ULC-S564:2022A

STANDARD FOR CATEGORIES 1 AND 2 FOAM LIQUID CONCENTRATES



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.

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.

ULC 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 standards, please contact:

ULC STANDARDS
Telephone: (613) 755-2729
E-mail: ULCStandards@ul.com

To purchase ULC Standards, visit: canada.ul.com/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 ULC Standard may be ordered from ULC Standards.

Standard for Categories 1 and 2 Foam Liquid Concentrates, ULC-S564

Second Edition, Dated April 1, 2006

Summary of Topics

This revision to ULC-S564 dated June 14, 2022 includes temperature range for solution and fuel; 4.2.2.1.2, 6.1.1.4, 6.1.3.6, 6.2.1.4 and 6.2.2.3

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated March 11, 2022.

PLEASE NOTE THAT CERTAIN CODES MAY REFER TO A SUPERSEDED VERSION OF THIS STANDARD. IN THOSE INSTANCES, THE RELEVANT VERSIONS ARE AVAILABLE FOR PURCHASE.

UL COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM UL INC.

STANDARD FOR CATEGORIES 1 AND 2 FOAM LIQUID CONCENTRATES

ICS 13.220.10

ULC Standards
Normes ULC

First Edition . . . . . January 1998
SECOND EDITION . . . . . APRIL 2006
Reaffirmation . . . . . April 2016
Revision 1 . . . . . February 17, 2022
REVISION 2 . . . . . JUNE 14, 2022

Copyright © 2022

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.

UL COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM UL INC.

CONTENTS

ULC STANDARDS COMMITTEE ON FIRE FIGHTING FOAMS 7

REFERENCE PUBLICATIONS 9

PREFACE 11

1 SCOPE 13
2 GLOSSARY 13
3 GENERAL 17
3.1 COMPONENTS 17
4 FOAM LIQUID CONCENTRATE REQUIREMENTS 17
4.1 INDUCTION METHODS 17
4.2 PERFORMANCE 17
4.3 CONTAINER REQUIREMENTS 20
4.4 MARKING 23
5 FOAM EQUIPMENT REQUIREMENTS 24
5.1 CONSTRUCTION 24
5.2 HYDRAULIC CHARACTERISTIC TEST 25
5.3 INDUCTION RATE TESTS 26
5.4 MINIMUM STORAGE TEMPERATURE TEST 26
5.5 HYDROSTATIC PRESSURE TEST 27
5.6 EQUIPMENT PRESSURIZATION TEST 27
5.7 10-DAY MOIST AMMONIA AIR STRESS CRACKING TEST 27
5.8 SALT SPRAY CORROSION TEST 28
5.9 ELASTOMERIC PARTS TESTS OTHER THAN HOSE 29
5.10 RUBBER MATERIALS TESTS – HOSE 30
5.11 EXPOSURE TESTS FOR POLYMERIC MATERIALS AND FIBREGLASS COMPONENTS USED IN PARTS OTHER THAN CONTAINERS 31
5.12 MARKING 32
6 CLASS B FIRE TESTS 33
6.1 SPRINKLERS AND SPRAY NOZZLES 33
6.2 TOPSIDE DISCHARGE DEVICES 35
6.3 SUBSURFACE INJECTION 37
TABLE 39
FIGURES 42

UL COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM UL INC.

ULC STANDARDS COMMITTEE ON FIRE FIGHTING FOAMS

NAME	AFFILIATION	CATEGORY	REGION
T. Aitken	Greater Toronto Airports Authority	AHJ/Regulator	Ontario
A. Barragan	Bioex	Producer	USA
K. Henderson	Canadian Airports Council	Consumer	Canada
V. Hourdebaigt	Environment and Climate Change Canada	AHJ/Regulator	Canada
M. Hubert	The Solberg Company	Producer	USA
Y. Ko	National Research Council Canada	Government	Canada
B. Rowswell	National Foam	Producer	Canada
B. Shugarman	UL LLC	Testing and Standards Org.	USA
B. Valois	Autopyro	General Interest	Canada
G. Vestergom Jr.	Unifoam Company Ltd.	Producer	Canada
G. Edwards (Project Manager)	Underwriters Laboratories	Non-voting	USA
D. Haithcock (Chair)	Underwriters Laboratories	Non-Voting	USA

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.

UL COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM UL INC.

REFERENCE PUBLICATIONS

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 of Mechanical Engineers (ASME)
Three Park Avenue, New York, NY 10016-5990 U.S.A.
Telephone: 1-800-843-2763
www.asme.org

• ASME B 1.20.1-83 (Reaffirmed 2001), Pipe Threads, General Purpose (Inch)

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 A 307-04, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

• ASTM B 117-03, Standard Practice for Operating Salt Spray (Fog) Apparatus

• ASTM D 412-98a (Reapproved 2002), Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension

• ASTM D 638-03, Standard Test Method for Tensile Properties of Plastics

• ASTM D 1141-98 (Reapproved 2003), Standard Practice for the Preparation of Substitute Ocean Water

• ASTM D 1331-89 (Reapproved 2001), Standard Test Methods for Surface and Interfacial Tension of Solutions of Surface-Active Agents

• ASTM D 1414-94 (Reapproved 2003), Standard Test Methods for Rubber O-Rings

• ASTM D 1693-05, Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics

• ASTM D 2240-05, Standard Test Method for Rubber Property – Durometer Hardness

• ASTM G 26-94, Standard Practice for Operating Light-Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials

---

Document Published by the National Fire Protection Association (NFPA)
1 Batterymarch Park, Quincy, MA 02269-9101, U.S.A.
Telephone: (617) 770-3000 Fax: (617) 770-0700
www.nfpa.org

• NFPA 11-2005, Standard for Low-, Medium-, and High-Expansion Foam

UL COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM UL INC.

• NFPA 16-2003, Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems

---

Documents Published by Underwriters' Laboratories of Canada (ULC)
7 Underwriters Road, Toronto, ON M1R 3B4 Canada
Telephone: (416) 757-3611 or 1-866-9373-ULC
www.ulc.ca

• CAN/ULC-S522-M86, Standard for Fire Extinguisher and Booster Hose

• ULC/ORD-C199-2003, Automatic Sprinklers for Fire-Protection Service

---

UL COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM UL INC.

PREFACE

This is the Second Edition of the Standard for Categories 1 and 2 Foam Liquid Concentrates, ULC-S564

This Edition of the Standard has been formally approved by the ULC Standards Committee on Fire Fighting Foams.

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.

Attention is drawn to the possibility that some of the elements of this Canadian standard may be the subject of patents rights. ULC Standards shall not be held responsible for identifying any or all such patents 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 ULC-S564 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.

Comments or proposals for revisions on any part of the Standard may be submitted at any time. Proposals should be submitted via a Proposal Request in the On-Line Collaborative Standards Development System (CSDS) at https://csds.ul.com/canada.

This Standard is intended to be used for conformity assessment.

UL COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM UL INC.

1 SCOPE

1.1 The Standards for *foam liquid concentrates* are divided into three categories.

Category 1	Category 2	Category 3
Primarily for use on general-purpose hydrocarbon fires	Primarily for use on polar solvents, oxygenated fuels, and water-miscible fuels and all Category 1 applications	Primarily for use on aircraft rescue fire fighting and all Category 1 applications

This Standard refers to Categories 1 and 2 *foam liquid concentrates*.

NOTE: The requirements for Category 3 Aqueous Film-Forming Foam (AFFF) Liquid Concentrates are contained in the Standard CAN/ULC-S560 and the requirements for Category 3 Film-Forming Fluoroprotein (FFFP) Foam Liquid Concentrates are contained in the Standard CAN/ULC-S563.

1.2 These requirements cover *foam* producing equipment and *liquid concentrates* employed for the production and discharge of *foam* that has an expansion ratio of 20:1 or less and is used for fire extinguishment. These requirements are based on the premise that *foam* equipment and specified types of *foam liquid concentrates* with which they are intended to be used are to be investigated for use with each other.

1.3 If *foam* equipment covered by these requirements incorporate sprinklers, the sprinklers shall comply with the requirements for Automatic Sprinklers for Fire-Protection Service, ULC/ORD-C199.

1.4 Requirements for the installation and use of *foam* equipment and *foam liquid concentrates* are included in the Standard for Low-, Medium-, and High-Expansion Foam, NFPA 11.

2 GLOSSARY

NOTE: Terms used in this standard that are in *italics* are defined as follows:

CLASS B FIRES – Fires in flammable and combustible liquids, gases, and greases.

CONTROL – A reduction in fire intensity of approximately 90 %.

DISCHARGE COEFFICIENT "K_m" – Coefficient of discharge in the formula:

$$K_m = \frac{Q}{\sqrt{p}}$$

Where:

Q = Flow in L/min,

p = Pressure in kPa.

DISCHARGE DEVICE – Fixed, semifixed, or portable devices, such as *foam* chambers, *fixed foam makers*, monitors, nozzles, *spray nozzles*, and sprinklers, that direct the flow to the fire or flammable liquid surface.

UL COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM UL INC.

FIRE TEST PAN – The *fire test pan* is to be square, straight sided, with a minimum area of 4.65 m^2. The pan is to be of steel not less than 12 mm thick with liquid tight welded joints and provided with 35 by 35 by 6 mm thick angle to reinforce the upper edge. The reinforcement is to be continuous around the perimeter of the pan and is to form a turned-out edge flush with the top edge of the pan. The reinforcing angle is to be continuously welded to the outside of the pan at the top edge and tackwelded at the edge of the lower lip of the angle.

FILM-FORMING LIQUID CONCENTRATE – A *foam solution* that has a spreading coefficient greater than zero when tested in accordance with the Film Forming Test, Subsection 4.2.1.

FIXED FOAM MAKER – A device that generates *foam* which is intended to be installed between the supply piping of *foam solution* and piping leading to discharge outlets.

FOAM – A firefighting agent made by mechanically mixing air with a solution consisting of fresh or salt water to which a *foam liquid concentrate* has been added.

FOAM CHAMBER – A device that:

A May include an integral foam maker;

B Is intended for fixed installation on flammable or combustible liquid storage tanks; and

C Produces foam and introduces it into the storage tanks.

FOAM EXPANSION VALUE – The ratio of final *foam* volume to original *foam solution* volume before adding air.

FOAM QUALITY – A measure of a *foam*'s physical characteristics, expressed as the *foam*'s *twenty-five percent drain time* and expansion value.

FOAM SOLUTION – A mixture of a proportioned or premixed foam *liquid concentrate* dissolved in either fresh or *salt water*.

FULL-SCALE EQUIPMENT – Field installed components, such as *proportioners* and *foam* makers, that are intended to extinguish fires.

INDUCTION – A method that uses the venturi principle to introduce a proportionate quantity of *foam* concentrate into a water stream.

A *Pressure Induction* –This method employs the water supply to pressurize the *foam* concentrate storage tank. At the same time, water flowing through an adjacent venturi or orifice creates a pressure differential. The difference between the water supply pressure and this lower pressure area forces the *foam* concentrate to flow through a fixed or metering orifice into the water stream.

B *Vacuum Induction* – This method utilizes the negative pressure created by water passing through a venturi to draw the *liquid concentrate* from the storage tank or container through a pickup tube and mix it with the water stream.

C *Pump-and-Motor Induction* – By means of an auxiliary pump, *foam* compound is injected into the water stream passing through an inductor. The resulting *foam solution* is then delivered to a *foam* maker. The *proportioner* may be inserted in the line at any point between the water source and *foam* maker.

UL COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM UL INC.

FOAM LIQUID CONCENTRATE – A protein or synthetic based liquid that is intended to be diluted with fresh water, *salt water*, or a mixture of both fresh and *salt water* to a concentration (volume of concentrate/volume of solution). Different types of low expansion *foam liquid concentrates* are designated as follows:

A *Aqueous Film-Forming (AFFF) Foam* – A *foam liquid concentrate* that has a fluorinated surfactant base plus stabilizing additives.

B *Protein (P)* – A *foam liquid concentrate* that has a hydrolysed protein base plus stabilizing additives; and shall be formulated such that it does not contain intentionally added per- and/or poly-fluorinated substances (“PFAS”).

C *Fluoroprotein (FP)* – A *foam liquid concentrate* that is similar to protein, but with one or more fluorinated surfactant additives.

D *Film-Forming Fluoroprotein (FFFP)* – A *foam liquid concentrate* that has both a hydrolysed protein and fluorinated surfactant base plus stabilizing additives.

E *Synthetic Fluorine Free Foam (SFFF)* – A foam liquid concentrate that has a base other than fluorinated surfactant or hydrolyzed protein; and shall be formulated such that it does not contain intentionally added per- and/or poly-fluorinated substances (“PFAS”).

F *Alcohol Resistant (AR- suffix)* – A *foam liquid concentrate* intended to extinguish both hydrocarbon and polar solvent (water miscible) fuel fires. To be identified as alcohol resistant, a *foam liquid concentrate* shall comply with the fire tests indicated in Sprinklers and Spray Nozzles, 6.1, or Topside Discharge Devices, Subsection 6.2,using both heptane and isopropyl alcohol test fuels.

MONITOR – A device that includes a *nozzle* and is intended to deliver a large *foam* stream and is mounted on a stationary support at grade level or on an elevated platform, or a vehicle.

NOZZLE – A portable device intended to discharge *foam solution*. A nozzle may be either aspirating or nonaspirating and may pick up *foam liquid concentrate* directly from a container (self-inducting) or utilize a *foam solution* produced at some point before introduction into the nozzle.

PROPORTIONER – A device intended to provide continuous introduction of *foam liquid concentrate* at the recommended ratio into a water stream to form a *foam solution*.

SALT WATER – Synthetic seawater complying with the Standard Practice for the Preparation of Substitute Ocean Water, ASTM D 1141 or the equivalent.

SPECIAL FIRE EQUIPMENT (SMALL SCALE EQUIPMENT) – *Foam* nozzles or *foam* makers, used for the Class B Fire Tests, that produce *foam* at the flow rate required for the Class B Fire Tests and having a *foam quality* approximating that produced using *full-scale equipment*.

Special fire equipment may be provided by the manufacturer to produce a range of *foam quality*.

SPRAY NOZZLE – A device attached to piping intended to discharge *foam* in a fixed spray pattern.

SPRINKLER, FOAM-WATER TYPE – An air aspirating, open type sprinkler, constructed to discharge water or *foam*-water solutions.

STANDARD SPRINKLER – A nonair aspirating type sprinkler that complies with the requirements for Automatic Sprinklers for Fire-Protection Service, ULC/ORD-C199, and discharges water or *foam solutions*.

UL COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM UL INC.

STOVE PIPE – A device intended to provide an open area for the 1 min free burn during the burnback test. The *stove pipe* shall be constructed of 0.4 to 1.2 mm sheet steel. The *stove pipe* is to be cylindrical in shape with an inside diameter not less than 300 mm and length not greater than 350 mm.

SUBSURFACE FOAM INJECTION – Discharge of *foam* into a storage tank below the liquid surface near the tank bottom.

TEST FUELS –

(a) *HEPTANE* – Commercial grade hydrocarbon having the following characteristics:

Distillation –	
Initial boiling point	95 °C
50 %	97 °C
Dry Point	98 °C
Specific Gravity (15.6 °C/15.6 °C)	0.702 (not critical)
Gravity °API	70.2 (not critical)

(b) *POLAR SOLVENT FUELS* – Standard Polar Test fuels are as follows:

Polar Solvent Group	Standard Test Fuel
Alcohol	Isopropyl Alcohol
Ketones	Dimethyl Ketone
Esters	N-Butyl Acetate
Carboxylic Acids	Glacial Acetic Acid
Amines	Ethylene Diamine
Aldehydes	Propionaldehyde
Ethers, except Diethyl and Methyl Tertiary Butyl Ether	Isopropyl ether
Impurities for any polar test fuel is not to exceed 1.0 %	

TOPSIDE APPLICATION – A method of *foam* discharge wherein the *foam* is applied onto the top of a burning fuel surface.

TORCH – A device intended to determine the sealability of a *foam* blanket when used as described under Class B Fire Tests, Section 6. The *torch* shall be constructed so that the flame is not less than 100 mm in length and 150 mm in height.

TWENTY-FIVE PERCENT DRAIN TIME – The time required for a 25 % volume of liquid *foam solution* to drain from the *foam* sample.

TYPE II DISCHARGE OUTLET – A fixed device that delivers *foam* onto the burning liquid and partially submerges the *foam* and produces restricted agitation of the surface. Examples of a *Type II discharge outlet* discharge outlet include *foam* chambers and *foam* makers.

UL COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM UL INC.

TYPE III DISCHARGE OUTLET – A fixed or portable device that delivers *foam* in a manner that causes the *foam* to fall directly onto the surface of the burning liquid and does so in a manner that causes general agitation. Examples of a Type III discharge outlet include hose stream *nozzles* and *monitors*.

3 GENERAL

3.1 COMPONENTS

3.1.1 Except as indicated in Clause 3.1.2, a component of a product covered by this Standard shall comply with the requirements for that component.

3.1.2 A component need not comply with a specific requirement that:

A Involves a feature or characteristic not needed in the application of the component in the product covered by this Standard; or

B Is superseded by a requirement in this Standard.

3.1.3 A component shall be used in accordance with its recognized rating established for the intended conditions of use.

3.1.4 Specific components are recognized as being incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions for which they have been recognized.

4 FOAM LIQUID CONCENTRATE REQUIREMENTS

4.1 INDUCTION METHODS

4.1.1 A *liquid concentrate* shall be formulated so that it may be introduced into water flowing under pressure in pipe lines, by *pressure induction*, *vacuum induction*, or *pump-and-motor* (combined with balancing valves) *induction* method.

4.2 PERFORMANCE

4.2.0 Combustion Ion Chromatography

4.2.0.1 For a foam liquid concentrate formulated such that it does not contain intentionally added per- and/or poly-fluorinated substances (PFAS), the concentration of permissible PFAS concentration is <1mg/L Total Organic Fluorine (TOF) when measured by combustion ion chromatography.

4.2.1 Film-Forming Test

4.2.1.1 A film-forming foam liquid concentrate shall have a spreading coefficient (see Clause 4.2.1.5) greater than zero when tested as described in Clauses 4.2.1.2 through 4.2.1.5.

4.2.1.2 The surface tension of the *foam solution* and the interfacial tension of the *foam solution* and cyclohexane are to be determined using a tensiometer as described in the Standard Test Methods for Surface and Interfacial Tension of Solutions of Surface-Active Agents, ASTM D 1331.

UL COPYRIGHTED MATERIAL – NOT AUTHORIZED FOR FURTHER REPRODUCTION OR DISTRIBUTION WITHOUT PERMISSION FROM UL INC.