

Approval Standard for Fume Exhaust Ducts or Fume and Smoke Exhaust Ducts

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Foreword

FM Approvals are 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 FM 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 Approval shall demonstrate that they meet the intent of the Approval Standard, and that quality control in manufacturing and/or applications shall ensure a consistently uniform and reliable product or service. FM Approval Standards strive to be performance-oriented and to facilitate technological development.

For examining equipment, materials and services, FM 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 or service/application.

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

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1. INTRODUCTION

1.1 Purpose

This standard states Approval requirements for ducts used in exhausting noncombustible chemical fumes and corrosive vapors or noncombustible chemical fumes, corrosive vapors and smoke in fire situations.

1.2 Scope

- 1.2.1 This standard sets performance requirements for ducts installed according to limitations and requirements specified for each individually manufactured duct system.
- 1.2.2 The fire performance of a duct depends in part on its ability to limit fire spread and on its ability to exhaust smoke in case of fire, if applicable. It is necessary to evaluate flame spread potential on the interior and exterior of the duct, and its structural integrity after fire exposure when used as a smoke exhaust system.
- 1.2.3 This standard is not intended to determine the suitability for all end use conditions of a product. Conditions under which a duct assembly is used vary widely. For example, ducts may be subjected to environments not represented by standard corrosion tests. This standard, therefore, does not evaluate the corrosion resistance in every environment where duct materials are used for handling corrosive fumes. It is the responsibility of the manufacturer to determine the suitability of the duct system for specific corrosive environments. The manufacturer should be consulted for recommended corrosive fume applications. Further, it is required that the manufacturer comply with all requirements of the "Accepted Industry Practice for Industrial Duct Construction" published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA).
- 1.2.4 This standard evaluates ducts for their performance in regard to fire spread on the inner and outer surface of the duct and the suitability of the duct to be used for smoke removal. However, for ducts not intended for smoke removal in a fire situation (i.e., fume exhaust only) the exhausting capability of the duct is not evaluated.
- 1.2.5 This standard describes the minimum performance requirements for ducts that are intended for use in cleanroom facilities by evaluating the ability of the exterior surface to limit fire spread and smoke damage due to the contamination caused by products of combustion.

1.3 Basis for FM Approval

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

- 1.3.1 Examination and tests on production samples to evaluate
 - the suitability of the product;
 - the proper operation and performance of the product as specified by the manufacturer and required by FM Approvals; and,
 - the durability and reliability of the product.
- 1.3.2 An examination of the manufacturing facilities and audit of quality control procedures to evaluate the manufacturer's ability to consistently produce the product as examined and tested, and the marking procedures used to identify the product. These examinations are repeated as part of FM Approvals' Product follow-up program.

1.4 Basis for Continued Approval

Continued Approval is based upon:

- production or availability of the product as Approved;
- the continued use of acceptable quality control procedures;
- satisfactory field experience;
- compliance with the terms stipulated in the Approval Agreement; and
- re-examination of production samples for continued conformity to requirements.

1.5 Basis for Requirements

1.5.1 The requirements of this standard are based on experience, research and testing and/or the standards of FM Approvals and other organizations. The advice of manufacturers, users, trade associations and loss control specialists was also considered.

1.5.2 Meeting the requirements qualifies a product as an Approved duct for fume exhaust, fume and smoke exhaust or for use in cleanroom applications, as applicable. Requirements prohibit component substitution without prior authorization by FM Approvals.

1.5.3 The requirements of this standard reflect tests and practices used to examine characteristics of fume or fume and smoke exhaust ducts for the purpose of obtaining FM Approval. These requirements are intended primarily as guides and strict conformity is not always mandatory. Fume and smoke handling ducts having characteristics not anticipated by this standard may be Approved if performance equal or superior to that required by this standard is demonstrated, or if the intent of the standard is met. Alternatively, ducts which meet all the requirements identified in this standard may not be Approved if other conditions which adversely affect performance exist or if the intent of this standard is not met.

1.6 Effective Date

1.6.1 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 Approved under a previous edition shall comply with the new version by the effective date or else forfeit Approval. The effective date shall apply to the entire Approval Standard, or, where so indicated, only to specific paragraphs of the standard.

1.6.2 The effective date for this standard is **October 1, 2001** for compliance with all requirements.

1.7 System of Units

Units of measurement are U.S. customary units. These are followed by their arithmetic equivalents in International System (SI) units, enclosed in parentheses. Appendix B lists the selected units for qualities dealt with in testing these products; conversions to SI units are included. Conversion of U.S. customary units is in accordance with ANSI/IEEE/ASTM SI 10-97, *Standard for Use of the International System of Units (SI): The Modern Metric System*.

2. GENERAL INFORMATION

2.1 Product Information

- 2.1.1 Duct materials may be, but are not limited to, metal, coated metal, glass reinforced plastics, and polyvinyl chloride (PVC). Some are preformed, rigid, round, rectangular, or oval ducts.
- 2.1.2 Ducts covered by this standard are used for exhausting noncombustible chemical fumes and corrosive vapors, and/or exhausting smoke in fire situations. Experience has shown that duct materials may transmit fire from one area to another, even when they obtain relatively low flame spread ratings from other test methods. To achieve a representative fire test, the actual end use configuration of the duct materials must be considered under conditions of normal use.
- 2.1.3 Fire spread within a duct system is dependent upon the relative combustibility of the basic duct or lining and its joint material, the diameter or cross section of its main header and branch lines, the air flow and its structural integrity.
- 2.1.4 Fire spread within the duct system may be limited by resistance to ignition or by using some form of interruptor to prevent flame propagation. Interruptors may consist of collapsible sections, firestop dampers or automatic sprinklers. It should be noted that ducts incorporating interruptors in their design are not suitable for smoke exhaust use. However, ducts utilizing automatic sprinklers as a means of limiting fire spread may qualify for smoke exhaust if it can be demonstrated by test performance that sufficient air flow capacity remains to exhaust smoke successfully.
- 2.1.5 Some ducts may have different constructions and/or materials on their interior and exterior surfaces. To determine whether or not the duct will cause a spreading fire on its exterior surface, an additional test will be conducted with a fire exposure impinging on the exterior of the duct to evaluate its potential for flame propagation.
- 2.1.6 Due to the sensitivity of cleanroom environments, the high cost of construction and the high value of the equipment and products produced and stored in them, significant damage can be caused by the presence of small amounts of contamination. As a result, it is necessary to evaluate the ability of the exterior surface of the duct to limit fire propagation and restrict the emission of particulates in the form of smoke.
- 2.1.7 Ducts meeting the requirements of this Standard shall receive a listing in the *Approval Guide* as an Approved Fume and/or Smoke Exhaust Duct, as applicable. Ducts that meet the requirements for use in smoke sensitive areas such as cleanrooms shall be so noted in the *Approval Guide* and on the label denoting FM Approval. Resins used to fabricate Approved ducts are eligible to be listed in the FM Approvals' Specification Tested Products Guide as an Identified Resin System.

2.2 Requirements

- 2.2.1 The requirements of this standard shall be used to measure and describe the fire performance of fume exhaust or fume and smoke exhaust ducts in response to exposure from fire and the subsequent ability of the duct to remove smoke under controlled laboratory conditions. The results of these controlled exposures shall not be used to describe or appraise actual exposure conditions, since such conditions vary widely.

Ducts that are intended to be used in cleanroom facilities shall be evaluated for the ability of their exterior surfaces to limit fire propagation and restrict the emission of particulates in the form of smoke.