



Member of the FM Global Group



American National Standard for Evaluating Exterior Wall Systems

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Foreword

NOTE: This foreword is introductory only and is not part of American National Standard FM 4881.

This standard is intended to be used to evaluate exterior wall panel systems that are exposed to natural hazards such as wind, hail, and windborne debris. The exterior wall panel system shall be identified with specific installation requirements and ratings including a wind zone category, wind pressure rating, and hail resistance rating as described herein.

Appendix A to this American National Standard is informative and is not part of the requirements of the standard. Appendixes B - G are test procedures and are informative for the performance of the tests.

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1. INTRODUCTION

1.1 Purpose

- 1.1.1 This standard states the test requirements for exterior wall systems which are subjected to natural hazards and weather conditions (e.g. wind, hail, and windblown debris).
- 1.1.2 All exterior wall systems shall be tested and obtain a Class 1 fire rating. Therefore, ANSI 4880, *American National Standard for Evaluating the Fire Performance of Insulated Building Panels Assemblies and Interior Finish Materials*, is a prerequisite for all exterior wall systems.

1.2 Scope

- 1.2.1 This standard sets the performance requirements for exterior wall panel systems that are exposed to natural hazards such as wind, hail, and windborne debris. Exterior wall panel systems include, but are not limited to, wall panels constructed of metal, plastic, mineral wool, composite, or glass fiber.
- 1.2.2 Exterior wall panels systems shall be evaluated with specific installation requirements and ratings including a:
- wind zone category,
 - wind pressure rating, and
 - hail resistance rating.
- 1.2.3 Exterior wall systems shall be tested with specific building installation requirements, including, but not limited to:
- the support thickness and yield strength of the supports,
 - the support spacing use in the building construction, and
 - the fasteners, fastening accessories, and fastening scheme of the panels to the supports.
- 1.2.4 Any component which may be used in the installation of an exterior wall panel system such as fasteners, clips, or any other accessories, are considered part of the scope of the product and must be evaluated as part of the system. Any component that may affect the test performance must be included in the test sample construction.
- 1.2.5 Since environmental conditions can vary by location, this standard is not intended to determine the suitability of the use of a product at a particular location.
- 1.2.6 This standard shall not be used to qualify metal composite materials (MCM), cavity walls, fenestration products such as doors, windows and storm shutters, exterior insulated finish systems (EIFS), or other exterior wall coating systems.

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 national and international organizations. The advice of manufacturers, users, trade associations and loss control specialists has also been considered.
- 1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of exterior wall systems.

1.4 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 equivalent value may be approximate. Appendix A lists some of the selected units used in testing these products; conversions to SI units are included. Conversion of U.S. customary units is in accordance with American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)/American Society for Testing Materials (ASTM) SI 10, "American National Standard for Metric Practice."

2. GENERAL INFORMATION

2.1 Product Information/Application

The desired wind zone category, wind rating, and hail ratings shall be selected by the panel manufacturer of an exterior wall system prior to performance testing. Since weather conditions can vary widely throughout the world, desired ratings should be based, in part, on the geographical location where an exterior wall system shall be constructed, and its surroundings as well as the historical meteorological events that have occurred and are likely to occur in the future.

Exterior wall systems that meet the requirements of this standard shall maintain the integrity of the building structure for the Approved wind zone category and design ratings. However, during a weather event wall systems may unexpectedly experience conditions which exceed the Approved ratings. All systems should be examined after each storm for damage that could adversely affect its performance in future storms, and repairs should be made as soon as possible to any damaged areas.

2.2 Wind Zone Category

There are three different wind zone categories:

- Non-Tropical Cyclone (NTC)
- Tropical Cyclone (TC)
- Tropical Cyclone Missile (TCM)

Each zone has different performance requirements and wind pressure rating limitations that are applicable to the weather conditions which the zone would typically experience. The performance requirements for each zone are detailed in Section 4, and the wind pressure rating limitations are detailed in Section 2.3.

2.3 Wind Pressure Rating

The wind pressure rating of an exterior wall system shall be the maximum inward and outward pressures (+P/-P) successfully tested under the Wind Pressure Rating Test. The positive sign (+P) is used to signify the inward pressure or the applied force which is pushing the wall assembly against the supports. The negative sign (-P) is used to signify the outward pressure or the applied force pulling the wall assembly away from the supports.

Wind pressures on a building can vary and are based on multiple factors including, but not limited to, wind speeds and terrain at geographic location of the building, and the building geometry such as building height, width, and the roof slope. Due to these variable factors, the desired rating shall be selected by the wall panel manufacturer and shall be within the minimum and maximum ratings allowed for the desired wind zone category shown in Table 1.2. The rating shall be given in

increments of 5 lbs/ft² (0.25 kPa).

Table 1.2 Minimum and Maximum Wind Pressure Ratings per Wind Zone Category

Wind Zone Category	Minimum Wind Pressure Rating* +P/-P (lbs/ft ²)	Wind Speeds (3-Second Gusts) Associated with Minimum Pressure Rating*	Maximum Wind Pressure Rating +P/-P (lbs/ft ²)
NTC	+40/-40	85 mph (38 m/s)	+75/-75
TC	+45/-45	95 mph (42 m/s)	None
TCM	+60/-60	110 mph (49 m/s)	None

*The minimum wind pressure rating is based on the associated wind speed of that zone and other critical factors including the least critical building geometries and surrounding terrain. Higher pressure ratings may be desired for specific geographic locations with higher wind speeds and/or more critical terrains and/or more critical building geometries.

2.4 Hail Resistance Rating

All exterior wall assemblies shall have a Hail Resistance Rating of either Moderate (MH), Severe (SH), or Very Severe (VSH). The rating evaluated shall be selected by the wall panel manufacturer.

3. APPLICABLE DOCUMENTS AND GLOSSARY

3.1 Applicable Documents

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

3.1.1 American Society for Testing and Materials (ASTM) International

ASTM E330/E330M-14, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

ASTM E1233/E1233M-14, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differential

ASTM E1886-13a, 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 E1996-14a, Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Windborne Debris in Hurricanes

3.1.2 American National Standard (ANSI)

ANSI FM 4880, American National Standard for evaluating (A) Insulated Building Panels Assemblies or (B) Interior Finish Materials,

3.1.3 Building Codes

Florida Building Code 5th Edition (2014), Test Protocols for High-Velocity Hurricane Zones

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

3.1.4 International Building Code

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

3.2 Terminology

For purposes of this standard, the following terms apply:

Exterior Wall Panel System

An assembly or construction of materials and/or components which form the outer protective layer of a building structure. An exterior wall system typically consists of, but are not limited to, supports, wall panels, fasteners, and a fastener scheme.

Inward Pressure (+P)

A condition created on the windward side of a building measured in force pounds per unit area (pounds per square foot, PSF). It is caused by wind forces and places forces toward the wall. It is also known as positive pressure. The positive sign (+P) is used to signify the inward pressure of the wind pressure rating of an exterior wall panel system.

Moderate Hail (MH) Rating

A moderate hail rating is given to an exterior wall panel that is capable of withstanding the simulation of moderate hail in the Hail Resistance Rating Test. The simulation of moderate hail is created by projecting ice balls with a nominal 1.5 in. (38 mm) diameter with a minimum kinetic energy of 7.8 ft-lbs (10.4 J) at an exterior wall panel.

Outward Pressure (-P)

A condition created on the leeward side of a building measured in force pounds per unit area (pounds per square foot, PSF). It is caused by wind forces and places forces away from the wall. It is also known as negative pressure. The negative sign (-P) is used to signify the outward pressure of the wind pressure rating of an exterior wall panel system.

Wind Pressure Rating (+P/-P)

The maximum inward and outward pressures (+P/-P) successfully tested under the Wind Pressure Rating Test.

Severe Hail (SH) Rating

A severe hail rating is given to an exterior wall panel that is capable of withstanding the simulation of severe hail in the Hail Resistance Rating Test. The simulation of severe hail is created by projecting ice balls with a nominal 1.75 in. (44 mm) diameter with a minimum kinetic energy of 14.9 ft-lbs (20.3 J) at an exterior wall panel.

Supports

The horizontal and/or vertical steel framing of a building structure that a wall panel is directly secured or fastened too. Supports are also known as girts, studs, sheeting rail, etc.

Tropical Storm

A storm in which wind rotates about a center of low atmospheric pressure, clockwise in the southern hemisphere and counterclockwise in the northern hemisphere. Tropical storms include but are not limited to, hurricanes, typhoons, and tropical cyclones.

Very Severe Hail (VSH) Rating

A very severe hail rating is given to an exterior wall panel that is capable of withstanding the simulation of very severe hail in the Hail Resistance Rating Test. The simulation of very severe hail is created by projecting ice balls with a nominal 2 in. (50.8 mm) diameter with a minimum kinetic energy of 53 ft-lbs (71.8 J) at an exterior wall panel.

Windborne Debris

Objects and pieces of broken materials that have become airborne projectiles due to the high winds caused by tropical storms.

Zone Tropical Cyclone (TC)

An area prone to tropical storms. External wall systems with a TC Zone shall have a minimum wind pressure rating of +45/-45 based on an associated wind speed of 95 mph which this area may experience.

Zone Non- Tropical Cyclone (NTC)

An area that is not prone to tropical storms. External wall systems with a NTC Zone shall have a minimum wind pressure rating of +40/-40 based on an associated wind speed of 85 mph which this area may experience. Also, an NTC Zone shall not exceed a wind pressure rating of +75/-75, higher ratings require successful performance requirements for a TC Zone.

Zone Tropical Cyclone Missile (TCM)

An area prone to tropical storms that could produce windborne debris. External wall systems with a TCM Zone shall have a minimum wind pressure rating of +60/-60 based on an associated wind speed of 110 mph which this area may experience.

4. GENERAL REQUIREMENTS

4.1 Markings

4.1.1 Markings on the product or, if not possible, on its packaging or label accompanying the product, shall include the following information:

- name and address of the manufacturer or marking traceable to the manufacturer,
- date of manufacture or code traceable to date of manufacture or lot identification, and
- model number or product identification.

4.1.2 When hazard warnings are needed, the markings shall be universally recognizable.

4.1.3 All markings shall be legible and durable.

4.2 Instructions

The manufacturer shall provide the user with:

- instructions for the installation, maintenance, and operation of the product; and
- services to ensure proper installation, inspection, or maintenance for products of such nature that it would not be unreasonable to expect the average user to be able to provide such installation, inspection, or maintenance.

4.3 Drawings/Formulations/Specifications Required

The manufacturer shall provide complete system installation drawings, including; supports, fasteners, fastener spacing, etc.

4.4 Fasteners, Clips, and Other Accessories

All fasteners, clips, stress plates, and/or other accessories used in the installation of an exterior wall assembly shall be evaluated in conjunction with the exterior wall assembly.

5. PERFORMANCE REQUIREMENTS

Performance requirements are based on desired ratings. Not all tests listed under this section are applicable to every rating. The requirements for each rating covered by this Standard are detailed in each section.

Tests of alternate constructions may be waived if considered less critical than those which were previously tested.

5.1 Wind Pressure Rating

5.1.1 Requirement:

The desired pressure rating and zone category shall be selected by the wall panel manufacturer prior to the Wind Pressure Rating Test. The desired pressure rating (+P/-P) shall be within the minimum and maximum allowed for that particular zone category, as detailed in Table 1.2 and the rating shall be given in increments of 5 lbs/ft² (0.25 kPa).

An (1) exterior wall assembly sample shall consist of the installation of wall panels on supports. The components and their utilization during the assembly shall set requirements and/or limitations for all installations of the exterior wall system. These requirements and/or limitations include, but are not limited to:

- supports (strength and thickness)
- fasteners, clips, stress plates, and/or other accessories, and
- spacing of supports, fasteners, clips, stress plates, and/or other accessories.

All exterior wall systems shall be subjected to the static pressure sequence, shown in Table 5.1.1, and a cyclic pressure sequence for the targeted zone category. The cyclic pressure sequence for Zone Non-Tropical Cyclone (NTC) is shown in Table 5.1.2. The cyclic pressure sequence for Zone Tropical Cyclone (TC) and Tropical Cyclone Missile (TCM) is shown in Table 5.1.3.

Table 5.1.1 Static Pressure Sequence for all Zone Categories (NTC, TC, and TCM)

Loading Sequence	Pressure Direction	Static Pressure Based on Pressure (P)	Duration of Pressure
1	Inward	0.5(P)	1 minute
2	Inward	1.0(P)	1 minute
3	Outward	0.5(P)	1 minute
4	Outward	1.0(P)	1 minute