

PRECAST CONCRETE TANKS



**Underwriters
Laboratories of Canada®**



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.

Other Recognized Documents (ORD) developed by Underwriters Laboratories of Canada are developed in accordance with the procedure outlined in CAN-P-1500, "Additional Requirements for Accreditation of Certification Bodies", published by the Standards Council of Canada.

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

CORPORATE HEADQUARTERS

Underwriters Laboratories of Canada
7 Underwriters Road
Toronto, Ontario M1R 3A9
Telephone: (416) 757-3611
Fax: (416) 757-9540
Customer Service: 1-866-937-3852

The Standards Council of Canada (SCC) is the coordinating body of the National Standards System, a coalition of independent, autonomous organizations working towards the further development and improvement of voluntary standardization in the national interest.

The principal objects of the SCC are to foster and promote voluntary standardization as a means of advancing the national economy, benefiting the health, safety and welfare of the public, assisting and protecting the consumer, facilitating domestic and international trade, and furthering international cooperation in the field of standards.

The National Standards System of Canada accepts the use of Other Recognized Documents (ORD) as defined in CAN-P-1500, "Additional Requirements for Accreditation of Certification Bodies", published by the Standards Council of Canada.

The Standards Council of Canada is located at:

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

REGIONAL OFFICES

EASTERN OFFICE

6505, Rte Transcanadienne, Suite 330
St-Laurent, Québec H4T 1S3
Telephone: (514) 363-5941
Fax: (514) 363-7014
Customer Service: 1-866-937-3852

PACIFIC OFFICE

13775 Commerce Parkway, Suite 130
Richmond, British Columbia V6V 2V4
Telephone: (604) 214-9555
Fax: (604) 214-9550
Customer Service: 1-866-937-3852

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
Customer Service: 1-866-937-3852

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

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

Copies of this Other Recognized Document may be ordered from ULC Standards.



Documents
Document Sharing Hub

PRECAST CONCRETE TANKS

ICS 13.060.30; 75.200; 91.100.30

Prepared and Published by



First Edition.....January 2000
SECOND EDITION.....AUGUST 2014

Copyright © 2014

ULC Standards

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

Document ID: 123456789

TABLE OF CONTENTS

FOREWORD	.I
PREFACE	.II
1 SCOPE	.1
2 REFERENCE PUBLICATIONS	.1
3 GLOSSARY	.3
4 CONSTRUCTION	.4
4.1 GENERAL	.4
4.2 MATERIALS	.5
4.3 MANUFACTURING	.5
4.4 CONCRETE	.5
4.5 MULTIPLE-PIECE TANKS	.6
4.6 MANWAY	.6
4.7 PUMPOUT OPENINGS	.6
4.8 MONITORING AND LEAK DETECTION	.6
4.9 SUPPORT SYSTEM AND WEATHERING PROTECTION	.7
4.10 HANDLING	.7
4.11 HARDWARE	.7
4.12 JOINTS	.7
4.13 FINISH	.7
4.14 ASSEMBLY	.7
4.15 HEATING EQUIPMENT	.8
4.16 ELECTRICAL EQUIPMENT	.8
4.17 ADDITIONAL CONSTRUCTION REQUIREMENTS FOR SPECIFIC APPLICATIONS	.8
4.17.1 SEPTIC TANK APPLICATION	.8
4.17.2 OIL-WATER SEPARATOR APPLICATION	.8
4.17.3 ABOVEGROUND SECONDARY CONTAINMENT APPLICATION	.8
4.17.4 BELOW GRADE VAULT APPLICATION	.8
4.17.4.1 Ventilation	.8
4.17.4.2 Normal and Emergency Venting	.9
5 PERFORMANCE TESTING	.9
5.1 GENERAL	.9
5.2 TANK CAPACITY DETERMINATION	.9
5.3 BUOYANCY TEST	.9
5.4 HYDROSTATIC LOAD TEST	.9
5.5 EXTERNAL PRESSURE TEST	.10
5.6 PERMEABILITY TEST	.10
5.7 EVALUATION OF NONMETALLIC GASKET AND SEAL MATERIALS	.10
5.8 LIFT FITTING LUGS TEST	.11
5.9 CONCENTRATED LOADING TEST	.11
5.10 STRENGTH TEST	.11
5.11 VACUUM TEST	.12
5.12 WATERTIGHTNESS TEST	.12

5.13	IMPACT TEST	13
5.14	HYDROSTATIC TEST - LIQUID-TIGHT RISER	13
5.15	TANK CONNECTIONS TEST	13
5.15.1	Torque Test	13
5.15.2	Bending Moment Test	14
5.16	HANDLING TEST	14
5.17	TEST REPORT	14
6	MARKING	15
7	MANUFACTURING AND PRODUCTION TESTS	15
7.1	VISUAL INSPECTION	15
7.2	VAULT WALL, FLOOR AND LID THICKNESS	15
7.3	COMPRESSIVE STRENGTH	15
8	INSTALLATION AND MAINTENANCE INSTRUCTIONS	15
	TABLES	17
	FIGURES	18
	APPENDIX A – REQUIREMENTS FOR CONCRETE (NORMATIVE)	20
	APPENDIX B – REQUIREMENTS FOR CONCRETE SUBJECTED TO FREEZING AND THAWING (NORMATIVE)	22
	APPENDIX C – REQUIREMENTS FOR CONCRETE SUBJECTED TO SULPHATE ATTACK (NORMATIVE)	23

FOREWORD

Certification organizations are periodically requested to promptly provide certification services for devices, constructions, materials and systems where Canadian recognized Standards do not currently exist or are not entirely applicable. Accordingly, the certification organization utilizes its experience, existing specifications and requirements in related areas, together with assistance from its advisory councils to develop and prepare Other Recognized Documents (ORDs) for use in conducting the necessary tests and evaluation investigation.

Underwriters Laboratories of Canada has prepared many ORDs in response to requests from, and in conjunction with, industry, code writing bodies, regulatory agencies and others prior to promulgating a certification program. In many instances such documents have become published ULC Standards and subsequently National Standards of Canada. It is the intention of Underwriters Laboratories of Canada to continue this practice, as appropriate.

Comments on the content of this ORD should be directed to the Head Office of Underwriters Laboratories of Canada, 7 Underwriters Road, Toronto, Ontario, CANADA, M1R 3A9.

NOTE: These Other Recognized Documents are accepted under the National Standards System of Canada. Reference may be made to the Document CAN-P-1500, "Additional Requirements for Accreditation of Certification Bodies", published by the Standards Council of Canada located at 270 Albert Street, Suite 200, Ottawa, Ontario, CANADA, K1P 6N7.

PRECAST CONCRETE TANKS

PREFACE

This is the Second Edition of the Other Recognized Document Precast Concrete Tanks, ULC/ORD-C142.15.

Only metric SI units of measurement are used in this ORD. 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, B and C, identified as normative, form a mandatory part of this ORD.

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 Second Edition ORD is based on, and now supersedes, the First Edition.

Attention is drawn to the possibility that some of the elements of this ORD 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 ORD should be sent to the ULC Mark Program Owner of Underwriters Laboratories of Canada. 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.

This ORD is intended to be used for conformity assessment.

1 SCOPE

1.1 The requirements of this ORD apply to stationary aboveground and underground precast concrete tanks, and underground vaults.

1.2 The requirements of this ORD apply to:

- A Tanks intended for use as primary containment for liquids that are non-destructive to concrete, such as water contaminated with oil, waste water, or similar products; and
- B Tanks and vaults intended for use as secondary containment for flammable liquids and/or combustible liquids.

1.3 This ORD is a companion document to Standard CAN/ULC-S656, Standard for Oil-Water Separators. (See Subsection 4.17.2, Oil-Water Separator Application.)

1.4 This ORD is a reference document for other Standards and ORDs applicable to the manufacturing of precast concrete tanks, such as ULC-S655, Aboveground Protected Tanks Assemblies for Flammable and Combustible Liquids, and ULC/ORD-C142.20, Secondary Containments for Aboveground Flammable and Combustible Liquid Storage Tanks.

1.5 The requirements of this ORD apply to below-grade vaults intended for the secondary containment of flammable liquids and/or combustible liquids in an aboveground tank.

1.6 Precast concrete tanks are intended primarily for installation and use in accordance with, but not limited to, the following:

- A The Canadian Environmental Protection Act;
- B The National Fire Code of Canada;
- C The National Building Code of Canada; and
- D Manufacturer's installation requirements.

2 REFERENCE PUBLICATIONS

The documents shown below are referenced in the text of this ULC Other Recognized Document (ORD). Unless otherwise stated elsewhere in this ORD, such reference shall be considered to indicate the edition and/or revisions of the documents available at the date on which this ULC ORD is published.

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 A36/A36M-11, Standard Specification for Carbon Structural Steel
- ASTM C39 REV A (2012), Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
- ASTM E96-12, Standard Test Methods for Water Vapor Transmission of Materials

Documents Published by CSA Group
5060 Spectrum Way, Suite 100, Mississauga, Ontario L4W 5N6 Canada
Telephone: 1-800-463-6727
www.csa.ca

- CSA A23.1/A23.2-09 (UPD 1, 2011), Concrete materials and methods of concrete construction/Test methods and standard practices for concrete
- CSA A23.3-04 (R 2010), Design of concrete structures
- CSA A23.4-09, Precast concrete - Materials and construction
- CSA A3000-08, Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005)
- CSA B66-10, Design, material, and manufacturing requirements for prefabricated septic tanks and sewage holding tanks
- CSA C22.1-12, Canadian Electrical Code, Part I Safety Standard for Electrical Installations
- CSA G40.20/G40.21-13, General requirements for rolled or welded structural quality steel/Structural quality steel
- CAN/CSA S6-06 (SUPP 3, 2013), Canadian Highway Bridge Design Code, incorporating Supplement 1: May 2010; Supplement 2: October 2011; Supplement 3: March 2013

Documents Published by the Department of Justice Canada
100 Metcalfe Street, Ottawa, Ontario, K1A 0H8 Canada
Telephone: (613) 957-4519
laws-lois.justice.gc.ca/eng/acts/C-15.31/

- Canadian Environmental Protection Act, 1999

Documents Published by the National Research Council Canada (NRC)
1200 Montreal Road, Bldg. M-58, Ottawa, Ontario K1A 0R6 Canada
Telephone: 1-877-672-2672
www.nrc-cnrc.gc.ca

- National Building Code (NBC) of Canada, 2010
- National Fire Code (NFC) of Canada, 2010

Documents Published by Underwriters Laboratories of Canada (ULC)
7 Underwriters Road, Toronto, ON M1R 3A9 Canada
Telephone: (416) 757-3611, ext. 61744; FAX (613) 231-5977, "ATTN: Publications"
E-mail: publications@ulc.ca
www.ulc.ca

- CAN/ULC-S660-08, Standard for Nonmetallic Underground Piping for Flammable and Combustible Liquids

- ULC/ORD-C58.12-92 (CAN/ULC-S675.1), Leak Detection Devices (Volumetric Type) for Underground Flammable Liquid Storage Tanks
 - ULC/ORD-C58.14-92 (CAN/ULC-S675.2), Nonvolumetric Leak Detection Devices for Underground Flammable Liquid Storage Tanks
 - ULC/ORD-C142.20-95, Secondary Containments for Aboveground Flammable and Combustible Liquid Storage Tanks
 - ULC-S655-98, Standard for Aboveground Protected Tank Assemblies for Flammable and Combustible Liquids
-

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-S603.1-11, External Corrosion Protection Systems for Steel Underground Tanks for Flammable and Combustible Liquids
- CAN/ULC-S656-14, Standard for Oil-Water Separators
- CAN/ULC-S661-10, Overfill Protection Devices for Flammable and Combustible Liquid Storage Tanks
- CAN/ULC-S669-14, Standard for Internal Retrofit Systems for Storage Tanks for Flammable and Combustible Liquids

3 GLOSSARY

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

3.1 *BELOW-GRADE VAULT* — A *secondary containment* constructed of reinforced concrete forming a complete enclosure to the primary *tank*.

3.2 *BURIAL DEPTH* — The depth over the top of the outer shell of the installed *tank* to the finished grade.

3.3 *COMBUSTIBLE LIQUID* — Any liquid having a flash point at or above 37.8 °C and below 93.3 °C.

3.4 *FLAMMABLE LIQUID* — Any liquid having a flash point below 37.8 °C and a vapor pressure not exceeding 275.8 kPa (absolute) at 37.8 °C.

3.5 *LIQUID-TIGHT* — An enclosure that does not allow external liquid, typically water, to penetrate through to the enclosure area.

3.6 *LIQUID-TIGHT RISER* — A *liquid-tight* extended containment attached to the *tank* to provide ground level enclosure to the *manway* located on the top part of the single or multiple-piece *tank*.

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

3.8 *PRECAST CONCRETE* — Concrete elements cast in a location other than their final position in service.