



Approval Standard for Storage Containers for IBCs

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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 storage containers used to house single Intermediate Bulk Containers (IBCs) that contain ignitable liquids when located within manufacturing, industrial or other similar type environments.
- 1.1.2 The storage Approval criteria may include, but are 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 storage containers for Intermediate Bulk Containers (IBCs) that contain ignitable liquids when located within manufacturing, industrial or other similar type environments.
- 1.2.2 This standard does not apply to IBC storage containers intended for use in transit within a facility or to and from various facilities or when otherwise falls under any jurisdictional limitations such as those found in the Transportation Code of Federal Regulations.
- 1.2.3 This standard does not provide any information, guidelines or limitations on the proper storage of IBCs, storage heights, locations or protection requirements for various ignitable liquids that might be stored within an IBC.

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/or loss control specialists was also considered.
- 1.3.2 Storage units are intended to capture the majority of a liquid release within a footprint designed to limit the size of a potential pool fire. Containing the majority of released ignitable liquid prevents the formation of a spreading fire. Limiting the size of the pool surface within the unit limits the heat release rate of the fire thereby limiting the expected damage within an occupancy.
- 1.3.3 The requirements of this standard reflect tests and practices used to examine characteristics of storage containers for IBCs for the purpose of obtaining Approval of individual storage units. Storage containers for IBCs 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, storage containers for IBCs 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;
 - 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 is 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 Approval report;
- satisfactory re-examination of production samples for continued conformity to requirements; and
- satisfactory Surveillance Audits conducted as part of FM Approvals' product follow-up 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 the date of issue 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. Conversion of U.S. customary units is in accordance with the American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)/American Society for Testing Materials (ASTM) SI 10-2010, "American National Standard for Metric Practice."

1.8 Applicable Documents

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

Department of Transportation (DOT) Title 49, Code of Federal Regulations, Parts 100 through 199 IBC Storage Container Fire Test, FM Approvals

IBC Storage Container Leakage Test, FM Approvals

IBC Storage Container Catchment Basin Collection Test, FM Approvals

United Nations Recommendations on the Transport of Dangerous Goods, Part 6, Ninth Edition, Chapter 16.

1.9 Definitions

For purposes of this standard, the following terms apply:

Catchment Basin – a feature of the storage container unit that collects any liquid that leaks or streams from an IBC. A likely cause of any leakage or streams that occur would be a release of liquid resulting from the valve accidentally being opened or left opened.

Ignitable Liquid – any liquid or liquid mixture that will burn. A liquid is defined as having the ability to burn if it has a measurable fire point. Ignitable liquids include flammable liquids, combustible liquids, inflammable liquids or any other term for a liquid that will burn.

Intermediate Bulk Container (IBC) – any closed vessel intended for storing and transporting liquids, as defined in Title 49, Code of Federal Regulations, Parts 100 through 199 or in Part 6 of the United Nations Recommendations on the Transport of Dangerous Goods, Ninth Edition, Chapter 16. For purposes of this standard, Approval will be limited to containers that have a maximum capacity of 330 gallons (1250 L).

Storage Container for IBCs – a noncombustible unit that houses an IBC. The unit shall collect and contain any leakage or escape of liquid from the IBC and limit the exposed liquid surface area to control the potential fire size. It shall be permitted to have one side open to allow easy access to the IBC unit.

Sump – the lowest portion of the container where any liquid will collect.

2 GENERAL INFORMATION

2.1 Product Information

- 2.1.1 All storage containers for IBCs shall be Approved for the largest IBC for which it is tested using the minimum thickness material for which Approval is desired.
- 2.1.2 Following authorization of an Approval examination, the manufacturer shall submit sample(s) for examination and testing based on the following as determined by FM Approvals following review of the preliminary information.
- 2.1.3 Requirements for samples may vary depending on design features, results of prior or similar testing, and results of any foregoing tests.

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, as applicable and when available, 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, brochures, sales literature, spec. sheets, installation, operation and maintenance procedures as applicable and when available.;
- 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 sample(s) for examination and testing based on the following as 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.

3 GENERAL REQUIREMENTS

3.1 Review of Documentation

- 3.1.1 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 or Structural Features

- 3.2.1 All storage containers for IBCs shall meet the following criteria:

- be of non-combustible construction;
- be designed to house only a single IBC having a maximum capacity of 330 gallons (1250 L);
- contain a leak-tight sump that is capable of storing at least 110% of the contents of the largest IBC for which it is designed;
- be designed to ensure that at least 90% of any released liquid is captured and directed into the sump;
- shall have solid walls on three (3) vertical sides of the unit to a minimum height equal to the top of the IBC plus two (2) inches (50 mm);
- shall be stable and stationary. No wheels or other devices are permitted which would allow the unit to be physically moved by personnel while housing an IBC;
- shall limit the exposed surface area to an area no larger than 17 ft² (1.5 m²).

- 3.2.2 The above criteria is based upon the assumption that any liquid escaping the IBC can flow unimpeded into the sump. If a storage container incorporates a feature or features not anticipated by this Approval Standard, such as but not limited to flame arrestors, screen mesh through which liquid could pass, moveable components, automatic closing devices or other devices that could impede the flow of liquid into the sump, then additional testing may be necessary to verify that not more than 10% of the liquid contents would leak or spill out of the storage unit upon a catastrophic failure of a completely full IBC.

- 3.2.2.1 If the storage unit incorporates any joints or seams that are not fully welded and are located or positioned such that openings could develop through which liquid could possible leak or flow through, additional testing may be required.

3.3 Markings

- 3.3.1 Marking on the product or the label accompanying the product, shall include the following information:

- Company name, city and state (and country where applicable) of the manufacturer or marking traceable to the manufacturer;
- model number, size, rating, capacity, weight capacity of the IBC and liquid, 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. 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 Written Instructions

The manufacturer shall provide the end user with written instructions on the use and maintenance of the product.

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

In order to qualify for Approval, each storage container for IBCs shall satisfy the following requirements.

4.1 IBC Storage Container Fire Test

4.1.1 Requirement

- a. All storage containers for IBCs shall be evaluated for their ability to withstand an internal fire simulating an accidental release of the contents and ignition of an ignitable liquid from the IBC.
- b. Upon completion of the twenty (20) minute internal fire exposure, the sump shall remain leak tight and the exposed pool fire surface area shall not exceed 17 ft² (1.5 m²) at any time during the fire test.
- c. In cases where the containment system incorporates a feature not anticipated as explained in Paragraph 3.2.2, an alternate fire test method, acceptable solely to FM Approvals, shall be allowed to be conducted as an alternative. Any such alternative will verify that any automatic closing devices or features that impede the flow of liquid into the sump, will still meet the acceptance criteria shown below in Paragraph 4.1.2.

4.1.2 Test/Verification

The test specimen shall be subjected to the IBC Storage Container Fire Test for a period of twenty (20) minutes. At the start of the fire test, 4 inches (102 mm) of heptane shall be floated on top of 1 inch (25 mm) of water placed in the base of the sump.

- a. The unit will be monitored to ensure that the surface area at the base of the pool fire does not exceed 17 ft² (1.5 m²) at any time during the fire test.

- b. Upon completion of the fire test, the sump shall be examined to verify that no through openings developed through which ignitable liquid or flame could pass.
- c. Any flames resulting from liquid collecting and ponding in the catchment basin shall be considered when determining the maximum 17 ft² (1.5 m²) allowable flame surface area.
- d. Upon completion of the fire test, an evaluation shall be made to verify that the maximum flame area of 17 ft² (1.5 m²) shall not be exceeded when the maximum liquid storage capacity (110% of the contents of the IBC is present).

4.2 IBC Storage Container Leakage Test

4.2.1 Requirement

- a. All storage containers shall be evaluated for their ability to contain 110% of the capacity of the largest IBC for which the unit has been designed.
- b. Upon completion of the twenty-four (24) hour IBC Storage Container Leakage Test, no liquid shall have leaked from the sump.

4.2.2 Tests/Verification

- a. The test specimen shall be filled with water to a capacity that represents 110% of the volume of the largest IBC for which Approval is desired. During the test, the unit will be examined for signs of water leakage through any seams or openings in the sump.
- b. This test will be waived if there are no openings in any part of the sump and if all seams below the high liquid level of the sump are continuously welded.

4.3 IBC Storage Container Catchment Basin Collection Test

4.3.1 Requirement

- a. All storage containers for IBCs shall be evaluated for their ability to collect at least 90% of any released liquid from a simulated accidental release of the IBC contents.
- b. Upon completion of the test, at least 90% of the liquid released during a simulated accidental release shall be captured by the catchment basin and redirected to the sump.

4.3.2 Tests/Verification

The test specimen shall collect all liquid leaking from a simulated accidental release which has been subjected to the IBC Storage Container Catchment Basin Collection Test.

5 OPERATIONS REQUIREMENTS

A quality assurance program is required to assure that subsequent storage containers for IBCs produced by the manufacturer shall present the same quality and reliability as the specific storage 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.
- 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' Form 797, 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

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