

Approval Standard

Class 1 Exterior Wall Systems

Class Number 4881
November 2007

Approval Standard

for

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Foreword

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 Approval Standards is to present the criteria for 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. Approval Standards strive to be performance-oriented and 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 Master 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

- 1.1.1 This standard states Approval requirements for Class 1 Exterior Wall Systems. Exterior wall systems are exposed to a number of natural hazards and must reject rain, wind, hail, water infiltration and other deleterious affects caused from everyday exposure to heat, cold, building movement and sunlight. Damage to a building's outer layer compromises its ability to provide the functions it has been designed to deliver. Compromised exterior walls and openings can pave the way for serious damage to the building contents and to the building structure itself due to storms and the long term effects of water and air infiltration. Damage to the building envelope during high wind events such as hurricanes, tropical cyclones or typhoons will produce costly undesirable effects and possible business interruptions. Products that receive Approval recognition have been evaluated to provide assurance that they will perform their intended functions and maintain the integrity of the building envelope for the stated design conditions.
- 1.1.2 Exterior wall systems are also exposed to fire and must be able to limit fire propagation over and/or through the assembly. Common sources of ignition include, but are not limited to, the potential fire exposure from one or more adjacent buildings or from yard storage. This is particularly important as many potential fire exposures may be on adjacent property where control of the exposure may be outside the influence of the owner of the exposed building.

1.2 Scope

- 1.2.1 This standard sets performance requirements for exterior wall panels under simulated laboratory conditions. Exterior wall systems are examined for their ability to limit fire propagation over and/or through the assembly when exposed to an ignition source simulating a building fire (see Approval Standard 4880, Class 1 Fire Rating of Insulated Wall or Wall & Roof/Ceiling Panels; Interior Finish Materials, or Coatings, and Exterior Wall Systems (2005) for a complete description of the fire test requirements). This standard also sets the performance requirements for exterior wall panels when exposed to various natural hazards such as the cyclic nature of wind in high wind events, the impact of simulated hail and where required, the impact of windborne debris during hurricanes, tropical cyclones and typhoons.
- 1.2.2 FM Approved wall panels, for interior and/or exterior use, shall be examined for their ability to limit fire spread using Approval Standard 4880. Exterior wall systems shall also be examined for various natural hazards as detailed in this standard.
- 1.2.3 Systems that are intended solely for use as interior walls systems shall be qualified in accordance with Approval Standard 4880.
- 1.2.4 This standard is intended to qualify many types of exterior wall systems including, but not limited to metal, concrete, composite and glass.
- 1.2.5 This standard is not intended to qualify fenestration products such as doors, windows and storm shutters or other exterior insulated finish systems (EIFS), or other exterior wall coating systems. This standard does not address quality of workmanship or ease of or need for maintenance.
- 1.2.6 This standard is not intended to determine the suitability for all end use conditions of a product. Conditions under which exterior wall systems are used vary widely. It is the responsibility of the manufacturer and building owner to determine the suitability of the exterior wall system for the intended location.
- 1.2.7 One of the more critical natural hazards that a building is exposed to is rain. The issue of water damage to a building is a major concern. FM Approvals recognizes the importance of exterior wall systems in preventing water infiltration and the resulting damage.

1.2.7.1 Popular opinion is that most water damage to exterior wall systems is caused by repeated exposure to rain and moisture over long periods of time as opposed to short periods of intense exposure during a single storm. In addition to the intensity of rainfall and the material used to form the exterior of the system, the ability of the entire “system” to prevent water infiltration is also a function of the performance of the materials used for jointing and sealing purposes as well as the systems resistance to ultraviolet light, heat, aging, building movement and repeated freeze/thaw.

1.2.7.2 A review of the existing test methods currently in the public domain was conducted. None were incorporated into this standard at this time as they were deemed to be inadequate for the purpose of this standard. It is the intention of FM Approvals to conduct research on this topic in the future. At that time, the standard may be revised to incorporate other test methods and criteria deemed necessary to adequately address water infiltration.

1.2.8 In an effort to assist customers of FM Approvals in qualifying their products for use in the State of Florida while obtaining Approval, manufacturers can use Appendix FLA to obtain a listing by FM Approvals as a Specification Tested Product that can be used to also satisfy the performance criteria required by the Test Protocols for High-Velocity Hurricane Zones in Florida.

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 Meeting these requirements qualifies a product as an FM Approved exterior wall system. Requirements prohibit component substitution without prior authorization by FM Approvals.

1.3.3 The requirements of this standard reflect tests and practices used to examine characteristics of exterior wall systems for the purpose of obtaining Approval. These requirements are intended primarily as guides and strict conformity is not always mandatory. Exterior wall systems 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, exterior wall systems 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.

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 to evaluate

- the suitability of the product;
- the proper performance of the product as specified by the manufacturer and as demonstrated when examined in accordance with this standard;
- the durability and reliability of the product.

1.4.2 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 follow-up Facilities and Procedures Audit 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 control procedures;
- satisfactory field experience;
- compliance with the terms stipulated in the Agreements of FM Approvals; and
- re-examination, if deemed necessary, of production samples for continued conformity to requirements.

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. 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 **January 1, 2006** for compliance with all requirements.

1.6.3 The effective date for compliance with all requirements relating to water infiltration has not been determined (see Paragraph 1.2.6).

1.6.4 The effective date for compliance for Appendix FLA shall be **November 1, 2007**.

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*.

1.8 Applicable Documents

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

American Society for Testing and Materials (ASTM) International

ASTM E 283-04, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen

ASTM E 330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

ASTM E 1233-00, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differential

ASTM E 1886-02, Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials

ASTM E 1996-03, Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes

FM Approvals/FM Global

Approval Standard 4470, Class 1 Roof Covers (1986 with addenda)

Approval Standard 4880, Class 1 Fire Rating of Insulated Wall or Wall & Roof/Ceiling Panels; Interior Finish Materials or Coatings; and Exterior Wall Systems (2005)

Test Standard 4473, Specification Test Protocol for Impact Resistance Testing of Rigid Roofing Materials by Impacting with Freezer Ice Balls (February 2000)

Structural Test Method for Exterior Wall Systems Exposed to Static Air Pressure Differentials (Appendix C)

Structural Test Method for Exterior Wall Systems Exposed to Cyclic Air Pressure Differentials (Appendix D)

Test Method for Exterior Wall Systems Impacted by Windborne Debris (Appendix E)

Simulated Hail Resistance Test Using Freezer Ice Balls. (Appendix F)

FM Global Property Loss Prevention Data Sheet 1-28, Design Wind Loads (January 2002)

FM Global Property Loss Prevention Data Sheet 1-29, Roof Deck Securement and Above-Deck Roof Components (September 2003)

Building Codes

2004 Florida Building Code

Testing Application Standard (TAS) 201-94, Impact Test Procedures

Testing Application Standard (TAS) 202-94, Criteria for Testing Impact and Non-Impact

Resistant Building Envelope Components Using Uniform Static Air Pressures

Testing Application Standard (TAS) 203-94, Criteria for Testing Products to Cyclic

Wind Pressure Loading

International Building Code

SSTD 12-99, Standard for Determining Impact Resistance for Windborne Debris

1.9 Glossary

Class 1 — signifies that the material meets FM Approvals test requirements as a non-fire propagating material. Such materials do not require sprinkler protection in and of themselves when used in accordance with FM Global Property Loss Prevention Data Sheets.

Class 1 Exterior Wall System — an exterior wall system that meets the requirements of this standard for fire, wind, impact from hail, corrosion (if applicable) and missile impact from windborne debris, where applicable.

Exterior Wall System — an assemblage of materials that form the outer protective layer of a building.

Inward Wind Pressure — a condition created on the windward side of a building. It is caused by wind forces and places forces toward the wall. It is referred to by some entities as positive pressure.

Outward Wind Pressure — a condition created on the leeward side of a building. It is caused by wind forces and places forces away from the wall. It is referred to by some entities as negative pressure.

Pressure Coefficient — a factor accounting for variations in inward and outward wind pressure on walls at different locations and elevations of the same building.

Windborne Debris — objects and pieces of broken materials that have become airborne projectiles due to the high winds caused by hurricanes, tropical cyclones and typhoons.

2 GENERAL BACKGRUND AND INFORMATION

2.1 General Background

- 2.1.1 The selection of an exterior wall system is a critical component in the overall effectiveness of a building's ability to perform the functions for which it has been designed. It is the first line of defense in combating the effects of natural hazards and protecting the lives of those in or near the building as well as the contents of the building. The system selected must be durable, cost effective and aesthetically pleasing. It must be able to withstand the design conditions that will be placed on the system from internal sources for which it has been constructed as well as natural external sources such as rain, wind and hail. Selection of a system that has not demonstrated that it can withstand the design conditions over long periods of time can lead to a loss of life or property as well as a loss of business.
- 2.1.2 Design conditions vary widely throughout the world. The selection of an exterior wall system should be based, in part, on the geographical location where it will be constructed, its surroundings as well as the historical meteorological events that have occurred and are likely to occur in the future.
- 2.1.3 Anticipated design conditions at a particular geographic location vary depending on the intensity of the event, the surrounding terrain and elevation. Components on the windward side of a building are subjected to design wind pressures [P^{inward}] which increase as the elevation of the building increases. Pressures on the leeward side [P^{outward}] of a building can reach twice the wind pressure normally found on the windward face of the building at the same elevation but acting in the opposite direction. Approval ratings will show both inward (+) and outward (-) pressures for which the system has been successfully tested. In an effort to allow for economic building construction, Approval will be granted for two ratios of inward and outward pressure. The ratio of the inward and outward pressures shall be (+)1.0 to (-)1.4 or (+)1.0 to (-)2.0.
- 2.1.4 In an effort to allow for economic building construction, in addition to the wind load ratings shown above, Approval categories have been developed for the most common windstorm zones likely to be encountered. These zones, as explained in Paragraph 3.2.3, shall be designated as Zones HM, H and NH. The zones have been established to Approve products intended for use in areas that require protection against a) hurricane force winds and missile impacts resulting from windborne debris (HM), b) hurricane force winds only (H) and c) non-hurricane areas (NH) that do not require either a) or b).
- 2.1.5 Exterior wall systems that meet the requirements of this Approval Standard will maintain the integrity of the building envelope for the stated design conditions. While the performance requirements contained in this Approval Standard would indicate that FM Approved exterior wall systems will not suffer permanent deformation or physical damage after windstorms or hail storms, the systems should be examined after each storm for damage that could adversely affect its performance in future storms.

- 2.1.5.1 In the case where a system has been FM Approved for use in areas prone to hurricane force winds and the missile impacts from windborne debris, the system may sustain permanent physical damage. As such, the systems should be examined after each storm for damage that could adversely affect its performance in future storms. Repairs should be made as soon as possible to any damaged areas.
- 2.1.5.2 Because the acceptance criteria for systems impacted by windborne debris vary throughout the country, two (2) levels of both large and small missile Approval have been created (see Paragraph 3.2.2). This will assist manufacturers and end users in determining if the system will meet local codes requirements and FM Global Data Sheet recommendations.

2.2 General Information

- 2.2.1 The requirements of this standard shall be used to measure and describe the performance of exterior wall systems to simulated fire, wind loads and hail impact under controlled laboratory conditions.
- 2.2.2 The performance of exterior wall systems can be greatly affected by the quality of the workmanship and the long term effects of water infiltration, exposure to sunlight, heat, building movement and the normal aging process. These items have not been considered in developing the test methods included in this standard.
- 2.2.3 A particular wall system may be designed for interior use only, exterior use only or for both interior and exterior use. In all cases they shall be examined for their ability to limit fire propagation over and/or through the assembly when exposed to an ignition source simulating a building fire. All such fire tests shall be conducted in accordance with Approval Standard 4880.
 - 2.2.3.1 Wall systems designed for both interior and exterior use can be qualified by a single fire test as noted in 2.2.3 if a) the wall panels are not symmetrical and FM Approvals can determine the most critical side to be tested based on engineering judgment or b) the wall is symmetrical and incorporates a fire barrier such as gypsum board.
 - 2.2.3.2 This standard is not applicable to wall systems designed solely for interior use. Such systems shall be examined in accordance with Approval Standard 4880.

2.3 Markings

- 2.3.1 The packaging for exterior wall systems shall bear the manufacturer's name, product trade name and the Approval mark of FM Approvals (see Appendix A).
- 2.3.2 Each FM Approved exterior wall system shall also bear the Approval marking, where practicable, on components that consist of long sections. Such markings shall be permitted to be located on the backside of the component such that it can not be seen after it has been installed.
- 2.3.3 Upon completion of an installation, the manufacturer shall attach permanent, corrosion resistant nameplates to the exterior of the building. The nameplates shall be visible from ground level. At a minimum, the nameplates shall bear the manufacturer's name, product trade name, date of construction, the Approval mark of FM Approvals and the applicable Approval ratings for fire, wind and hail.
- 2.3.4 With the exception of the nameplates installed on the exterior of the building after the completion of an installation, labels or markings denoting Approval shall be applied by the manufacturer only within and on the premises of manufacturing locations that are under the FM Approvals Facilities and Procedures Audit Program.