

Approval Standard

Flexible Hose Assemblies for
Flammable Gases and/or
Ignitable Liquids

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Foreword

The FM Approvals certification mark is intended to verify that the products and services described will meet 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, successful re-examinations of equipment, materials, and services as appropriate, and 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 flexible hoses used to carry flammable gases and / or ignitable liquids. Flexible hoses used to carry flammable gases and / or ignitable liquids may be used with, but not limited to, appliances or machinery.
- 1.1.2 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 encompasses the design and performance requirements for flexible hoses with threaded end fittings used to carry flammable gases and / or ignitable liquids, such as, but not limited to, propane and natural gas, which may be used in appliances or machinery.
- 1.2.2 Flexible hoses used to carry flammable gases and / or ignitable liquids are used in many residential and commercial applications. Some commercial markets are laundromats, restaurants and food service, retail, and healthcare. Flexible hoses may be connected to stoves, ovens, furnaces, boilers, gas-fired fireplaces, etc.
- 1.2.3 Flexible hoses for flammable gases and / or ignitable liquids are made with corrugated stainless steel tubing with an optional non-metallic covering. The stainless steel is austenitic stainless steel alloy of the 300 series. Threaded end fittings are applied for connection to an ignitable liquid or gas source and appliance or machinery.
- 1.2.4 The intent of the design and performance requirements is for the flexible hoses to withstand stresses imposed by shifting or tipping appliances and machinery and/or by damage to structural framing caused by earthquakes, without fracture or leakage.
- 1.2.5 This standard is not applicable to hoses intended for direct burial underground.
- 1.2.6 This standard is not applicable to hoses intended for use with propane in its liquid state.
- 1.2.7 Other applications shall be evaluated on a case-by-case basis. In cases where International System (SI) sized flexible hoses for flammable gases and / or ignitable liquids are to be examined for Approval, test criteria comparable to the equivalent or nearest United States (U.S.) customary units shall be used.
- 1.2.8 Approval Standards are intended to verify that the product described will meet stated conditions of performance, safety, and quality useful to the ends of property conservation.

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, trade associations, jurisdictions and/or loss control specialists was also considered.

- 1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of flexible hoses for flammable gases and / or ignitable liquids for the purpose of obtaining Approval. Flexible hoses for flammable gases and / or 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, flexible hoses for flammable gases and / or 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
 - the performance of the product as specified by the manufacturer and required by FM Approvals
 - the durability and reliability of the product, as far as practical
- 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' Surveillance Audit program.
- 1.4.3 Installation guidelines require the installation of striker plates at all penetration points through framing members.

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

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 for compliance with all requirements is the publication date.

1.7 System of Units

Units of measurement used in this Standard are U.S. customary units. These are followed by their arithmetic equivalents in 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 10-97, "Standard for Use of the International System of Units (SI): The Modern Metric System." Two units (liter and bar), outside of but recognized by SI, are commonly used in international fire protection and are used in this Standard.

1.8 Applicable Documents

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

ASTM SI10 - 10 IEEE/ASTM SI 10, *American National Standard for Metric Practice*

FM Global Property Loss Prevention Data Sheet 7-32, *Ignitable Liquid Operations*

International Organization for Standardization (ISO) 10380 - 1994, *Corrugated flexible metallic hose and hose assemblies*

International Organization for Standardization (ISO) 7369 – 2004, *Pipework – Metal hoses and hose assemblies – Vocabulary*

ANSI/CSA LC 1-2005 CSA 6.26-M2005, *Fuel Gas Piping Systems Corrugated Stainless Steel Tubing (CSST)*

FM Approvals Standard 1637—2010, *Approval Standard for Flexible Sprinkler Hose with Threaded End Fittings*

Ditch, B., *Development of a Fire Performance Test for Corrugated Stainless-Steel Tubes*, FM Approval Class Number 6036

1.9 Definitions

For purposes of this standard, the following terms apply:

Appliance (Machinery)

Any device that uses gas or liquid as a fuel to produce light, heat, power, refrigeration, air conditioning, etc.

Corrosion Resistant

Flexible hoses for flammable gases and / or ignitable liquids shall be termed corrosion resistant if its interior surface exhibits equivalent resistance to aqueous corrosion as steel pipe which is internally coated with zinc by the hot-dip process to a weight of no less than 1.8 oz/ft² (0.55 kg/m²).

Corrugated Hose

Pressure-tight hose with corrugations, helicoidal (formed or arranged in a spiral) or annular (formed in a ring) to the axis of the hose. Made by deforming the metal and flexibility is obtained by bending the corrugations.

Dynamic Bend Radius

The minimum acceptable bending radius of the hose, bent in relation to the hose axis, as specified by the manufacturer.