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SUBJECT 2583

OUTLINE OF INVESTIGATION
FOR
FUEL TANK ACCESSORIES

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Summary of Topics:

This First Issue of Subject 2583, Outline of Investigation for Fuel Tank Accessories, covers requirements for mechanical type accessories that are typically intended for attachment to fuel storage tanks or their connecting pipes in fueling system applications.

Part I – Vapor Control Products covers functional devices normally installed in the vapor phase, such as emergency vents, normal vents, fill and vapor adapters, and various caps. Other tank accessories will be added in the future under subsequent Parts.

The initial draft is based on a combination of existing requirements, internal guidelines and parallel Standards. The proposed 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 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 covered by each Part of this Outline as identified below:

1.2.1 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, such as emergency vents, normal vents, adapters and caps.

1.2.2 Part II Liquid Control Products (reserved for future use) – Liquid control products such as overfill containment devices, overfill prevention devices, and flow restrictors.

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

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

1.2.5 Part V Miscellaneous Products (reserved for future use) – Miscellaneous products such as lift lugs, striker plates and monitor well caps.

1.3 These products are intended for use with storage tanks or fueling systems containing automotive fuels 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 (Ed75 – Ed85) for Automotive Spark-Ignition Engines, high blend ethanol, with gasoline/ethanol mixtures in the nominal E85 range (E70 – E90); and
- e) Mid Range Ethanol Blends (E11 to E69) using variable mixtures of ASTM D4814, Low Blend Ethanol and ASTM D5798, High Blend Ethanol.

1.4 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.

1.5 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.

1.6 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.

1.7 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.

1.8 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.

1.9 These requirements 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.

1.10 These requirements do not cover flame arrester features or evaluations, which are found in the Standard for Flame Arresters, UL 525.

2 Units of Measurement

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

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 **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.

4.3 **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.

4.4 **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.

4.5 **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.

4.6 **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 (Ed75 – Ed85) for Automotive Spark-Ignition Engines: AKA high blend ethanol or E85 (E70 - E90);
- 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 to E69) using variable mixtures of ASTM D4814 Low Blend Ethanol and ASTM D5798 High Blend Ethanol.

4.7 RELIEF PRESSURE (aka Crack Pressure) – The initial pressure or vacuum at which a valve seat opens to allow fluid to flow through the device.

4.8 FLOW RATING – The volume/time value measured under steady state conditions at a specific pressure or vacuum for marked rating purposes.

CONSTRUCTION

5 General Construction – Part I Vapor Control Products

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.

5.1.1 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.

5.1.2 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 plus 1.0 psig pressure to minus 0.5 psig vacuum range.

5.1.3 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.

5.1.4 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
- c) Protect adapter openings against entry of water and debris.

5.1.5 Tank Caps shall be designed to meet the following construction criteria:

- a) Be readily removable during inspection operations;
- b) Protect monitor/sensor wiring (if included) from pullout; and
- c) Protect tank openings against entry of water and debris.

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.

5.3 Tank accessories provided with threaded connections shall be of NPT, NPTF, BSPT, BSPP, MPSM, or similar types using industry recognized specifications.

PERFORMANCE

6 General Performance – Part I Vapor Control Products

6.1 General test matrix

6.1.1 Representative production samples of each tank accessory or component shall be subjected to the appropriate Performance Tests in Table 6.1, with sample variations of product type, design, material and size as specified in each test method.

Table 6.1
Vapor Control Products Test Matrix

Performance Tests	E-Vents	N-Vents	Adapters/Caps
Functional Tests	6.2.1	6.3.1	6.4.1
E-Vent Relief and Flow	7.1	–	–
N-Vent Relief and Flow ^b	–	7.2	–
Leakage and Hydrostatic	–	–	7.3
Abuse/Assembly Tests	6.2.2	6.3.2	6.4.2
Drop	8.1	8.1	8.1
Assembly	8.2	8.2	8.2
Impact	8.3	8.3	8.3
Repeat Function	8.4 ^c	8.4 ^c	8.4 ^c
Exposure/Compatibility Tests	6.2.3	6.3.3	6.4.3
Air Aging	9.1 ^a	9.1 ^a	9.1 ^a
UV Light	9.2 ^a	9.2 ^a	9.2 ^a
Salt Fog	9.3 ^a	9.3 ^a	9.3 ^a
Fuel Exposure (Vapor)	9.4 ^a	9.4 ^a	9.4 ^a

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Table 6.1 Continued

Performance Tests	E-Vents	N-Vents	Adapters/Caps
Repeat Function	9.5 ^c	9.5 ^c	9.5 ^c
Special Tests	6.2.4	6.3.4	6.4.4
Rain	10.1	10.1	—
Icing	10.2	10.2	—
Fire	10.3	—	—
Leak Rate ^b	—	10.4 ^b	—
Cycling	—	10.5	10.5
Repeat Function	10.6 ^c	10.6 ^c	10.6 ^c
Metal Stress Crack	10.7 ^a	10.7 ^a	10.7 ^a
Plastic Stress Crack	10.8 ^a	10.8 ^a	10.8 ^a
a – dependent upon material(s)			
b – optional testing to air quality regulations			
c – dependent upon sample condition and test results			

6.1.2 Representative samples for the 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.

6.1.3 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).

6.1.4 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);
- 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.