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

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NATIONAL STANDARD OF CANADA

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

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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

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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

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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

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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

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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 Manifolded 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

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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.