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UL 2583

Outline of Investigation for Fuel Tank Accessories

Issue No: 4
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Summary of Topics:
This new issue of UL 2583 is being published to:
1. Add corrections, clarifications and general editorial revisions.
2. Add requirements for electrical type Overfill Protection Devices under Part II Liquid Control Products.
3. Add requirements for Portable/Mobile Tank Spill Prevention Devices under Part V Miscellaneous Products
4. Add gravity flow only rated options, revise test methods to permit evaluation at the manufacturers rated flow & pressure, and clarify high capacity & shutoff levels for Overfill Protection Devices.
5. Add mechanical & electrical Liquid Level Gauges (LLGs) with options for overfill protection.

This ***outline is based on a combination of existing requirements, internal guidelines and parallel Standards. The requirements are intended to reflect general updates in design and technology, regulatory compliance, industry needs, and also to address scope of use, biofuels, compatibility and functional safety issues with respect to generally expected assembly, use and environmental conditions over the product lifetime.***

These requirements are not intended to specifically address each and every stakeholder's needs or concerns, and every conceivable operating condition or weather extreme. As with all standards, the requirements reflect a minimum level of safety, are not warranties or guarantees, and rely upon external stakeholders to ensure proper installation, use, and periodic inspection with maintenance or replacement as appropriate for continued safety.

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INTRODUCTION

1 Scope

1.1 These requirements cover mechanical type accessories that are typically intended for attachment to storage tanks or connecting pipe in commercial (public) or private (fleet) automotive fueling station and similar storage or dispensing applications, and are designed to provide automatic safety or operational functions.

1.2 These products may be used with underground or aboveground tank systems and with liquid and/or vapor phases of the fuels and similar fuels or liquids covered by each Part of this Outline as identified below:

1.3 Part I Vapor Control Products - Functional devices and accessories intended for connection to tank top openings (directly on fittings or indirectly on pipe) and perform safety or operational functions in vapor spaces, such as emergency vents, normal vents, adapters and caps.

1.4 Part II Liquid Control Products - Functional devices and accessories intended for connection to tank top openings (directly on fittings or indirectly on pipe) and perform safety or operational functions in liquid spaces, such as spill containment devices, overfill prevention devices, flow restriction devices, and liquid level gauges.

1.5 Part III Structural and Containment Products (reserved for future use) - Metallic components such as access devices, manways, supports, and dikes.

1.6 Part IV Corrosion Protection Products (reserved for future use) - Nonmetallic components such as tank anchors, dielectric bushings, anode packs, coatings and resins.

1.7 Part V Miscellaneous Products Miscellaneous products such as portable/mobile tank spill prevention devices, lift lugs, striker plates and monitor well caps.

1.8 These products are intended for use with storage tanks or fueling systems containing automotive fuels and similar fuels or liquids under the expected use conditions and exposures that have similar chemical, physical and material compatibility properties as represented in these requirements. The use fuels are intended to be formulated in accordance with 40 CFR Part 80 “Regulation of Fuels and Fuel Additives” and meet the following ASTM Fuel Specifications and blend limitations:

a) ASTM D975, Standard Specification for Diesel Fuel Oils, with biodiesel blends up to a maximum of 5 percent (B5);
b) ASTM D7467, Standard Specification for Low Blend Biodiesel, with biodiesel blends between 6 to 20 percent (B6 to B20);
c) ASTM D4814, Standard Specification for Automotive Spark-Ignition Engine Fuel, gasoline or oxygenated gasoline, with limited ethanol blends up to a maximum of 10 percent (E10);
d) ASTM D5798, Standard Specification for Fuel Ethanol Blends for Automotive Spark-Ignition Engines, with high gasoline/ethanol blends in the (E51 - E83) range; and
e) Mid Range Ethanol Blends (E11 to E50) using variable mixtures of ASTM D4814, Low Blend Ethanol and ASTM D5798, High Blend Ethanol.
f) Isobutanol Fuel Blends (max iBu16) using variable mixtures of ASTM D4814 Gasoline (E0)_and ASTM D7862 Butanol (2-methyl-1-propanol isomer).

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1.9 Products covered by this Outline are intended to be installed and used in accordance with one or more of the following:

a) NFPA 30, Flammable and Combustible Liquids Code;
b) NFPA 30A, Code for Motor Fuel Dispensing Facilities and Garages;
c) NFPA 1, Uniform Fire Code;
d) International Fire Code published by the International Fire Council; or
e) Other Applicable Federal and State regulations for the specific product or application it is being utilized in, such as DOT for portable/mobile tanks.

1.10 These products are factory manufactured and intended for in-shop or on-site assembly, inspection and testing for the specified application and use conditions by qualified persons in accordance with the manufacturer's instructions and local requirements. If provided, electrical devices & components are additionally evaluated for use in hazardous locations.

1.11 These products are intended to be periodically inspected and maintained for continued service, or taken out of service if necessary, by qualified persons in accordance with industry recommended practices and/or the manufacturer's instructions.

1.12 These products have not been evaluated for use after natural disasters, fires or exposures to chemicals not representative of the test liquids/vapors or excessive physical damage beyond the expected assembly, installation and uses as identified in these requirements.

1.13 These products have not been evaluated for special applications where exposed to heavy or continuous physical abuses, excessive mechanical stresses; or environments that operate outside of the expected atmospheric conditions and ambient use temperature range.

1.14 E-vent and P/V-vent requirements do not cover flame arrester features or evaluations, which are found in the Standard for Flame Arresters, UL 525, but may optionally be evaluated to EPA 40 CFR Part 63 Subpart CCCCCC, CARB (CP-201) or other air quality regulations at the request of the manufacturer.

1.15 Flow Restrictors and Overfill Preventers do not cover any general purpose manual or automatic safety valves, which are found in UL 842, UL 842A and UL 842B, or combustible liquid only devices, which are found in UL 180.

1.16 Spill Containers do not cover long term fuel exposures or use as a tank sump, which are found in UL 2447.

1.17 Communication requirements, such as EMC, EMI & FCC for wired or wireless options are not covered under this Standard.

2 Units of Measurement

2.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

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3 Undated References

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.

4 Glossary

4.1 For the purpose of this outline, the following definitions apply.

4.2 ADAPTER (ATG, Fill and/or Vapor Types) - Devices designed to connect tank fittings or pipe to normal vents and fill or vapor hose, or monitoring equipment. Adapters are intended for installation on aboveground or underground tanks, or connecting pipe above the normal liquid level. Adapters may have lock, swivel and/or self-seal features, and may be separate from, or attached to other devices.

4.3 CAP (Adapter or Tank Types) - Devices designed to prevent water or debris from entering adapter, tank or pipe openings, but are intended for periodic removal to facilitate fill, vent or monitoring operations. Caps may also have locking features and/or allow passage of low voltage monitor or sensor wiring, and may be separate from, or attached to other devices above the normal liquid level.

4.4 EMERGENCY VENT (aka E-Vent) - Normally closed device designed to automatically relieve excessive internal tank pressures of primary compartments or interstitial spaces during a fire exposure. Emergency vents are intended for installation above the normal liquid level on aboveground tanks, on short lengths of connecting vent pipe, or on extended pipe systems where remote venting is required.

4.5 FLOW RATING - The volume/time value for normal or emergency vents measured under steady flow conditions at a specific pressure or vacuum for marked rating purposes.

4.6 FLOW RESTRICTION DEVICES (aka Flow Restrictors or FRDs) - A device installed in a tank's vent opening (typically assembled to the vent fitting & vent pipe) that significantly reduces the potential for overfilling the tank either above the rated liquid level, or beyond the primary containment capacity. FRDs are typically mechanical captured ball float types which partially or fully block liquid exiting from the vent pipe, but may not immediately indicate overfill conditions to the operator. FRD's are typically limited to gravity fill methods.

4.7 FUELS - Typically those liquids identified in 40 CFR Part 80 “Regulation of Fuels and Fuel Additives” and compliant with only the ASTM Fuel Specification below that are dispensed in commercial or fleet motor vehicle fueling stations for used in automotive engines (internal combustion or compression ignition):

a) ASTM D4814, Standard Specification for Automotive Spark-Ignition Engine Fuel: AKA gasoline, gasohol, oxygenated gas, or low blend ethanol (max E10);

b) ASTM D5798, Standard Specification for Fuel Ethanol Blends for Automotive Spark-Ignition Engines: AKA high blend ethanol or (E51 - E83);

c) ASTM D975, Standard Specification for Diesel Fuel Oils: AKA on- road diesel, or low blend biodiesel (max B5);

d) ASTM D7467, Standard Specification for Low Blend Biodiesel AKA mid blend biodiesel (B6 - B20);

e) Mid Range Ethanol Blends (E11 - E50) using variable mixtures of ASTM D4814 Low Blend Ethanol and ASTM D5798 High Blend Ethanol.

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f) Isobutanol Fuel Blends (max iBu16) using variable mixtures of ASTM D4814 Gasoline (E0)_and ASTM D7862 Butanol (2-methyl-1-propanol isomer).

4.8 Liquid Level Gauge (aka Level Gauge or LLG) – A device that accurately detects, measures and displays the liquid level(s) in a storage tank, primarily fuel, and optionally identifies water bottoms. These devices may be mechanical, electrical, or a combination thereof, typically consisting of a level sensor and direct or indirect display and optional audible and/or visual indicator.

4.9 NORMAL VENT (aka Pressure/Vacuum Vent or P/V Vent) - Normally closed device designed to automatically equalize tank pressure or vacuum in primary compartments or interstitial spaces due to atmospheric changes or fill and withdraw operations. Normal vents are intended for installation above the normal liquid level on aboveground or underground tanks, or on short lengths of connecting vent pipe, or on extended piping systems where remote venting is required.

4.10 OVERFILL PREVENTION DEVICES (aka Overfill Preventers or OPDs) - A device installed in a tank's fill opening (typically assembled to the fill adapter & drop tube) that significantly reduces the potential for overfilling the tank either above the rated liquid level, or beyond the primary containment capacity. Mechanical OPDs are typically float arm types connected to a closing valve that indicate overfill conditions to the operator, and may be designed for gravity fill, pressure fill or both types. Electrical OPDs are typically magnetic or ultrasonic type sensors wired to a remote control panel that supplies power and analyzes data to signal the operator when near an overfill condition, and may have audible and/or visual signals.

4.11 Portable/Mobile Tank Spill Prevention Device (aka PTSPD) – A device intended for field installation into the fill opening of a portable/mobile tank to prevent or significantly reduce leakage out of the opening during on/off road transport on vehicles (such as pick-up trucks) over rough terrain.

4.12 RELIEF PRESSURE or RELIEF PRESSURE/VACUUM (aka Crack Pressure, Operational Relief or Emergency Relief) - The pressure or vacuum at which a normal or emergency vent begins to open and operate under low flow conditions.

4.13 SPILL CONTAINMENT DEVICES (aka Spill Containers or SCDs) - A liquid tight, weather resistant container designed to temporarily collect and retain small fuel spills that can occur during tank filling processes. SCDs are also provided with means for evacuation to an appropriate container, and may either be integral to the tank around the fill opening (spin-on or weld-on type spill containers) or remote fill stations connected to the tank with piping (side mounted or stand alone type fill boxes).

CONSTRUCTION

5 General Construction - All Tank Accessories

5.1 Tank accessories shall be designed and constructed to resist damage and/or malfunction from expected assembly, installation, environmental and other use conditions for their intended application(s) in accordance with the applicable performance tests described in this Outline.

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5.2 Tank accessories are permitted to be constructed from any combination of materials, and shall be capable of assembly, installation and inspection by qualified persons. Wires connecting device components, such as sensors and panels, shall be rated for the intended location and use.

5.3 Tank accessories provided with threaded connections shall be of NPT, NPTF, BSPT, BSPP, MPSM, or similar types using industry recognized specifications, or if a proprietary type, both ends shall be supplied by the manufacturer.

5.4 See Part I for specific Vapor Control Product requirements.

5.5 See Part II for specific Liquid Control Product requirements.

5.6 See Part III Structural and Containment Products (reserved for future use)

5.7 See Part IV Corrosion Protection Products (reserved for future use)

5.8 See Part V Miscellaneous Products

PERFORMANCE

6 General Performance - All Tank Accessories

6.1 Representative production samples of each tank accessory or component shall be subjected to the appropriate Performance Tests in the applicable Test Matrix Table for Part I or Part II products, with sample variations of product type, design, material and size as specified in each test method.

6.2 Representative samples for Performance Tests are defined as either:
a) "ALL" = all nominal or trade sizes within a manufacturer's product range for each design series;
b) "WC" = worst case size, thickness, materials or other variations in a design series; or
c) As otherwise indicated in a specific test.

When determining a WC sample, the test objectives, parameters (fuels, fluids, temps...), pass/fail criteria and other sequential tests using the same sample shall be considered in addition to construction variations in a design series.

6.3 Assembly of tank accessory samples and connection to intended pipe, hose or fittings shall be done in accordance with the manufacturer's instructions (such as thread torque or other critical assembly parameters) using manufacturer-supplied components (such as gaskets).

6.4 Damage of any critical product or component after testing (if required for assessment of function, selecting WC samples, or instruction information), shall be determined by visual examination without magnification. The following items are examples of non-compliant results; however, final determination of damage characteristics and results shall consider manufacturer input before testing or be qualified by a specific test pass/fail criteria:

a) Inability of functional parts to operate as intended from either mechanical damage or exposure incompatibility, (such as bent or corroded springs, or torn or distorted seals);

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b) Cracking, splitting, or permanent distortion of structural or protective components (such as bodies or enclosures), and dislodging or puncture of screens or caps;
c) Other damage that would result in a reduction of safety the product is intended to perform.

Exception No. 1: If the damage is obviously visible during initial installation, and it is indicated in the instructions per 21.2 d) that products with this specific damage should not be placed into service, then it is acceptable.

Exception No. 2: If protective packaging is used to prevent damage during storage and transit, and markings per 20.1 g) indicating it should not be removed prior to installation, the drop test may be conducted with the packaging in place.

6.5 Unless otherwise indicated in a specific test method, all tests shall be conducted with working fluids (air, water, etc.) at 21 ±6°C (70 ±10°F) or at normal ambient room temperatures between 18°C and 29°C (65°F and 85°F) and 50 percent (± 20 percent) RH. All pressures shall be measured with respect to gauge (psig).

6.6 Unless otherwise indicated in a specific test method, hydrostatic tests shall be conducted with water (or similar liquids) and pneumatic tests shall be conducted with air (or similar gasses). In either case, precautions shall be used to prevent personal injury at high pressures.

PART I - VAPOR CONTROL PRODUCTS

7 General Construction

7.1 Emergency vents shall be designed to meet the following construction criteria:
a) Not exceed a 2.0 inch to 12.0 inch nominal pipe size range;
b) Be normally closed;
c) Resist entry of water; and
d) Provide initial emergency relief within a 0.5 psig to 1.0 psig pressure range, or if below 0.5 psig, identify the relief pressure is below 0.5 psi per 20.1 c).

7.2 Normal vents shall be designed to meet the following construction criteria:
a) Not exceed a min 2.0 inch to 6.0 inch nominal pipe size range;
b) Be normally closed;
c) Resist entry of water; and
d) Provide initial operational relief within a 0 to 1.0 psig pressure to 0 to 0.5 psig vacuum range.

7.3 Fill and vapor adapters shall be designed to meet the following construction criteria:
a) Not exceed a 2.0 inch to 4.0 inch nominal pipe size range;
b) Provide leak tight connections to couple with typical delivery hose;
c) Withstand typical delivery truck operating pump and vacuum pressures; and
d) For UST Types - Meet CARB CP-201 Fig 3A (Fill) or Fig 3B (Vapor) dimensional specifications.

7.4 Adapter Caps shall be designed to meet the following construction criteria:
a) Be readily removable during delivery operations;
b) Protect adapter hose connections from physical damage; and

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