty of accuracy. Our products are sold on the condition that the user himself will evaluate them, as well as our recommendations, to determine their suitability for his own purpose before adoption. Also, statements regarding the use of our products or processes are not to be construed as recommendations for their use in violation of any patent rights or in violation of any applicable laws or regulations.

September, 2012

Guertin Coatings - A Division of Cloverdale Paint Inc.
50 Panet Road • Winnipeg, Manitoba • R2J 0R9 • T 204.237.0241 • F 204.233.5051
www.guertincoatings.com

ADVANTAGES

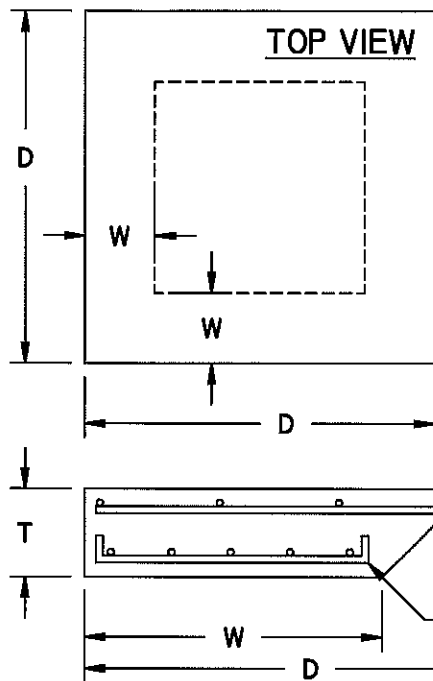
- Dry food contact approved
- Low coefficient of friction
- Excellent sharp edge coverage
- Outstanding corrosion resistance
- High pH/alkali free finish

USES

- Dry food contact applications
- Grain bins

MERIDIAN POWDER

Meridian Powder	Liquid Paint equivalent required to meet same performance
Corrosion Resistance	High Performance 2-component Epoxy and Urethane Topcoat
Humidity Resistance	High Performance 2-component Epoxy and Urethane Topcoat
Impact Resistance	Flexible 2-component Urethane Primer and Urethane Topcoat
Weathering	Super Durable Performance 2-component Urethane
Abrasion	Ceramic or Flake filled Topcoat
Hardness	Polyurethane
Flexibility	No known liquid equivalent
Chip Resistance	Flexible 2-component Urethane Primer and Topcoat



NOTES:

- REINFORCING STEEL TO BE DEFORMED BARS WITH A MIN. YIELD STRENGTH OF 40ksi (300 MPA)
- CONCRETE TO HAVE A MINIMUM 28 DAY STRENGTH OF 3000 PSI (20 MPA)
- PAD TO BE BASED ON FIRM GROUND WITH A BEARING CAPACITY OF 2000 PSI (100kN/m sq)
- ALL TOP SILT AND SOFT GROUND BENEATH PAD TO BE REMOVED AND REPLACED WITH GRAVEL APPROX. M3 BASED ON EXACT DRAWING DIMENSIONS & SPECIFICATIONS NOTED ABOVE

10M @ 12" o/c EACH WAY (OR 2 LAYERS OF 6x6x1/4 WELDED WIRE FABRIC)

FOR BOTTOM REINFORCEMENT STEEL & STIRRUPS SEE TABLE

STANDARD MODELS	D	T	W	REINF.	STIRRUPS	APPROX. M ³
1810 - 1825	19'0"	18"	3' 6"	5 - 20M	10M AT 12" o/c	11.9
1625 - 1632	19'0"	18"	3' 6"	5 - 20M	10M AT 12" o/c	11.9
1610 - 1620	18'6"	16"	3' 0"	5 - 20M	10M AT 12" o/c	9.4
1410 - 1420	15'6"	16"	3' 0"	4 - 20M	10M AT 12" o/c	8.0
1205 - 1215	13'0"	14"	2' 6"	4 - 15M	10M AT 12" o/c	4.7
1010 - 1015	11'6"	12"	2' 6"	3 - 15M	N/R	3.3
910 - 915	10'6"	10"	2' 6"	3 - 15M	N/R	2.3
808 - 812	10'0"	10"	2' 6"	3 - 15M	N/R	2.2
705 - 710	9'0"	8"	2' 6"	3 - 15M	N/R	1.5

GRAIN MAX. MODELS	D	T	W	REINF.	STIRRUPS	APPROX. M ³
GM5300, 6400, 7500	19'0"	18"	3' 6"	5 - 20M	10M AT 12" o/c	11.9
GM3000, 4000, 5000, 6000	19'0"	16"	3' 0"	5 - 20M	10M AT 12" o/c	10.2
GM2000	15'6"	16"	3' 0"	4 - 20M	10M AT 12" o/c	8.0
GM1000	13'0"	10"	2' 6"	4 - 15M	N/R	3.4

THIS DRAWING IS THE EXCLUSIVE PROPERTY OF MERIDIAN MANUFACTURING GROUP AND MAY NOT BE DUPLICATED BY ANY MEANS WITHOUT THE SPECIFIC PERMISSION OF MERIDIAN MANUFACTURING GROUP



CUSTOMER:
BINFAM - SQUARE BIN PAD (5)

DRAWN BY: JL
DATE DRAWN: 06/04/10

PROJECT PARTS LIST