Approval Standard
for
Open Shelving for Racks

Class Number 6914

August 2010

©2010 FM Approvals LLC. All rights reserved.

Documents
Document Sharing Hub

Full document details: FM 6914 2010

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.

Documents
Document Sharing Hub

Full document details: FM 6914 2010

TABLE OF CONTENTS

1 INTRODUCTION 1
1.1 Purpose 1
1.2 Scope 1
1.3 Basis for Requirements 1
1.4 Basis for Approval 2
1.5 Basis for Continued Approval 2
1.6 Effective Date 2
1.7 System of Units 2
1.8 Applicable Documents 3
1.9 Definitions 3
2 GENERAL INFORMATION 5
2.1 Product Information 5
2.2 Approval Application Requirements 6
2.3 Requirements for Samples Examination 6
3 GENERAL REQUIREMENTS 7
3.1 Review of Documentation 7
3.2 Markings 7
3.3 Manufacturer's Installation Instructions 7
3.4 Calibration 7
4 PERFORMANCE REQUIREMENTS 8
4.1 Actual Delivered Density (ADD) Testing of Open Shelving for Racks 8
5 OPERATIONS REQUIREMENTS 10
5.1 Demonstrated Quality Control Program 10
5.2 Facilities and Procedures Audit (F&PA) 11
5.3 Installation Inspections 11
5.4 Manufacturer's Responsibilities 12
APPENDIX A: UNITS OF MEASUREMENT 13
APPENDIX B: FM APPROVALS CERTIFICATION MARKS 14

Documents
Document Sharing Hub

Full document details: FM 6914 2010

1 INTRODUCTION

1.1 Purpose

This standard states Approval requirements for open shelving for racks. Rack storage of combustible commodities creates a substantial hazard and potential for large fires should ignition occur in the storage area due to several issues such as large amounts of fuel that can be concentrated in racks, uninhibited airflow throughout a stable rack array and the potential for shielding of commodity from overhead sprinklers. While solid shelves may inhibit vertical fire growth they, at the same time, promote horizontal fire spread and can prevent sprinkler water from penetrating down through a rack to the fire area. They also limit the pre-wetting of combustibles. Once the fire breaks out of the area of origin, it may be too large in intensity for the sprinkler systems to be effective. Shelving not Approved by FM Approvals may be considered a fire hazard and, if not properly addressed, may require special protection such as in-rack sprinklers.

1.2 Scope

1.2.1 This standard sets the performance requirements of open shelving for racks. Specifically it addresses their ability to allow a sprinkler water flow penetration rate equivalent to rack shelving having 70% (or greater) open area. All requirements in this standard shall be met in order for these products to be eligible to receive FM Approvals certification.

1.2.2 This standard is intended to evaluate only those hazards investigated and is not intended to determine the suitability for all end use conditions of these products. Conditions under which these products are used vary widely. For example, these materials may be subjected to environments, storage arrangements and fuel loadings not anticipated by this standard.

1.2.3 This standard does not address the issue of open shelving for racks during natural hazard events such as seismic occurrences.

1.2.4 Approval criteria shall include, but are not limited to, performance requirements, marking requirements, an examination of manufacturing facilities, an audit of quality assurance procedures and a follow-up program.

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 FM Approvals and other organizations. The advice of manufacturers, users, trade associations and loss control specialists was also considered.

1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of open shelving for rack for the purpose of obtaining FM Approval. These requirements are intended primarily as guides and strict conformity is not always mandatory. Open shelving for racks 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, open shelving for racks that meet all the requirements identified in this standard may not be FM Approved if other conditions that adversely affect performance exist or if the intent of this standard is not met.

Documents
Document Sharing Hub
Full document details: FM 6914 2010

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 use;
- the proper operation and 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 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 the FM Approvals' quality control follow-up program.

1.5 Basis for Continued Approval

Continued Approval is based upon:

- production or availability of the product as 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, if deemed necessary, of production samples for continued conformity to requirements; and
- satisfactory Facilities and Procedures Audits (F&PA's) 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

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 This standard will be effective immediately upon publication for compliance with all requirements.

1.7 System of Units

Units of measurement 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 value may be the 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".

Documents
Document Sharing Hub
Full document details: FM 6914 2010

1.8 Applicable Documents

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

FM Approvals Standard for Automatic Control Mode Sprinklers, Class Number 2000.

FM Approvals Standard for Suppression Mode [Early Suppression – Fast Response (ESFR)] Automatic Sprinklers, Class Number 2008.

FM Global Property Loss Prevention Data Sheet 8-9, *Storage of Class 1, 2, 3, 4, and Plastic Commodities*.

FM Approvals Test Procedure, *Actual Delivered Density (ADD) Testing of Open Shelving for Racks.*

1.9 Definitions

Actual Delivered Density (ADD) — The rate at which water is actually deposited from an operating sprinkler onto the top horizontal surface of a burning combustible array.

Discharge Coefficient(K-Factor) — The coefficient of discharge, K, as expressed in the equation:

$$K = \frac{Q}{P^{1/2}}$$

Where Q is the flow in gallons per minute (gal/min), and P is the pressure in pounds per square inch (psi). Expressed in SI Units: Q is the flow in liters per minute (L/min) and P is the pressure in bar. The discharge coefficient, therefore, has units of gal/min/(psi)$^{1/2}$ or L/min/(bar)$^{1/2}$.

Flue Spaces — The spaces between rows of storage are called flue spaces. In rack storage, the longitudinal flue spaces are perpendicular to the direction of loading, and transverse flue spaces are parallel to the direction of loading (See Figures 1 and 2 below).

Documents Document Sharing Hub

Full document details: FM 6914 2010