# UL 2152

## Outline of Investigation for Special Purpose Nonmetallic Containers and Tanks for Specific Combustible or Noncombustible Liquids

**Issue Number: 1**

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***Summary of Topics***

***This is the First Issue of Subject 2152, Outline of Investigation for Special Purpose Nonmetallic Containers and Tanks for Specific Combustible or Noncombustible Liquids, which is intended to cover a variety of nonmetallic containers and tanks with specialized aboveground use applications with restricted liquids ratings, and other unique features, including:***

Liquid Chemical Containers and Tanks for combustible or noncombustible liquids used in non-residential applications.

Cooking Oil Tanks for fresh and waste oils used in restaurants or similar commercial food preparing applications having engineered transfer systems.

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## INTRODUCTION

### 1 Scope

1.1 These requirements cover special purpose nonmetallic containers and tanks (vessels) for specific aboveground use applications for combustible or non-combustible liquids as indicated for each special purpose type, which are intends to address the specific designs, features, limitations, use factors and other unique characteristics of each type. The basic types of different special purpose vessels covered by this Outline are:

a) Liquid Chemical Containers and Tanks designed for stationary storage of combustible or non-combustible liquids in non-residential applications, and are intended to be used in accordance with NFPA 30, Chapter 9 (Storage of Liquids in Containers – General Requirements), Section 9.4 (Acceptable Containers and Tanks). Liquid chemical tanks are limited to the specific liquid(s) or family of similar liquids and application(s) to which they are rated under the evaluation; and

b) Cooking Oil Tanks designed for storage of cooking oils and fats typically found in restaurant or similar commercial food preparing applications having engineered transfer systems. These tanks are intended for either delivery of fresh oil and/or collection of waste oils by trained persons using service trucks with pressure or vacuum pumps through piping networks. These tanks are limited to Class IIIB oils & fats, and are intended to be installed in cooking oil storage systems used in commercial kitchens, in accordance with NFPA 1, Chapter 66.19.7 or NFPA 30, Chapter 19.7.

1.2 These requirements do not cover nonmetallic cans, containers or tanks for which there are separately published standards, such as:

a) Bulk Shipping Containers intended for commercial transportation applications in accordance with DOT Hazardous Materials Regulations (Title 49 CFR Parts 100-1999), UN Recommendations on Transport of Dangerous Goods (Part 6), or NMFC (Items 256, 258, 294 & 296);

b) Consumer Portable Fuel Cans in accordance with ASTM Standard Specifications for Gasoline (ASTM F852) or Diesel & Kerosene (ASTM F976), and their Spill Resistant Fueling Systems (ASTM F2234);

c) Portable Containers and Tanks in accordance with UL 75;

d) Commercial Safety Cans in accordance with UL 1313; or

e) Oil Burner Tanks in accordance with UL 2258.

1.3 All special purpose vessels are factory manufactured atmospheric types of primary, secondary or diked containment designs, and may be constructed in any shape, size or capacity as allowed for each vessel type. The containment materials are formed from primarily thermoplastic or thermoset polymers with or without integrated metallic components.

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1.4 In addition to basic requirements for the vessel's structural integrity, material compatibility, environmental exposures and fire resistance, optional requirements for accessories covered in this outline that are installed in/on the tank, such as supports, pumps, heaters, gauges, filters, hoses, valves, controls may be included in the evaluation.

1.5 Any accessories or components not evaluated under 1.4 that are shipped with, attached to, or added to the tanks are not included in the scope of the vessel's evaluation. It is intended that the AHJ approve the use and/or installation of any such accessories or components independent of the evaluated tank.

1.6 These requirements do not cover special evaluations for resistance to hurricanes, tornadoes, earthquakes, floods, or other natural disasters; or large scale fire and excessive damage resistance. In addition, assessment of any damage for continued use after such events, are not included in the evaluation.

1.7 Any common fuel, oil and other liquid terms referenced in this Outline are intended to be those which are commercially available, and which meet a recognized industry specification, such as ASTM, SAE or SCE.

## 2 General

### 2.1 Units of measurement

2.1.1 Values stated without parentheses are the requirement. Values within parentheses are considered explanatory or approximate information.

### 2.2 Undated references

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

## 3 Glossary

3.1 For the purpose of this document, the following definitions apply:

3.2 Aboveground Tank – A storage tank that is intended for installation above grade, at grade or below grade without backfill, or in buildings.

3.3 Atmospheric Tank – A storage tank that has been designed to operate at pressures from minus 0.5 psig to 1.0 psig (minus 3.4 kPa to 6.9 kPa) at the top of the tank.

3.4 Diked Containment – A single wall construction with bottom, sides, and an open or closed top intended to provide secondary containment of aboveground tank(s). The dike area is capable of being monitored for leakage, but can't be pressurized.

3.5 Diked Containment Tank (Dike Tank) – A primary containment tank within an open or closed dike intended to provide at least 110 percent spill containment of the primary tank(s). Open top dikes do not have covers to prevent precipitation or debris from entering the dike area. Closed top dikes have covers to resist precipitation or debris from entering the dike area.

3.6 Fuel – A flammable or combustible liquid which is commercially available as an energy source for spark ignition or compression ignition engines, generators, turbines, heaters, or similar equipment; and meet appropriate ASTM Fuel Specifications, such as:

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a) Gasoline – General description of various Flammable Class I petroleum distillates and alcohol blends compliant with ASTM D4814 or ASTM D5798 in a range of E0 to E83 typically used in spark ignition engines.

b) Diesel – General description of various Combustible Class II petroleum distillates and biodiesel blends compliant with ASTM D975 or ASTM D7467 in a range of B0 to B20 typically used in compression ignition engines.

c) Fuel Oil/Heating Oil – General description of various Combustible Class II petroleum distillates and biodiesel compliant with ASTM D396 in a range of B0-B5 typically used in heating equipment.

d) Kerosene – General description of various Combustible Class II petroleum distillates compliant with ASTM D3699 typically used in cooking, heating, lighting or similar equipment.

e) Turbine Oil – General description of various Combustible Class II petroleum distillates compliant with ASTM D2880 typically used in turbine type engines or generators.

3.7 Interstitial Space (Interstice) – A space between the walls of a multiple wall tank that is capable of communicating fluid from a leak in an adjacent wall to a collection point for monitoring.

3.8 Nonmetallic – Synthetically produced organic materials capable of being molded into any form. For the purpose of this Outline, they typically include, but are not limited to, thermoplastics, such as PE, and thermosets, such as FRP.

3.9 Oil – A combustible liquid which is commercially available as a lubricating oil or working fluid for engines, machines, or similar equipment; and meet appropriate SAE or Similar Specifications, such as:

a) Motor Oil or Lube Oil – General description of various Class IIIB petroleum distillate or synthetic type oils with higher viscosity typically used as lubricants in engines or machinery applications.

b) Hydraulic Oil or Transmission Oil – General description of various Class IIIB petroleum distillate or synthetic type lower viscosity oils typically used as working fluids in engine or machinery applications.

c) Unused Oils – General description of Class IIIB motor, lube, hydraulic, transmission or similar oils that have not been transferred to motor vehicles, engines or machinery, and do not adversely affect the tank.

d) Used Oils – General description of Class IIIB motor, lube, hydraulic, transmission or similar oils drained from motor vehicles, engines or machinery after use, that may contain small amounts of contaminants, but do not adversely affect the tank.

e) e) Cooking Oils – General description of Class IIIB fresh or waste liquids extracted from either plants (such as corn, soy, canola, palm, or vegetable oils) and/or animals (such as fats or grease), and used in cooking or food preparation processes.

3.10 Performance Tests – A complete evaluation conducted by a certifier on a limited quantity of representative tanks. These tests are intended to verify compliance with all applicable performance requirements in a standard.

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3.11 Primary Containment – The ability of a tank design and construction to contain a liquid while in normal use (intended storage).

3.12 Primary Containment Tank (Primary Tank) – The wall of a tank construction that provides primary containment.

3.13 Production Tests – A limited evaluation conducted by the manufacturer on each tank prior to shipping. These tests are intended to verify compliance with production requirements in a standard, such as leakage.

3.14 Secondary Containment – The ability of a tank design or construction to contain a liquid only in abnormal use (from primary containment leakage or rupture).

3.15 Secondary Containment Tank (Secondary Tank) – A primary containment tank within a secondary containment shell forming an interstitial space to the greater of 330 degrees or 95 percent fill, and which is capable of being pressurized and monitored for leakage from either the interior or exterior walls.

3.16 Special Purpose Container or Tank – A nonmetallic aboveground container or tank (vessel) covered by the requirements of this Outline, which are intended for specific applications and/or fuels or liquids as indicated by each special purpose type.

a) Liquid Chemical Container or Tank – A special purpose vessel with optional dispensing or collection equipment intended only for storage of only Class II or III combustible liquid chemicals or non-combustible liquid chemicals to which they are evaluated to for specific applications.

b) Cooking Oil Tanks – A special purpose tank for storage of Class IIIB cooking oils and fats typically found in restaurant or similar commercial food preparing applications having engineered transfer systems, and are intended for either delivery of fresh oil or collection of waste oils by trained persons using service trucks with pressure or vacuum pumps through piping networks.

3.17 Storage Container (Container) – A vessel having a liquid capacity that does not exceed 60 gal (230 L), is primarily intended for stationary installation, and is not used for processing.

3.18 Storage Tank (Tank) – A vessel having a liquid capacity that typically exceeds 60 gal (230 L), is primarily intended for stationary installation, and is not used for processing.

3.19 Support – Optional aboveground tank or container load bearing members intended to provide stability and structural support without creating hazardous shell stresses. Typical supports designs include saddles, beams and legs.

3.20 Vent Opening – A tank or container top opening that is intended to provide separate or combined normal venting and/or emergency venting. The vent opening(s) may be either a fitting on the shell or short pipe stub attached to the fitting or shell.

a) Emergency Vent – A vent opening or device that automatically relieves excessive internal pressure due to an external fire exposure or blockage of the normal vent.

b) Normal Vent – A vent opening or device that automatically relieves internal pressure or vacuum during normal storage (atmospheric pressure equalization) and during normal operations (fill or withdraw).

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## CONSTRUCTION

### 4 General Construction of All Special Purpose Containers and Tanks

### 4.1 Containment type, shape, dimensions, capacity and materials

4.1.1 Containers shall be primary types only. Tanks shall be of a primary, secondary or diked containment design, and are permitted to have compartments. Both are permitted to be of any shape and orientation. Any limitations in dimensions and capacity, plus required and optional features are indicated by the specific construction requirements for each special purpose container or tank in Section 5 of this Outline.

4.1.2 For all refillable vessels greater than 5 gal (20 L), the marked nominal capacity of a primary container or tank, or each compartment of a multi-compartment tank, shall be within 95 – 100 percent of the actual maximum capacity. The capacity may be determined by measuring the liquid or calculating the volume. The capacity and other required markings shall comply with Section 12.

4.1.3 All containers and primary tanks shall be formed or molded from only non-metallic materials which comply with the applicable requirements in this Outline of Investigation. If provided, secondary or dike tank walls are permitted to be either metallic or nonmetallic. Tanks of any form shall not have any shell penetrations below the liquid level line except for supply or drain connections.

4.1.4 Secondary tanks shall have containment of at least 300 degrees or 95 percent height of the primary tank, and the interstitial space shall be capable of being pressurized with the use of a common fitting (threaded cap/plug or rubber expansion plug).

4.1.5 Diked tanks shall have containment of at least 110 percent of the primary tank, spill coverage of at least 1 inch beyond the primary tank projected area, and a wall height to at least 1/2 the primary tank height. Dikes may be of the open or closed top design.

4.1.6 The secondary or diked tank wall is permitted to be in direct contact with the primary tank or separated by baffles or supporting members, but shall not restrict required venting or monitoring of the interstitial space as specified for each special container or tank type in Section 5.

4.1.7 All materials shall be evaluated for basic strength of materials, resistance to fire, expected environments and compatibility with rated fluids as identified for each special purpose tank type in the Performance Section.

4.1.8 All material joints (such as welding, fusing, bonding, etc.) and processes (such as extruding, curing, plating, etc.), shall be considered when evaluating the material's properties in 4.1.7.

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## 4.2 Openings and connections

4.2.1 Containers up to 5 gal (20 L) shall only have a top opening with resealable cap and means to provide venting while pouring. All other containers and tanks, or each compartment of a compartment tank shall have at least fill, withdraw and vent openings, but other optional openings may also be provided. All vessel openings shall be made through fittings connected to the shell with minimum or maximum sizes as required for each special purpose type in Section 5.

4.2.2 Fittings for tank top openings and connection to inlet/outlet pipes, or other devices shall be threaded or flanged types, or equivalent liquid tight connections. When permitted by the special purpose tank type, fittings below the normal liquid level shall only be threaded types. All fixed tank connections shall be evaluated for Fitting Torque and Bending per Sections 9.7 and 9.8.

4.2.3 Unless designed for a special connector that is provided with the tank, threaded fittings shall be shall be of NPT, NPTF, BSPT, BSPP, MPSM, or similar common trade types using industry recognized specifications.

4.2.4 All tank openings and open end fittings or connections shall be protected with wooden or plastic plugs, metal covers, or their equivalent, to protect threads and exclude foreign matter while in storage or in transit.

4.2.5 Except if provided with vent and monitor devices, all vent and monitor opening(s), and other openings for a specific purpose that are not provided at the factory shall be marked per 12.2.1 g) or identified in the installation instructions per 13.1.1.

## 4.3 Functional components and accessories

4.3.1 Tanks are not prohibited from using any combination of functional components or accessories provided they are designed to be integral with or assembled to the tank, and evaluated in accordance with the applicable requirements of this Outline of Investigation. Some typical functional components and accessories are identified below.

4.3.2 Thermal insulations shall not interfere with emergency venting or fluid communication of the interstitial space, and shall be subject to applicable Material Compatibility Tests in Section 7 following all applicable performance tests.

4.3.3 Rain covers or monitor caps for outdoor rated tanks shall resist rain and debris from entering the dike or secondary interstitial space, as evaluated per Section 9.10, following all applicable performance tests.

4.3.4 Pumps, if optionally provided to transfer liquids in and out of the tank shall comply with the applicable requirements of UL 124 for hand operated types, UL 79 for battery operated types, or UL 87B for electrically operated types, and shall be rated for the intended liquid(s).

4.3.5 Valves if optionally provided to control liquid flows in and out of the tank shall comply with the applicable requirements of UL 842 or UL 842B and shall be rated for the intended liquid(s). Fill limiting gauges shall comply with the Functional Operation Test per Section 9.11.

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4.3.6 Gauges if optionally provided to indicate liquid levels in the tank shall comply with the applicable requirements of UL 180, and shall be rated for the intended liquid(s).

4.3.7 Tank accessories if optionally provided for e-venting, n-venting, or spill containment shall comply with the applicable requirements of UL 2583, and shall be rated for the intended liquid(s).

4.3.8 Internal heaters if optionally provided for cooking oil tanks shall comply with the applicable requirements of UL 499, have a maximum set temperature limit of 140°F (60°C) and an over temperature limit.

## 5 Specific Construction of Special Purpose Containers and Tanks

### 5.1 Liquid chemical containers and tanks

5.1.1 Liquid chemical vessels shall be designed for storage of the specific combustible or noncombustible liquid(s) in their intended non-residential application(s) identified in NFPA 30, Chapter 9. This shall include, but are not limited to fire resistance, chemical resistance, temperature range, use locations, and methods of fluid transfer in/out of the vessels. The designs shall have specific construction features below, and shall be evaluated to the applicable Performance Tests in this Outline.

5.1.2 Liquid chemical containers and tank construction parameters and limitations identified in NFPA 30, Section 9.4, Acceptable Containers and Tanks shall be as follows:

a) Class II and IIIA Liquid Containers – NFPA 30, Section 9.4.1 (4) designs compliant with either US DOT Hazardous Materials Regulation Title 49 CFR Parts 100-199, or UN Recommendations on the Transport of Dangerous Goods Part 6, and in compliance with NFPA 30, Table 9.4.3.

b) Class II and IIIA Liquid Tanks – NFPA 30 Section 9.4.1 (6) designs compliant with either US DOT Hazardous Materials Regulation Title 49 CFR Parts 100-199, or UN Recommendations on Transport of Dangerous Goods Part 6 Classes 31H1, 31H2 & 31 HZ1, and in compliance with NFPA 30, Table 9.4.3.

c) Class IIIB Liquid Vessels – Any design types per items a) or b) above. Or other primary, secondary or diked design types up to 660 gal (2,500 L) meeting all appropriate Performance requirements of this outline.

d) Non-Combustible Liquid Vessels – Any design types per items a) or b) above. Or other primary, secondary or diked design types up to 1,320 gal (5,000 L) meeting all appropriate Performance requirements of this outline.

e) Liquid Rating(s) – Liquid ratings shall cover either specific liquids or families of liquids with similar chemical composition, properties and compatibility characteristics as evaluated in this outline, and in the same Liquid Class (per NFPA 30, Section 4.3).

f) Temperature Rating – Periodic maximum expected temperatures of storage in general non-residential applications are 120 °F (49 °C) except if specially evaluated for wider ranges.

g) Use Locations and Fire Protection – Options for indoor only or indoor/outdoor ratings, with no expectation of sprinkler protection except Class II and IIIA types per items a)or b) above.

h) Miscellaneous – Options for vessel stacking is permitted. Options for connection to pressure or vacuum pumps is permitted.

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