

CAN/ULC-S679:2017

**STANDARD FOR METALLIC AND NONMETALLIC
UNDERGROUND PIPING FOR FLAMMABLE AND
COMBUSTIBLE LIQUIDS**

Prepared and Published by:



ULC Standards
Normes ULC

Approved by:



Standards Council of Canada
Conseil canadien des normes



Documents

Document Sharing Hub

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

National Standard of Canada

A National Standard of Canada is a standard developed by an SCC-accredited Standards Development Organization (SDO), and approved by the Standards Council of Canada (SCC), in accordance with SCC's: *Requirements and Guidance-Accreditation for Standards Development Organizations*, and *Requirements and Guidance-Approval of National Standards of Canada Designation*. More information on National Standard requirements can be found at www.scc.ca.

An SCC-approved standard reflects the consensus of a number of experts whose collective interests provide, to the greatest practicable extent, a balance of representation of affected stakeholders. National Standards of Canada are intended to make a significant and timely contribution to the Canadian interest.

SCC is a Crown corporation within the portfolio of Industry Canada. With the goal of enhancing Canada's economic competitiveness and social well-being, SCC leads and facilitates the development and use of national and international standards. SCC also coordinates Canadian participation in standards development, and identifies strategies to advance Canadian standardization efforts. Accreditation services are provided by SCC to various customers, including product certifiers, testing laboratories, and standards development organizations. A list of SCC programs and accredited bodies is publicly available at www.scc.ca.

Users should always obtain the latest edition of a National Standard of Canada from the standards development organization responsible for its publication, as these documents are subject to periodic review.

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

For further information on ULC standards, please contact:

ULC STANDARDS

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

To purchase ULC Standards, visit: www.ulc.ca/ulcstandards

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 the 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

**STANDARD FOR METALLIC AND NONMETALLIC UNDERGROUND
PIPING FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS**

ICS 23.040.40, 23.040.50, 75.160.20, 75.200

Prepared and Published by:



Approved by:



FIRST EDITION OCTOBER 2017

Copyright © 2017

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 FUELING ACCESSORIES FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS	I
ULC STANDARDS TASK GROUP ON PIPING FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS ..	II
PREFACE	III
1 SCOPE	1
2 REFERENCE PUBLICATIONS	1
3 GLOSSARY	2
4 CONSTRUCTION	5
4.1 GENERAL	5
5 REQUIREMENTS	6
5.1 GENERAL	6
5.2 SHORT TERM PRESSURE TESTS	7
5.2.1 General	7
5.2.2 Leakage Test	8
5.2.3 Hydrostatic Test	8
5.2.4 Breakdown Test	8
5.3 LONG TERM PRESSURE TESTS	9
5.3.1 General	9
5.3.2 Sustained Pressure Test	9
5.3.3 Cyclic Pressure Test	9
5.4 VACUUM TESTS	10
5.4.1 General	10
5.4.2 Static Vacuum Test	10
5.4.3 Cyclic Vacuum Test	10
5.5 FITTING TORQUE TEST	11
5.6 FITTING BENDING TEST	11
5.7 PIPE BENDING TEST	11
5.8 DROP TEST	12
5.9 DROP TEST AFTER CONDITIONING	12
5.10 BALL IMPACT TEST	13
5.11 BALL IMPACT TEST AFTER CONDITIONING	13
5.12 PIPE BURIAL TESTS	14
5.12.1 General	14
5.12.2 Pull Strength Test	14
5.12.3 Puncture Resistance Test	14
5.12.4 Crush Resistance Test	14
5.13 LONG TERM COMPATIBILITY TEST	15
5.13.1 General	15
5.13.2 Repeat Short Term Pressure Test, Leakage Test, and Breakdown Test	18
5.13.3 Repeat Pull Strength Test	18
5.13.4 Repeat Crush Resistance Test	18

5.14 INTERSTITIAL COMMUNICATION TEST	19
5.15 UV COMPATIBILITY TEST	19
5.16 NONMETALLIC FITTING STRESS CRACK TEST	20
5.17 METALLIC FITTING STRESS CRACK TEST	20
5.18 PERMEATION TEST	20
6. MANUFACTURING AND PRODUCTION TESTS	21
6.1 GENERAL	21
6.2 LEAKAGE TEST	22
7. MARKING	22
7.1 GENERAL	22
8. INSTRUCTIONS	23
8.1 GENERAL	23
TABLES	25
FIGURES	29

ULC STANDARDS COMMITTEE ON FUELING ACCESSORIES FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS

NAME	AFFILIATION	REGION	CATEGORY
M. Mailvaganam (Chair)	M. Mailvaganam -Consultant	Ontario	General Interest
B. Andrew	Veeder-Root	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
K. Crellin	Brugg PipeSystems, LLC	U.S.A.	Producer
J. Duarte	Chemtura Canada Co./Cie	Canada	User
J. Dutton	Consultant	Canada	General Interest
D. Edgecombe	Petroleum Tank Management Association of Alberta	Alberta	Regulator
E. Fernandes	Ontario Petroleum Contractors Association	Ontario	User
S. Hyde-Clarke	National Research Council of Canada	Canada	General Interest
S. Jones	SDJ Associates blueprint2build Inc.	Canada	General Interest
P. Legault	Consultant	Canada	User
B. Nelson	Franklin Fueling Systems, Inc.	U.S.A.	Producer
G. Nikolic	MHCC Consultants, Inc.	Ontario	General Interest
D. Northcotte	Heartland Farm Mutual Insurance	Ontario	General Interest
R. Stephenson	Chevron	Canada	User
W. 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
P. Neil (Non-voting)	OPW Fueling Containment Systems, Inc.	U.S.A.	Associate Member
R. Riegel (Non-voting)	Underwriters Laboratories Inc.	U.S.A.	Associate Member
J. Wade (Non-Voting)	ULC Standards	Canada	Associate Member
C. D'Onofrio (Non-voting)	ULC Standards	Canada	Project Manager

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 PIPING FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS**MEMBER****REPRESENTING**

J. Wade(Chair) ULC Standards, Canada
K. Crellin.....Brugg PipeSystems, U.S.A.
J. Dutton.....Consultant, Canada
M. Mailvaganam M. Mailvaganam Consultant, Ontario
P. McDonald.....Underwriters Laboratories Inc., Canada
H. Nielinger Brugg PipeSystems, U.S.A.
R. Riegel Underwriters Laboratories Inc., U.S.A.
M. Schubert Brugg PipeSystems, U.S.A.
J. Prusko (Project Manager) UL Standards, U.S.A.

.....

STANDARD FOR METALLIC AND NONMETALLIC UNDERGROUND PIPING FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS

PREFACE

This is the First Edition of the Standard for Metallic and Nonmetallic Underground Piping for Flammable and Combustible Liquids, CAN/ULC-S679.

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

This Standard has been developed in compliance with the requirements of SCC for accreditation of a Standards Development Organization.

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 of CAN/ULC-S660, Standard for Nonmetallic Underground Piping for Flammable and Combustible Liquids, and the First Edition of CAN/ULC-S667, Standard for Metallic Underground Piping 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 review and action to revise or reaffirm this Standard will not exceed 5 years from 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.

Document ID: 123456789

1 SCOPE

1.1 This Standard sets forth minimum requirements for *primary carrier, secondary containment, integral primary/secondary, normal vent and vapour recovery, metallic, composite and nonmetallic pipe, fittings, and systems* (products) intended for use *underground* for the distribution and venting applications of petroleum-based *flammable and combustible liquids*, alcohols, and alcohol-blended fuels as identified in this document.

1.2 For the purpose of this Standard, *flammable and combustible liquids* mean gasoline, fuel oil, kerosene and diesel fuel, including gasoline with small amounts of additives such as detergents, solvents for detergents and anti-icing chemicals; diesel with up to 5 % biodiesel and gasoline with up to 15 % ethanol.

1.3 This Standard covers *metallic, composite and nonmetallic thermoplastic (flexible) and thermoset (rigid) plastic piping* with manufacturer-supplied *fittings* for *underground* use only. The products covered by this Standard have been evaluated for assembly in normal soil applications by *qualified persons* in accordance with the manufacturer's instructions.

1.4 The products covered by this Standard have not been evaluated for applications in *sumps* [more than 305 mm (12 in) inside a *sump* wall], as connector *pipe* (between *underground pipe* and dispensing device), aboveground or marine use, or other applications exceeding *normal temperatures*.

1.5 Products covered by this Standard are intended to be installed and used in accordance with, but not limited to, any of the following documents:

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

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 International)
100 Barr Harbour Drive, PO Box C700, West Conshohocken, PA 19428-2959 U.S.A.
Telephone: (610) 832-9585
www.astm.org

- ASTM A653/A653M-15, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc- Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- ASTM D471-16 REV A, Standard Test Method for Rubber Property - Effect of Liquids
- ASTM D1193-06 (R2011), Standard Specification for Reagent Water
- ASTM D2143-15, Standard Test Method for Cyclic Pressure Strength of Reinforced, Thermosetting Plastic Pipe
- ASTM D2412-11, Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading

- ASTM D2837-13 (E2014), Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
- ASTM D3567-97 (R 2011), Standard Practice for Determining Dimensions of “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings
- ASTM G153-13, Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic 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)
326 Broadway, Suite 400, Winnipeg, MB R3C 0S5 Canada
Telephone: (204) 948-2090 Fax: (204) 948-2125
www.ccme.ca

- CCME PN 1326-03 (UPD 2015), Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products

Document Published by the Canadian Standards Association (CSA)
5060 Spectrum Way, Mississauga, ON L4W 5N6 Canada
Telephone: (416) 747-4000 or 1-800-463-6727 Fax: (416) 747-2473
www.csa.ca

- CSA C22.2 No. 0.15-15, Adhesive Labels

Document Published by the National Research Council Canada (NRC)
Canadian Commission on Building and Fire Codes
1200 Montreal Road, Bldg. M-58, Ottawa, ON K1A 0R6 Canada
Telephone: (613) 993-9101 or 1-877-672-2672 Fax: (613) 949-3042
www.nrc-cnrc.gc.ca

- National Fire Code of Canada, 2015

Documents Published by Underwriters Laboratories Inc. (UL)
333 Pfingsten Road, Northbrook, IL 60062-2096, U.S.A.
Telephone: (847) 272-8800
www.ul.com

- UL 797-2007 (R2012), Standard for Electrical Metallic Tubing - Steel
- UL 969-1995 (R2014), Standard for Marking and Labeling Systems

3 GLOSSARY

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

3.1 *ASTM IRM 903* — High-swelling petroleum base oil described in ASTM D471, Standard Test method for Rubber Property - Effects of Liquids.

3.2 *ASTM REFERENCE FUEL C* — A blend of 50 % Isooctane and 50 % Toluene by volume.

3.3 *AUTHORITY HAVING JURISDICTION* — 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 *BARRIER LINER* — The thin inner or outer layer of a *composite pipe* that contains internal fuels, provides permeation resistance, and protects the outer structural *pipe* wall from exposure to fuels or external fluids.

3.5 *BREAKDOWN* — The pressure at which severe leakage, rupture or burst occurs.

3.6 *CHASE PIPE* — An *underground pipe* that is used to route *primary carrier*, *secondary containment*, or *integral primary/secondary pipe* between storage tanks and containment *sumps*. Typically used to extract the *pipe* without excavation, and is not considered secondary containment.

3.7 *CLOSED SECONDARY CONTAINMENT PIPING SYSTEM* — A *secondary piping system* with ends normally closed at the tank and *sump* with a minimum rated pressure of 350 kPa.

3.8 *COMBUSTIBLE LIQUID(S)* — Any liquid having a flash point at or above 37.8 ± 2 °C and below 93.3 ± 2 °C and as defined in the National Fire Code of Canada.

3.9 *COMPOSITE PIPE / PIPING (SYSTEM)* — An *underground piping system* in which the *pipe* design contains both *metallic* and *nonmetallic* major and critical components.

3.10 *FITTING(S)* — A manufacturer-supplied component(s) designed to connect, branch, or terminate *pipe* sections and contain liquids. Connections may be threaded, welded, crimped, clamped, compressed, thermo fused, solvent welded, or adhesive joined. *Sump* boots are not considered *fittings*.

3.11 *FLAMMABLE LIQUID(S)* — Any liquid having a flash point below 37.8 ± 2 °C and having a vapour pressure not exceeding 275 kPa (absolute) at 37.8 ± 2 °C and as defined in the National Fire Code of Canada.

3.12 *FLEXIBLE (PIPE/PIPING)* — *Pipe* with a manufacturer's recommended minimum bend radius less than or equal to 1.8 m. Typically constructed from thermoplastic materials.

3.13 *INTEGRAL* — Two or more separate components physically joined together or combined at the manufacturer to form a single part. *Primary* and *secondary pipe* joined in the field with a common *fitting* is not considered *integral*.

3.14 *INTEGRAL PRIMARY/SECONDARY (PIPE)* — A single *pipe*, constructed at the manufacturing site that combines both *primary carrier* and *secondary containment* with an interstitial space that can be monitored for leakage.

3.15 *LOW TEMPERATURE* — Temperature at -30 ± 2 °C.

3.16 *METALLIC(S)* — *Pipe(s)*, *fitting(s)*, or component(s) primarily consisting of metals (typically corrosion-resistant malleable types such as steel, aluminum, copper, and brass) with or without minor *nonmetallic* components (such as gaskets, seals, sleeves or bushings).