



Member of the FM Global Group

**Approval Standard
for
Safety Containers and Filling,
Supply and Disposal
Containers for Ignitable
(Flammable) Liquids**

Class Number 6051-6052

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Foreword

The FM Approvals certification mark is intended to verify that the products and services described will meet FM Approvals' stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of Approval Standards is to present the criteria for FM Approval of various types of products and services, as guidance for FM Approvals personnel, manufacturers, users and authorities having jurisdiction.

Products submitted for certification by FM Approvals shall demonstrate that they meet the intent of the Approval Standard, and that quality control in manufacturing shall ensure a consistently uniform and reliable product. Approval Standards strive to be performance-oriented. They are intended to facilitate technological development.

For examining equipment, materials and services, Approval Standards:

- a) must be useful to the ends of property conservation by preventing, limiting or not causing damage under the conditions stated by the Approval listing; and
- b) must be readily identifiable.

Continuance of Approval and listing depends on compliance with the Approval Agreement, satisfactory performance in the field, on successful re-examinations of equipment, materials, and services as appropriate, and on periodic follow-up audits of the manufacturing facility.

FM Approvals LLC reserves the right in its sole judgment to change or revise its standards, criteria, methods, or procedures.

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1 INTRODUCTION

1.1 Purpose

- 1.1.1 This standard states Approval requirements for safety containers and filling, supply or disposal containers for ignitable liquids. These containers have openings equipped with tightly fitting caps, or valves that remain closed unless held open for filling or discharging ignitable liquids.
- 1.1.2 Approval criteria may include, but not limited to, performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a follow-up program.

1.2 Scope

- 1.2.1 This standard applies to safety containers and filling, supply and disposal containers for ignitable liquids.

1.3 Basis for Requirements

- 1.3.1 The requirements of this standard are based on experience, research and testing, and/or the standards of other organizations. The advice of manufacturers, users, and loss control specialists was also considered.
- 1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of safety containers and filling, supply or disposal containers for ignitable liquids for the purpose of obtaining Approval. Safety containers and filling, supply or disposal containers for ignitable liquids having characteristics not anticipated by this standard may be FM Approved if performance equal, or superior, to that required by this standard is demonstrated, or if the intent of the standard is met. Alternatively, safety containers and filling, supply or disposal containers for ignitable liquids which meet all of the requirements identified in this standard may not be FM Approved if other conditions which adversely affect performance exist or if the intent of this standard is not met.

1.4 Basis for Approval

Approval is based upon satisfactory evaluation of the product and the manufacturer in the following major areas:

- 1.4.1 Examination and tests on production samples shall be performed to evaluate:
- the suitability of the product for its intended end use
 - the performance of the product as specified by the manufacturer and required by FM Approvals; and as far as practical,
 - the durability and reliability of the product.
- 1.4.2 An examination of the manufacturing facilities and audit of quality control procedures are made to evaluate the manufacturer's ability to consistently produce the product which is examined and tested, and the marking procedures used to identify the product. These examinations may be repeated as part of FM Approvals' product follow-up program.

1.5 Basis for Continued Approval

Continued Approval is based upon:

- production or availability of the product as currently FM Approved;
- the continued use of acceptable quality assurance procedures;
- satisfactory field experience;
- compliance with the terms stipulated in the FM Approval report and Master Agreement;
- satisfactory re-examination of production samples for continued conformity to requirements; and
- satisfactory audits as least annually as part of FM Approvals Surveillance Audit Program.

Also, as a condition of retaining Approval, manufacturers may not change a product or service without prior authorization by FM Approvals.

1.6 Effective Date

The effective date of an Approval standard mandates that all products tested for Approval after the effective date shall satisfy the requirements of that standard. Products FM Approved under a previous edition shall comply with the new version by the effective date or else forfeit Approval.

The effective date of this standard is June 30, 2017 for compliance with all requirements.

1.7 System of Units

Units of measurement used in this Standard are United States (U.S.) customary units. These are followed by their arithmetic equivalents in International System (SI) units, enclosed in parentheses. The first value stated shall be regarded as the requirement. The converted equivalent value may be approximate. Appendix A lists the selected units and conversions to SI units for measures appearing in this standard.

1.8 Applicable Documents

The following standards, test methods, and practices are referenced in this standard:

Test Procedure, *Stability for Safety Containers and Filling, Supply and Disposal Containers*

Test Procedure, *Leakage of Safety Containers and Filling, Supply and Disposal Containers.*

Test Procedure, *Strength of Pouring Spout and Handle of Safety Containers and Filling, Supply and Disposal Containers.*

Test Procedure, *Test Method of Fire Exposure for Safety Containers and Filling, Supply and Disposal Containers*

Test Procedure, *Test Method for Flame Arrester Components.*

Test Procedure, *Test Method of Abuse for Safety Containers and Filling, Supply and Disposal Containers*

Test Procedure, *Test Method of Weight Loss for Safety Containers and Filling, Supply and Disposal Containers.*

Test Procedure, *Test Method of Mechanical Strength for Safety Containers and Filling, Supply and Disposal Containers.*

1.9 Definitions

For purposes of this standard, the following terms apply:

Safety Container– A container for the safe handling and storage of ignitable liquids.

Filling Container – A container for the safe handling while dispensing ignitable liquids through a rigid and flexible spout.

Supply Container – A container for the safe handling and transfer of gasoline and other ignitable liquids.

Disposal Container – A container to provide an intermediate station for temporary storage of liquid wastes.

Flame Arrester - a device which prevents a flame from progressing through an ignitable gas/air mixture. The flame is quenched on the surfaces of a series of heat sinks through which the flame must pass. The emerging gases are sufficiently cooled to prevent re-ignition.

Viscosity –The resistance of a fluid to shear motion

2 GENERAL INFORMATION

2.1 Product Information

Safety containers, filling, supply and disposal containers are supplied completely assembled and in various capacities. The containers may be fabricated from steel with steel components or from high density Polyethylene plastic using stainless steel components. The containers may be supplied in various colors indicating what type of fluid media is being stored in that specific container. Other designs meeting the criteria of this standard may also be considered for Approval.

2.2 Approval Application Requirements

To apply for an Approval examination the manufacturer, or its authorized representative, should submit a request to information@fmapprovals.com.

The manufacturer shall provide the following preliminary information with any request for Approval consideration:

- a complete list of all models, types, sizes, and options for the products or services being submitted for Approval consideration;
- general assembly drawings, complete set of manufacturing drawings, materials list, anticipated marking format, nameplate format, brochures, sales literature, spec. sheets, installation, operation and maintenance procedures.
- the number and location of manufacturing facilities.

All documents shall identify the manufacturer's name, document number or other form of reference, title, date of last revision, and revision level. All documents shall be provided with English translation.

2.3 Requirements for Samples for Examination

2.3.1 Following authorization of an Approval examination, the manufacturer shall submit samples for examination and testing based on the following:

- Sample requirements to be determined by FM Approvals following review of the preliminary information.

2.3.2 Requirements for samples may vary depending on design features, results of prior or similar testing, and results of any foregoing tests.

2.3.3 The manufacturer shall submit samples representative of production. Any decision to use data generated using prototypes is at the discretion of FM Approvals.

2.3.4 It is the manufacturer's responsibility to provide any necessary test fixtures, such as those which may be required to evaluate the safety containers and filling, supply or disposal containers for ignitable liquids.

3 GENERAL REQUIREMENTS

3.1 Review of Documentation

During the initial investigation and prior to physical testing, the manufacturer's specifications and details shall be reviewed to assess the ease and practicality of installation and use. The Approval investigation shall define the limits of the Approval.

3.2 Physical features

3.2.1 Test Sample Production

All products submitted for testing shall be representative of production material. The need to monitor the manufacture of the test specimen shall be at the sole discretion of FM Approvals.

3.2.2 Container Capacity

A container shall not exceed 5 gal (18.9 L) capacity. Allowance shall be made for expansion of the liquid within the container due to normal usage.

3.2.3 Materials

The container shall be constructed of materials free of defects that would impair safety and serviceability over a temperature range of -40°F (-40°C) to 130°F (54°C). All materials shall be compatible with the liquids to be contained.

3.2.4 Flame Arrester

All openings in containers used for handling non-viscous liquids shall be protected by a securely installed flame arrester. It shall cause no undue restriction to the flow of liquid either into or out of the container.

3.2.5 Openings

A minimum number of openings shall be provided for each specific use and each opening shall be protected by a spring-loaded, automatic closing device. A single opening may be provided for filling and pouring.

3.2.6 Vacuum Venting

A vacuum breaking vent shall be provided where venting is not provided at the pour opening during withdrawal of liquid. The arrangement to serve this purpose shall effectively prevent flashback into the container.

3.2.7 Pressure Venting

A relief vent shall limit the internal container pressure when subjected to an exposure fire. It may be incorporated as part of the spring-loaded, automatic closure on the pouring or filling spout. The vent's opening point shall not be more than 5 psi (34 kPa) nor less than 3 psi (21 kPa).

3.2.8 Nozzle

The container may be integrally equipped with a flexible nozzle. The nozzle shall not leak at any joint when filled with heptane and flexed through its normal range without forcing. No sharp edges shall be exposed with the nozzle attached or separated from the container. If a nonmetallic nozzle is provided, it shall be electrically conductive and made to prevent kinking.

3.2.9 Handle

A substantial handle shall be provided for carrying the container and holding it while dispensing the contained liquid.

3.2.10 Seams

Seam(s) and joints of a metal container shall be lock-seamed, soft/hard soldered, brazed or welded; other joint construction shall be the subject of a special investigation.

3.2.11 Bottom

For metal containers, the bottom of the container shall be recessed and reinforced at the perimeter of the base.

3.3 Markings

3.3.1 Marking on the product or, if not possible due to size, on its packaging or label accompanying the product, shall include the following information:

- name and address of the manufacturer or marking traceable to the manufacturer;
- date of manufacture or code traceable to date of manufacture or lot identification;
- model number, size, rating, capacity, color, etc., as appropriate.

When hazard warnings are needed, the markings should be universally recognizable.

- 3.3.2 The model or type identification shall correspond with the manufacturer's catalog designation and shall uniquely identify the product as FM Approved. The manufacturer shall not place this model or type identification on any other product unless covered by a separate agreement.
- 3.3.3 The Approval Mark shall be displayed visibly and permanently on the product and/or packaging as appropriate and in accordance with the FM Approvals Certification Mark Usage Guidelines. The manufacturer shall not use this Mark on any other product unless such product is covered by a separate report.
- 3.3.4 All markings shall be legible and durable.

3.4 Manufacturer's Installation and Operation Instructions

The manufacturer shall provide the user with

- instructions for the usage, maintenance, and operation of the product;
- facilities for repair of the product and supply replacement parts; and
- services to ensure proper installation, inspection, or maintenance for products of such nature that it would not be reasonable to expect the average user to be able to provide such installation, inspection, or maintenance.
- Information regarding container material and ignitable liquid compatibility.

3.5 Calibration

All examinations and tests performed in evaluation to this standard shall use calibrated measuring instruments traceable and certified to acceptable national standards.

4 PERFORMANCE REQUIREMENTS

4.1 Stability Test

4.1.1 Requirement

The container will be filled to its rated capacity, tipped to an angle of 30° from horizontal and released.

4.1.2 Test/Verification

The container will return to its normal upright position and no spillage shall occur. Testing for stability resistance shall be in accordance with *Test Method for Stability of Safety Containers and Filling, Supply and Disposal Containers*, FM Approvals, LLC.

4.2 Leakage Test

4.2.1 Requirements

- A. Any valve shall not leak more than four (4) drops per minute when the container is filled with heptane and inverted for 10 minutes.
- B. All containers shall be subjected to a body/joint air pressure test at 10 psi (69 kPa) while under water and with all tank openings sealed.

4.2.2 Test/Verification

- A. The valves shall be able to comply with this test after 5,000 normal opening/closing operations. Testing for leakage shall be in accordance with *Test Method for Leakage of Safety Containers and Filling, Supply and Disposal Containers*, FM Approvals, LLC.
- B. No leakage of air shall occur at any point of the body, or at the seam(s) or joint(s). Testing for leakage shall be in accordance with *Test Method for Leakage of Safety Containers and Filling, Supply and Disposal Containers*, FM Approvals, LLC.

4.3 Strength of Pouring Spout and Handle Test

Pouring spout

4.3.1 Requirement

A concentrated test load, specified below in Table I, will be applied externally against the pour spout wall ¼ in. (6.3 mm) below the opening on the side opposite the valve opening linkage and perpendicular to the vertical axis of the container body. The spout shall comply with the leakage limits permitted under tightness of valve, under the leakage test outlined in 4.2.1

4.3.2 Test/Verification

The pouring spout shall remain in tack and comply with the leakage limits permitted under tightness of valve, under the leakage test outlined in section 4.2.1. Testing for pour spout shall be in accordance with *Test Method for Strength of Pour Spout and Handle for Safety Containers and Filling, Supply and Disposal Containers*, FM Approvals, LLC.

Handle

4.3.3 Requirement

The carrying handle shall withstand a test load, as specified in Table I, exerting a pull from the center of the normal carrying grip and parallel to the vertical axis of the container. All valves shall be tight and no leakage is permissible in the seams and joints of the container during and at the conclusion of this test. Testing for Strength of Pouring Spout and Handle shall be in accordance with Test method for *Strength of Pouring Spout and Handle of Safety Containers and Filling, Supply and Disposal Containers*, FM Approvals, LLC.

4.3.4 Test/Verification

The handle area shall show no signs of breakage or dis-engagement from the containers body. All valves shall be tight and no leakage is permissible in the seams and joints of the container during and at the conclusion of this test. Testing for Strength of Pouring Spout and Handle shall be in accordance with Test method for *Strength of Pouring Spout and Handle of Safety Containers and Filling, Supply and Disposal Containers*, FM Approvals, LLC.

TABLE I

<i>Capacity (gal.)</i>	<i>Capacity (L)</i>	<i>Test load on Pour spout lbs (N)</i>	<i>Test load on Handle lbs (N)</i>
< 0.5	< 1.9	25 (111)	75 (333)
0.5 to < 1	1.9 to < 3.8	50 (222)	125 (556)
1 to < 2	3.8 to < 7.6	75 (333)	150 (667)
2 to < 3	7.6 to < 11.4	100 (448)	175 (778)
3 to 5	11.4 to 18.9	125 (556)	250 (1112)

4.4 Fire Exposure Test

4.4.1 Requirement

The container, filled with heptane to its rated capacity and in its normally closed condition, shall be placed upright in a square, steel pan containing water on which is floated 1 in. (25 mm) of normal heptane. The surface of the heptane in the pan shall be 1 in. (25 mm) above the container bottom. The heptane in the pan shall be ignited and the exposure fire allowed to burn until it is consumed (approximately 8 minutes).

4.4.2 Test/Verification

The internal can pressure shall vent throughout the duration of the exposure fire and the contents of the can shall be retained without rupture or spillage. Testing for fire exposure shall be in accordance with *Test Method of Fire Exposure for Safety Containers and Filling, Supply and Disposal Containers*, FM Approvals, LLC

4.5 Flame Arrester Test

4.5.1 Requirement

Flame arresters shall prevent flame from progressing through a flammable gas/air mixture.

4.5.2 Test/Verification

Flame arresters shall be subjected to a fire exposure test within a controlled environment. Flame Arrester testing shall be in accordance with *Test Method for Flame Arrester Components*, FM Approvals, LLC.

4.6 Abuse Test

4.6.1 Requirement

The container, filled with water, shall withstand a drop to a concrete floor (landing on any part of the container except the spout or spout mechanism) from a height of 3 ft (0.9 m).

4.6.2 Test/Verification

The tested sample shall show no signs of sufficient damage to cause leakage. Testing for abuse shall be in accordance with *Test Method of Abuse for Safety Containers and Filling, Supply and Disposal Containers*, FM Approvals, LLC.

Nonmetallic Products**4.7 Weight Loss Test**

4.7.1 Requirement

A sample container shall be filled to rated capacity with heptane, sealed and stored for 30 days at 75°F +/-5° F (24°C +/-0.4°C).

4.7.2 Test/Verification

The total weight loss shall not exceed 0.10% at the conclusion of the 30 day test duration. Testing for weight loss shall be in accordance with *Test Method of Weight Loss for Safety Containers and Filling, Supply and Disposal Containers*, FM Approvals, LLC.

4.8 Mechanical Strength Test

4.8.1 Requirement

Resistance to mechanical piercing shall be tested at 130°F (54°C) by filling the container with water and leaving it for a minimum of 18 hours while supported on four ¼ in. (6.3 mm) diameter bolts.

4.8.2 Test/Verification

The tested container shall show no signs of leakage or puncture at any of the bolt locations or at any other location. Testing for mechanical strength shall be in accordance with *Test Method of*

Mechanical Strength for Safety Containers and Filling, Supply and Disposal Containers, FM Approvals, LLC.

5 OPERATIONS REQUIREMENTS

A quality assurance program is required to ensure that subsequent safety containers and filling, supply and disposal containers produced by the manufacturer shall present the same quality and reliability as the specific containers examined. Design quality, conformance to design, and performance are the areas of primary concern.

- Design quality is determined during the examination and tests, and is documented in the Approval Report.
- Continued conformance to this standard is verified by the Surveillance Audit program.
- Quality of performance is determined by field performance and by periodic re-examination and testing.

5.1 Demonstrated Quality Control Program

5.1.1 The manufacturer shall demonstrate a quality assurance program which specifies controls for at least the following areas:

- existence of corporate quality assurance guidelines;
- incoming quality assurance, including testing;
- in-process quality assurance, including testing;
- final inspection and tests;
- equipment calibration;
- drawing and change control;
- packaging and shipping; and
- handling and disposition of non-conforming materials.

5.1.2 Documentation/Manual

There should be an authoritative collection of procedures/policies. It should provide an accurate description of the quality management system while serving as a permanent reference for implementation and maintenance of that system. The system should require that sufficient records are maintained to demonstrate achievement of the required quality and verify operation of the quality system.

5.1.3 Records

To assure adequate traceability of materials and products, the manufacturer shall maintain a record of all quality assurance tests performed, for a minimum period of two years from the date of manufacture.

5.1.4 Drawing and Change Control

- The manufacturer shall establish a system of product configuration control that shall allow no unauthorized changes to the product. Changes to critical documents, identified in the Approval Report, must be reported to, and authorized by, FM Approvals prior to implementation for production.
- The manufacturer shall assign an appropriate person or group to be responsible for, and require that, proposed changes to FM Approved or Listed products be reported to FM Approvals before

implementation. The manufacturer shall notify FM Approvals of changes in the product or of persons responsible for keeping FM Approvals advised by means of FM Approvals' Revision Request form, FM Approved Product/Specification-Tested Revision Report or Address/Main Contact Change Report.

- Records of all revisions to all FM Approved products shall be maintained.

5.2 Surveillance Audit

- 5.2.1 An audit of the manufacturing facility is part of the Approval investigation to verify implementation of the quality assurance program. Its purpose is to determine that the manufacturer's equipment, procedures, and quality program are maintained to insure a uniform product consistent with that which was tested and FM Approved.
- 5.2.2 These audits shall be conducted periodically but at least annually by FM Approvals or its representatives
- 5.2.3 FM Approved products or services shall be produced or provided at or from the location(s) audited by FM Approvals and as specified in the Approval Report. Manufacture of products bearing the Approval Mark is not permitted at any other location without prior written authorization by FM Approvals.

5.3 Installation Inspections

Field inspections may be conducted to review an installation. The inspections are conducted to assess ease of application, and conformance to written specifications. When more than one application technique is used, one or all may be inspected at the discretion of FM Approvals.

5.4 Manufacturer's Responsibilities

The manufacturer shall notify FM Approvals of changes in product construction, components, raw materials, physical characteristics, coatings, component formulation or quality assurance procedures prior to implementation.

APPENDIX A: UNITS OF MEASUREMENT

FORCE:	1 lb = 4.448 N (Newtons)
LENGTH:	in. - "inches"; (mm - "millimeters") mm = in. x 25.4 ft - "feet"; (m - "meters") m = ft x 0.3048
AREA:	in ² - "square inches"; (mm ² - "square millimeters") mm ² = in ² x 6.4516 x 10 ² ft ² - "square feet"; (m ² - "square meters") m ² = ft ² x 0.0929
MASS:	lb - "pounds"; (kg - "kilograms") kg = lb x 0.454
PRESSURE:	psi - "pounds per square inch"; (bar - "bar") kPa = psi x 6.895 bar - "bar"; (kPa - "kilopascals") bar = kPa x 0.01 bar = psi x 0.06895
HEAT:	Btu - "British thermal units"; (J - "joules") J = Btu x 1.0551 x 10 ³
HEAT RELEASE RATE:	Btu/min - "British thermal units per minute"; (kW - "kilowatts") kW = Btu/min x 0.0176
TEMPERATURE:	°F - "degrees Fahrenheit"; (°C - "degrees Celsius") °C = (°F - 32) x 0.556
LIQUID:	gal - "gallons"; (L - "liter") L = gal x 3.785 L - "liter"; (dm ³ - "cubic decimeters") L = dm ³
FLOW RATE:	gal/min - "gallon per minute"; (L/min - "liters per minute") L/min = gal/min x 3.785