UL 2245

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Below-Grade Vaults for Flammable Liquid Storage Tanks

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UL Standard for Safety for Below-Grade Vaults for Flammable Liquid Storage Tanks, UL 2245

Second Edition, Dated December 28, 2006

Summary of Topics

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New product submittals made prior to a specified future effective date will be judged under all of the requirements in this Standard including those requirements with a specified future effective date, unless the applicant specifically requests that the product be judged under the current requirements. However, if the applicant elects this option, it should be noted that compliance with all the requirements in this Standard will be required as a condition of continued Listing, Recognition, and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

This Standard consists of pages dated as shown in the following checklist:

Page	Date
1-12	December 28, 2006

UL 2245

Standard for Below-Grade Vaults for Flammable Liquid Storage Tanks

First Edition – February, 1999

Second Edition

December 28, 2006

An effective date included as a note immediately following certain requirements is one established by Underwriters Laboratories Inc.

Revisions of this Standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements. Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at http://csds.ul.com.

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INTRODUCTION

1 Scope

1.1 These requirements cover below-grade vaults intended for the storage of flammable or combustible liquids in an aboveground atmospheric tank. Below-grade vaults are designed to contain one aboveground tank which can be a compartment tank. Adjacent vaults may share a common wall. The lid of the vault may be at or below-grade.

1.2 Below-grade vaults are constructed of a minimum of 6 inches (152.4 mm) of reinforced concrete or other equivalent noncombustible material and form a complete, liquid-tight enclosure that does not allow external ground water to permeate through the vault walls. Below-grade vaults can be evaluated as secondary containment vaults.

1.3 Below-grade vaults covered by these requirements do not include an evaluation of components, such as ventilation equipment, leak detection and monitoring equipment, overfill protection equipment, and access ladders.

1.4 Below-grade vaults are intended for installation and use in accordance with the manufacturer's instructions and the following fire codes: the Flammable and Combustible Liquids Code, NFPA 30, the Automotive and Marine Service Station Code, NFPA 30A, and the Uniform Fire Code, Appendix II-J.

1.5 Below-grade vaults covered by these requirements may be shipped in parts that require final assembly in the field. When field assembly is required, detailed installation instructions shall be provided.

1.6 These requirements do not cover seismic loading.

1.7 A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this Standard, and that involves a risk of fire, electric shock, or injury to persons shall be evaluated using the appropriate additional component and end-product requirements to determine that the level of safety as originally anticipated by the intent of this Standard is maintained. A product whose features, characteristics, components, materials, or systems conflict with specific requirements or provisions of this Standard shall not be judged to comply with this Standard. Where appropriate, revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this Standard.

2 General

2.1 Components

2.1.1 Except as indicated in 2.1.2, a component of a product covered by this Standard shall comply with the requirements for that component.

2.1.2 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.

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

2.1.4 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.

2.2 Units of measurement

2.2.1 When a value for measurement is followed by a value in other units in parentheses, the first stated value is the requirement.

2.3 Undated references

2.3.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

3 Glossary

3.1 For the purpose of this standard the following definitions apply.

3.2 ABOVEGROUND TANK FOR FLAMMABLE LIQUIDS – A tank complying with the requirements in the Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids, UL 142.

3.3 ATMOSPHERIC TANK – A storage tank that has been constructed to operate at pressures from atmospheric through 1.0 psig (6.4 kPa) measured at the top of the tank.

3.4 BELOW-GRADE VAULT – A liquid-tight enclosure consisting of four walls, a floor, and a lid for the purpose of containing a single flammable or combustible liquid aboveground atmospheric storage tank. A below-grade vault is not an occupancy and not intended to be occupied except for inspection, repair, or maintenance. The vault may be evaluated to provide secondary containment for the stored liquid.

3.5 INTERSTITIAL SPACE – The space between the primary tank and secondary containment structure that can be monitored for the presence of vapor or liquid.

3.6 LIQUID-TIGHT – Refers to an enclosure, in this case a vault, that does not allow external liquid, typically water, to penetrate through to the enclosed area.

3.7 SECONDARY CONTAINMENT – A structure that has permeability less than 1×10^{-7} cm/sec (48 grams m^2/day) for the stored fluids, is external to and forms an interstitial space with the primary tank, and contains the entire contents of the primary tank in the event of a rupture.

CONSTRUCTION

4 Below-Grade Vaults

4.1 A below-grade vault shall be constructed of a minimum of 6 inches (152.4 mm) of reinforced concrete or other equivalent noncombustible material with the exception of joint seals, pipe and access-way seals, concrete linings, damp-proofing materials, and waterproofing materials. All materials that contact the tank contents shall be compatible with the liquids stored in the tanks.

4.2 The vault shall be constructed to withstand anticipated loads including:

a) Soil and hydrostatic loading on the floors, walls, and lid;

b) Uplifting by groundwater or flooding; and

c) Loads such as traffic and heavy equipment.

The vault shall be constructed to withstand HS20-44 loading in accordance with the American Association of State Highway and Transportation Officials, AASHTO, Standard for Highway Bridge Design. Vault structural drawings shall bear the stamp of a registered professional engineer.

4.3 The below-grade vault shall be liquid-tight. Pipe openings and access ways shall be sealed to be liquid-tight as described in the installation instructions. External coatings shall be applied to porous surfaces so the vault is damp-proof and waterproof.

4.4 A minimum of one personnel access way shall be provided. The access way cover shall be nonsparking and secured against unauthorized entry. The access way dimensions shall be a minimum of 30 inches (762 mm) at any point. Mounting provisions for a permanently affixed nonferrous ladder shall be provided. The floor shall be sloped to drain to a sump that is not located directly beneath any personnel access way. The travel distance from any point in the vault to an access way shall not be more than 20 feet (6.1 m).

4.5 Below-grade vaults shall be provided with a means of applying a fire-suppression agent to the interior of the vault.

5 Tank Securement

5.1 A means shall be provided to secure the tank to withstand uplifting due to flooding.

6 Monitoring and Leak Detection

6.1 Below-grade vaults shall be provided with means to install vapor- and liquid-phase monitoring and leak detection equipment.

7 Ventilation

7.1 Below-grade vaults shall be provided with a means to ventilate the interior of the vault and remove vapors.

7.2 Ventilation provisions shall not restrict any required personnel access way. Exhaust ventilation shall be constructed to remove vapors or fumes from the vault through ducting that is located within 3 to 12 inches (76 to 304 mm) of the floor. The location of inlet and exhaust shall be arranged to provide movement across all portions of the floor to prevent accumulation.

7.3 For below-grade vaults used for the storage of Class I liquids, the means for ventilation shall be permanent.

8 Normal and Emergency Venting

8.1 An opening through the vault for normal tank vent piping shall be provided. Normal vent piping, when provided with the vault, shall terminate 12 feet (3.66 m) above grade.

8.2 Emergency venting devices for the primary tank are permitted, but not required to discharge inside the vault. An opening through the vault for emergency venting of the primary tank is not required to be provided.

9 Lifting and Handling Means

9.1 Large sections of the below-grade vault shall be provided with a means for lifting during production, transportation, and installation.

PERFORMANCE

10 Buoyancy Test

10.1 For the following sequence of tests, Buoyancy, Hydrostatic Load, and External Pressure (Sections 10 – 12), the vault is to be placed in a test pit on a foundation representative of the manufacturer's installation instructions. The vault is to be assembled to the degree required to conduct the Buoyancy and Hydrostatic Load Tests, Sections 10 and 11. Consideration is to be given to the detection of pooling or leakage from the bottom of the vault following the Hydrostatic Load Test. The vault is to be completely assembled for the External Pressure Test, Section 12, and is to have the specified anchoring system installed that prevents uplifting of the vault during this test.

10.2 The largest size tank intended for the smallest size vault is to be placed in the vault and secured against uplift using the manufacturer's specified instructions. The tank is to be empty.

10.3 The vault is to be flooded with water to its maximum capacity. When adjacent vaults share a common wall, only the largest vault section is to be filled for this test. This condition is to be held for a minimum of one hour.

10.4 The tank shall show no evidence of uplifting during this test. There shall be no evidence of structural damage to the vault.

11 Hydrostatic Load Test

11.1 This test is to be conducted immediately following the Buoyancy Test, Section 10. With the vault still flooded with water, the tank is to be filled with water. This condition is to be maintained for a period of 24 hours.

11.2 With the vault and tank filled with water as described, there shall be no signs of structural damage to the exterior of the vault, no signs of leakage after a thorough visual inspection of the walls, and no signs of pooling or leakage from the bottom of the vault.

11.3 Following the visual inspection of the vault exterior, the vault and the tank are to be emptied and the vault interior is to be inspected. There shall be no evidence of structural damage to the vault.