



Approval Standard for Lightweight Insulating Concrete for Use in Class 1 and Noncombustible Roof Constructions

Class Number 4454

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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 classification of lightweight insulating concrete when used in roof deck constructions. FM Approved lightweight insulating concretes are those that meet the criteria of this standard for combustibility and wind resistance.
- 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 sets performance requirements for lightweight insulating concrete when used in roof deck constructions. This standard examines the ability of lightweight insulating concrete to limit fire spread and resist wind forces.
- 1.2.2 In addition to the requirements specified in this standard, the components above the lightweight insulating concrete (e.g. roof covers, base sheets, fasteners) shall meet the requirements of the Approval Standard 4470—Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Systems for use in Class 1 and Noncombustible Roof Deck Construction.
- 1.2.3 This standard is intended to verify that the product as described will meet the stated conditions of performance and quality, useful to determine the suitability for end-use conditions of these products.
- 1.2.4 The requirements of this standard shall be used to measure and describe the performance of lightweight insulating concrete in response to exposure from fire and wind, 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.
- 1.2.5 The Approval program includes fire, wind uplift, corrosion, and other tests as noted. A complete review of construction and application specifications shall be conducted to assure, as far as possible, a practical and reliable installation. Inspection of the product manufacturing facility and of at least one field installation, at the discretion of FM Approvals, shall be conducted to assure conformance with the required tests and specifications.

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, jurisdictions and loss control specialists was also considered.
- 1.3.2 Meeting these requirements qualifies a product as an Approved lightweight insulating concrete. Requirements prohibit component substitution or modification without prior authorization by FM Approvals.
- 1.3.3 The requirements of this standard reflect tests and practices used to examine characteristics of lightweight insulating concrete for the purpose of obtaining Approval. Lightweight insulating concrete 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, lightweight insulating concrete which meets 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 when used in roof deck construction 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 components of 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.
- 1.4.3 An examination of the procedures employed in supplying the material components and sufficient mixing and installation instructions to the field site, where the actual Approved product is fabricated, to ensure the finished product meets the requirements for Approval.

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 Facilities and Procedures Audits (F&PAs) conducted as part of FM Approvals' product follow-up program.

Also, as a condition of retaining Approval, manufacturers may not change a product, component 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 FM Approved under a previous edition shall comply with the new version by the effective date or else forfeit Approval.
- 1.6.2 The standard will be effective immediately upon publication.

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 BSR/IEEE/ASTM SI 10, *Standard for Use of the International System of Units (SI): The Modern Metric System*.

1.8 Applicable Documents

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

BSR/IEEE/ASTM SI 10, *Standard for Use of the International System of Units (SI): The Modern Metric System*.

DIN Deutsches Institut für Normung e.V., DIN 50018, *Testing in a Structural Atmosphere in the Presence of Sulphur Dioxide*

ANSI/FM 4474 – American National Standard for Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies using Static Positive and/or Negative Differential Pressures.

American Society of Civil Engineers (ASCE), ASCE 7- Minimum Design Loads for Buildings and Other Structures.

American Welding Society (AWS), AWS D1.3 -Structural Welding Code – Sheet Steel

ASTM A 653, *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*

ASTM G 87, *Standard Practice for Conducting Moist SO₂ Tests*

FM Approval Standard 4470 — Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Systems for use in Class 1 Noncombustible Roof Deck Construction.

FM Global Property Loss Prevention Data Sheet 1-29, *Roof Deck Securement and Above-Deck Roof Components*

Test Procedure, 12 x 24 ft Wind Uplift Tests for Single Ply and Multi Ply Roof Coverings in accordance with ANSI/FM 4474.

Test Procedure, 5 x 9 ft Wind Uplift Tests for Single Ply and Multi Ply Roof Coverings in accordance with ANSI/FM 4474.

Test Procedure, 2 x 2 ft Wind Uplift Pull Test for Fully Adhered Roof Coverings in accordance with ANSI/FM 4474.

Test Procedure, FM Approvals Construction Materials Calorimeter, FM Approvals, LLC

Test Procedure, Corrosion Resistant Testing For Stress Plates, Batten Bars, and Fasteners Used to Secure Membranes and Insulations in Roof Constructions, FM Approvals, LLC