



Examination Standard for Cavity Wall Systems

Class Number 4411

December 2021

Foreword

This standard is 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 this standard is to present the criteria for examination of various types of products and services.

Examination in accordance with this standard shall demonstrate compliance and verify that quality control in manufacturing shall ensure a consistent and reliable product.

TABLE OF CONTENTS

1 INTRODUCTION.....	1
1.1 Purpose.....	1
1.2 Scope.....	1
1.3 Basis for Requirements	1
1.4 Basis for Certification	2
1.5 Basis for Continued Certification	2
1.6 Effective Date.....	2
1.7 System of Units	2
1.8 Normative References.....	3
1.9 Terms and Definitions.....	4
2 GENERAL INFORMATION	5
2.1 Product Information.....	5
2.2 Certification Application Requirements.....	5
2.3 Requirements for Samples for Examination.....	5
3 GENERAL REQUIREMENTS	6
3.1 Review of Documentation.....	6
3.2 Markings	6
3.3 Manufacturer’s Installation Instructions	6
3.4 Fasteners, Clips, and Other Accessories	6
3.5 Calibration.....	7
4 PERFORMANCE REQUIREMENTS.....	8
4.1 Resistance to Interior Fire Spread.....	8
4.2 16 ft. (4.9 m) High Parallel Panel Test.....	9
4.3 Simulated Wind Load Ratings.....	9
4.4 Corrosion Resistance Test.....	10
4.5 Hail Resistance Rating	10
4.6 Determination of pH of Aqueous Insulation Extraction	11
4.7 Noncombustible Rated Insulation (optional).....	11
4.8 Manufacturing Quality Control Tests	11
4.9 Identification Tests - Standard Practice for General Techniques for Obtaining Infrared Spectra for Qualitative Analysis, ASTM E1252	12
4.10 Identification Test – FM Approvals Thermal Desorption Gas Chromatography Mass Spectrometry (TD/GC/MS).....	12
4.11 Additional Tests.....	12
5 OPERATIONS REQUIREMENTS.....	13
5.1 Demonstrated Quality Control Program.....	13
5.2 Surveillance Audit	13
5.3 Installation Inspections.....	14
5.4 Manufacturer's Responsibilities.....	14
6 BIBLIOGRAPHY	14

1 INTRODUCTION

1.1 Purpose

- 1.1.1 This standard states testing and certification requirements for cavity wall systems. The primary use of cavity walls is to allow moisture that has penetrated the exterior surface to drain down the cavity space to flashing that directs the water to weep holes that allow the water to drain from the cavity.
- 1.1.2 Testing and certification criteria includes, but may not be limited to, performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a surveillance program.

1.2 Scope

- 1.2.1 This standard applies to any component intended for use in a cavity wall system.
- 1.2.2 Cavity wall systems are exterior wall constructions typically consisting of two walls separated by a cavity which contains an air gap. For cavity wall systems, the exterior facade can be made of brick or masonry construction, insulated or non-insulated panels, or ventilated siding. The interior can be made of combustible or noncombustible construction materials. Systems installed with ventilated siding, including metal faced panels (i.e. Aluminum Composite Material (ACM) or Metal Composite Material (MCM)), are often referred to as rainscreen systems. The cavity can contain insulation and other components which can be used to minimize heat loss in colder climates and solar gain in warmer climates. Insulation can be supplied in many forms including, but not limited to, rigid board stock and spray foam. Other components such as air and moisture retarders or weather resistive barriers (WRBs) may also be present.
- 1.2.3 Cavity wall systems that are tested in accordance with this standard must have an air gap. Systems without an air gap shall be tested to FM Approvals Examination Standard 4880, *Class I Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings and Exterior Wall Systems*, ANSI FM 4880, *American National Standard for Evaluating Insulated Wall or Wall and Roof/Ceiling Assemblies, Plastic Interior Finish Materials, Plastic Exterior Building Panels, Wall/Ceiling Coating Systems, Interior or Exterior Finish Systems*, FM Approval Standard 4881, *Class I Exterior Wall Systems*, or ANSI FM 4881, *American National Standard for Evaluating Exterior Wall Systems*, as applicable.
- 1.2.4 Systems that are tested in accordance with this standard must have adequate fire resistance on the interior side. Constructions without adequate fire resistance shall meet the requirements of FM Approvals Examination Standard 4881, *Class I Exterior Wall Systems*.
- 1.2.5 This standard does not grant certification for cavity wall systems as hourly rated fire barriers.
- 1.2.6 This standard shall not qualify exterior insulated finish systems (EIFS) or other exterior wall coating systems.
- 1.2.7 This standard is limited to constructions with 1 – 4 in. (25 – 102 mm) wide air gaps.

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 organizations. The advice of manufacturers, users, trade associations, jurisdictions and/or loss control specialists was also considered.
- 1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of cavity wall systems for the purpose of obtaining certification. Systems having characteristics not anticipated

by this standard may be certified if performance equal, or superior, to that required by this standard is demonstrated.

1.4 Basis for Certification

Certification 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 products for their intended use as a wall system;
- the performance of the products as specified by the manufacturer and required for certification; and as far as practical,
- the durability and reliability of the products when used as a certified wall system.

1.4.2 An examination of the manufacturing facilities for components and completed assemblies and audit(s) of quality control procedures may be made to evaluate the manufacturer's ability to consistently produce the products which are examined and tested, and the marking procedures used to identify the products. Subsequent surveillance may be required by the certification agency in accordance with the certification scheme to ensure ongoing compliance.

1.5 Basis for Continued Certification

The basis for continual certification may include, but is not limited to, the following based upon the certification scheme and requirements of the certification agency:

- production or availability of the products as currently certified;
- the continued use of acceptable quality control procedures;
- satisfactory field experience;
- compliance with the terms stipulated by the certification;
- satisfactory re-examination of production samples for continued conformity to requirements; and
- satisfactory surveillance audits conducted as part of the certification agency's product surveillance program.

1.6 Effective Date

The effective date of this certification standard mandates that all products tested for certification after the effective date shall satisfy the requirements of this standard.

The effective date of this standard is eighteen (18) months after the publication date of the standard for compliance with all requirements.

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. Conversion of U.S. customary units is in accordance with the ANSI/IEEE/ASTM SI 10.

1.8 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the cited edition applies.

- 1.8.1 American National Standards Institute, 1899 L Street, NW, Washington, DC 20036

ANSI FM 4880, *American National Standard for Evaluating the Fire Performance of Insulated Building Panel Assemblies and Interior Finish Materials*

ANSI FM 4881, *American National Standard for Evaluating Exterior Wall Systems*

ANSI/IEEE/ASTM SI 10, *American National Standard for Metric Practice*

- 1.8.2 FM Approvals, 1151 Boston-Providence Turnpike, Norwood, Massachusetts 02062

FM 4880, Class 1 Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings and Exterior Wall Systems

FM 4881, Class 1 Exterior Wall Systems.

- 1.8.3 ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428

ASTM C167, Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations

ASTM C303, Standard Test Method for Dimensions and Density of Preformed Block or Broad-Type Thermal Insulation

ASTM C871, Standard Test Methods for Chemical Analysis of Thermal Insulation Materials for Leachable Chloride, Fluoride, Silicate and Sodium Ions

ASTM D482, Standard Test Method for Ash of Petroleum Products

ASTM D1622, Standard Test Method for Apparent Density of Rigid Cellular Plastics

ASTM D1929, Standard Test Method for Determining Ignition Temperature of Plastics

ASTM D6294, Standard Test Method for Corrosion Resistance of Ferrous Metal Fastener Assemblies Used in Roofing and Waterproofing

ASTM E1252, Standard Practice for General Techniques for Obtaining Infrared Spectra for Qualitative Analysis

ASTM E1642, Standard Practice for General Techniques of Gas Chromatography Infrared (GC/IR) Analysis

ASTM E2058, Standard Test Method for Measurement of Material Flammability Using a Fire Propagation Apparatus (FPA)

- 1.8.4 British Standards Institute, 389 Chiswick High Road, London W4 4AL, United Kingdom

BS EN 1670, *Building Hardware – Corrosion Resistance – Requirements and Test Methods*

1.8.5 International Organization for Standardization, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva Switzerland

ISO 1716, Reaction-to-Fire tests for Building Products – Determination of the Heat of Combustion

1.8.6 National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169

NFPA 275, *Standard Method of Fire Tests for the Evaluation of Thermal Barriers*

1.9 Terms and Definitions

For purposes of this standard, the following terms apply:

Air Gap – The void between the inner surface of the exterior façade and insulation or sheathing within a cavity wall.

Cavity – The distance between the interior surface of the exterior façade and the interior structure of a cavity wall. The cavity may be partially filled with insulation, air retarders or other cavity wall components.

Cavity Wall System – Exterior wall constructions typically consisting of two layers of wall surfacing or sheathing separated by a cavity which contains an air gap. Rainscreen assemblies are a type of cavity wall system where the exterior facade is ventilated siding (i.e. ACM or MCM panels) that allows for drainage and evaporation inside the cavity. Components that may be present inside the cavity include, but are not limited to, insulation, thermal barriers, weather resistant barriers, and air and moisture retarders.

Factory Assembled – Cavity wall systems that are fabricated in a factory and delivered to their destination as a complete system.

Field Erected – Cavity wall systems in which individual components arrive separately at a site where they are assembled in place.

Insulation – Insulation is any of a variety of materials designed to reduce the flow of heat, either from, or into, a building.

Noncombustible – The property of a material to not ignite or burn. Materials are classified as noncombustible if they meet the optional requirements for noncombustible core rating in FM Approval Standard 4880, *Class 1 Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings, and Exterior Wall Systems*.

Spray Foam Insulation – The field applied spray foam insulation systems consist of multiple components delivered to a job site where they are mixed and sprayed in place prior to applying the wall covering.

Thermal Barrier – A material, product or assembly that prevents or delays ignition of an unexposed surface by limiting the temperature rise and by acting as a flame exposure barrier for a minimum of 15 minutes. This would include ½ in. (13 mm) or greater thickness of gypsum wall board, or a material, product or assembly that has met the requirements of NFPA 275 *Standard Method of Fire Tests for the Evaluation of Thermal Barriers*.

Thermoplastic – Polymers which soften when heated and harden when cooled. This process is repetitive provided the material is not heated above the point at which decomposition occurs.

Thermoset – A material that solidifies or “sets” irreversibly when heated. This property is usually associated with cross linking of the molecules induced by heat, chemical reaction or radiation.

2 GENERAL INFORMATION

2.1 Product Information

Cavity wall systems are exterior wall constructions typically consisting of two walls separated by a cavity which contains an air gap. For cavity walls, the exterior facade is typically made of brick or masonry construction, insulated or non-insulated panels or ventilated siding. The interior can be made of combustible or noncombustible construction materials. Systems installed with ventilated siding, including metal faced panels, masonry, etc., are often referred to as rainscreen systems. The cavity often contains insulation, weather resistive barriers and other components. The cavity wall systems can be factory made or field assembled. Other designs meeting the criteria of this standard may also be considered for certification.

2.2 Certification Application Requirements

The manufacturer shall provide the following preliminary information with any request for certification consideration:

- A complete list of all models, types, sizes, and options for the products being submitted for certification consideration;
- General assembly drawings, complete set of manufacturing drawings, raw material suppliers and specifications, proprietary formulations, anticipated marking format, brochures, sales literature, spec. sheets, installation, operation and maintenance procedures; and
- The number and location of manufacturing facilities,
- Desired wind zone category, hail rating and pressure rating, as applicable.
- All documents shall identify the manufacturer's name, document number or other form of reference, title, date of last revision, and revision level.
- All documents shall be provided with English translation.

2.3 Requirements for Samples for Examination

2.3.1 Observation of Test Sample Production

2.3.1.1 If a cavity wall system has foam plastic insulation components, production of the foam plastic component(s), including the blending of the polyol side of any two-part thermoset plastic foam, shall be witnessed. Witnessing of the isocyanate side or any other insulation material shall be at the discretion of the certification agency.

2.3.1.2 Witnessing of production of additional components of the cavity wall system will be at the discretion of the certification agency.

2.3.2 Sample requirements will be determined by the certification agency following review of the preliminary information.

2.3.3 Requirements for samples may vary depending on design features, results of prior or similar testing, and results of any foregoing tests.

2.3.4 The manufacturer shall submit samples representative of production. Any decision to use data generated using prototypes is at the discretion of the certification agency.

2.3.5 It is the manufacturer's responsibility to provide any necessary test fixtures, such as those which may be required to evaluate the insulated cavity wall construction or components.

3 GENERAL REQUIREMENTS

3.1 Review of Documentation

- 3.1.1 During the initial investigation and prior to physical testing, the manufacturer's specifications and details shall be reviewed to assess the ease and practicality of installation and use. The certification examination results may further define the limits of the final certification.

3.2 Markings

- 3.2.1 Marking on the product or, if not possible due to size, 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;
- model number or product identification,
- “Must be installed in accordance with the manufacturer’s provided installation guidelines”.

- 3.2.2 The certification agency’s mark of conformity shall be displayed visibly and permanently on the product and/or packaging as appropriate and in accordance with the requirements of the certification agency. The manufacturer shall exercise control of this mark as specified by the certification agency and the certification scheme.

- 3.2.3 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 Surveillance Audit Program.

- 3.2.4 All markings shall be legible and durable.

3.3 Manufacturer’s Installation Instructions

- 3.3.1 The manufacturer shall supply all necessary instructions and other assistance to the installer to ensure proper installation in accordance with the certified wall assembly. Printed instructions shall be provided by the manufacturer to demonstrate proper installation procedures. In addition, the written instructions shall include any specific installation requirements as contained in other pertinent FM Approvals standards.

- 3.3.2 As part of the certification examination, and at the discretion of the certification agency, at least one inspection of a field installation during and/or after completion may be required. In some cases, a continued program of inspections shall be necessary to assess the application procedures or changes within the application techniques.

3.4 Fasteners, Clips, and Other Accessories

- 3.4.1 All fasteners, clips, stress plates, and/or other accessories used in the installation of a cavity wall system shall be evaluated in conjunction with the cavity wall system.

- 3.4.2 With the exception of generic fastening accessories such as, but not limited to, nuts, bolts and rivets, all fasteners, clips, and stress plates used in a cavity wall system assembly shall require an examination of the manufacturing facility(ies) and/or the quality control facility(ies), audit of quality assurance procedures, and the surveillance audit program.

- 3.4.3 At the discretion of the certification agency, other accessories that may affect the test performance shall require an examination of the manufacturing facility(ies), audit of quality assurance procedures, and a surveillance audit program.

3.5 Calibration

- 3.5.1 Each piece of equipment used to verify the test parameters shall be calibrated within an interval determined on the basis of stability, purpose, and usage. A copy of the calibration certificate for each piece of test equipment is required. The certificate shall indicate that the calibration was performed against working standards whose calibration is certified and traceable to an acceptable reference standard and certified by an ISO/IEC 17025 accredited calibration laboratory. The test equipment shall be clearly identified by label or sticker showing the last date of the calibration and the next due date. A copy of the service provider's accreditation certificate as an ISO/IEC 17025 accredited calibration laboratory should be available.
- 3.5.2 When the inspection equipment and/or environment is not suitable for labels or stickers, other methods such as etching of control numbers on the measuring device are allowed, provided documentation is maintained on the calibration status of this equipment.

4 PERFORMANCE REQUIREMENTS

Performance requirements are based on product type. Not all tests listed under this section are applicable to every product type and/or rating.

At the sole discretion of the certification agency, tests of alternate constructions may be waived if considered less hazardous than those previously tested.

Confirming tests may be required, at the discretion of the certification agency, depending on design features and results of any foregoing tests.

Following a test failure, a re-test of an identical or similar assembly shall be at the sole discretion of the certification agency and with a technical justification of the conditions or reasons for the failure. When a test specimen fails to meet the certification acceptance criteria for a given classification/rating, two successful test specimens of the same or similar construction must meet the certification acceptance criteria to qualify for the given classification/rating. For each failed specimen, two successful test specimens are required. Any test specimen that fails more than three times is no longer considered a candidate for certification.

Prior to testing, assemblies shall be permitted to cure for a maximum period of 28 days.

4.1 Resistance to Interior Fire Spread

4.1.1 Test Method for Fire Spread within Cavity Wall Systems

Cavity wall systems must demonstrate an ability to withstand vertical fire spread in the cavity of the wall construction. Testing for resistance to interior fire spread shall be in accordance with a modified version of Appendix D of ANSI FM 4880, *American National Standard for Evaluating the Fire Performance of Insulated Building Panel Assemblies and Interior Finish Materials*.

Modifications include:

1. Sample size is 4x8 ft (1.2x2.4 m).
2. The ignition source for the 2 in. (51 mm) wide test cavity is a 12 in. (305 mm) long by 2 in. (51 mm) wide by 12 in. (305 mm) high sand burner. The ignition source for the 4 in. (102 mm) wide test cavity is a 12 in. (305 mm) long by 4 in. (102 mm) wide by 12 in. (305 mm) high sand burner.
3. The output of the sand burner is set by controlling the propane gas flow rate. The propane is to be of commercial grade with a minimum of 85% propane content. At a height of 6 in. (152 mm) above the propane burner, the heat flux to the sample surface is 40 to 45 kW/m² (3.5 to 4.0 BTU/ft²/s).
4. The target propane flow rate for the 2 in. (51 mm) wide burner is 4.2 L/min (0.15 ft³/min). The corresponding chemical heat release rate is 5.8 kW (5.5 BTU/s).
5. The target propane flow rate for the 4 in. (102 mm) wide burner is 6.8 L/min (0.24 ft³/min). The corresponding chemical heat release rate is 9.5 kW (9.0 BTU/s).
6. Steel sheet metal is installed along the top of the test construction to simulate a vertical fire stop.
7. The bottom of the test construction is also sealed with sheet metal in order to maintain realistic air flows within the construction. A slot is placed in the bottom piece of sheet metal to accommodate the appropriate sand burner.
8. The test assembly is representative of both sides of the cavity.

If certification is desired for a single air gap that is 1 – 2 in. (25 to 51 mm) wide, the construction will be tested as a 2 in. (51 mm) air gap. If certification is desired for a single air gap that is greater than 2 in. (51 mm) but less than 4 in. (102 mm) wide, the construction will be tested as a 4 in. (102 mm) air gap. If certification is desired for a construction with a range of air gap widths, more than one full scale test will be required.

4.1.1.1 Conditions of Acceptance

During the 15 minute exposure to the propane sand burner, the specimen shall exhibit a chemical heat release rate equal to or less than 100 kW (95 BTU/s) and a maximum visible flame height equal to or less than 6 ft. (1.8 m).

4.2 16 ft. (4.9 m) High Parallel Panel Test

Cavity wall systems must demonstrate an ability to withstand fire spread on the exterior façade of the wall construction. Testing for resistance to fire spread shall be in accordance with Appendix D of ANSI FM 4880, *American National Standard for Evaluating the Fire Performance of Insulated Building Panel Assemblies and Interior Finish Materials*.

This test may be waived at the discretion of the certification agency for cavity wall systems having an exterior facade that is made from concrete, masonry, uninsulated / single skin panels, or similar components.

4.2.1 Conditions of Acceptance:

For no height restriction, the maximum gross chemical heat release rate (PCHRR) during the 16 ft (4.9 m) High Parallel Panel fire test shall be less than, or equal to, 830 kW.

For a maximum height of 50 ft (15.2 m) restriction, the maximum gross chemical heat release rate (PCHRR) during the 16 ft (4.9 m) High Parallel Panel fire test shall be less than, or equal to, 1100 kW.

4.3 Simulated Wind Load Ratings

Testing for simulated wind load ratings shall be in accordance with FM Approvals Examination Standard 4881, *Class 1 Exterior Wall Systems*. The tests shall include exposure to static air pressure differentials and cyclic air pressure differentials.

Cavity wall systems having an exterior facade that is made from concrete, masonry, or similar components shall not be subjected to these tests and shall be considered meeting the wind load requirements of FM Approvals Examination Standard 4881. The value for the wind load ratings of these types of systems shall be evaluated by a registered design professional and submitted to the certification agency.

4.3.1 Structural Test Method for Exterior Wall Systems Exposed to Static Air Pressure Differentials

Testing for simulated wind load ratings when exposed to static air pressure differentials shall be accordance with ANSI FM 4881, *American National Standard for Evaluating Exterior Wall Systems*.

4.3.1.1 Conditions of Acceptance

The specimen shall be considered to meet the test criteria if there is no sign of cracking, fastener pull-out or any other signs of failure.

4.3.2 Structural Test Method for Exterior Wall Systems Exposed to Cyclic Air Pressure Differentials Testing for simulated wind load ratings when exposed to cyclic air pressure differentials shall be in accordance with ANSI FM 4881, *American National Standard for Evaluating Exterior Wall Systems*.

4.3.2.1 Conditions of Acceptance

The specimen shall be considered to meet the test criteria if there is no sign of cracking, fastener pull-out or any other signs of failure.

4.4 Corrosion Resistance Test

Corrosion resistance testing is conducted on the fasteners and fastening components that are located inside of the cavity wall system.

4.4.1 Testing for corrosion resistance shall be in accordance with *Standard Test Method for Corrosion Resistance of Ferrous Metal Fastener Assemblies Used in Roofing and Waterproofing*, ASTM D6294, or *Building Hardware – Corrosion Resistance – Requirements and Test Methods*, BS EN 1670.

4.4.2 Conditions of Acceptance

4.4.2.1 For ASTM D6294:

Through visual inspection, the amount of red rust is determined. Staining is not considered red rust. A sample passes the corrosion test when no specimen has a rust area of greater than 15%. Any sign of coating blistering, peeling, or cracking is cause for failure.

- For threaded fasteners, the measure of rust is based on the fastener area above the substrate through which the threads are driven.
- For hammered fasteners, the measure of rust is based on the fastener area above the substrate into which the fastener is hammered. It excludes the portion impacted by the hammering device.
- For stress plates, the measure of rust is based on the top and bottom surfaces. It excludes the 1/16 in. (1.6 mm) inward from the outside perimeter of the top and bottom surfaces and 1/32 in. (0.8 mm) concentrically outward from the perimeter edge of the center hole on the top and bottom surface.

4.4.2.2 For BS EN 1670:

Samples must meet a minimum Grade 3 (high corrosion resistance) classification.

4.5 Hail Resistance Rating

Testing for hail resistance ratings shall be in accordance with FM Approvals Examination Standard 4881, *Class 1 Exterior Wall Systems*. The tests shall include a simulated hail impact test using freezer ice balls.

4.5.1 Simulated Hail Resistance Test Using Freezer Ice Balls

Testing for simulated hail resistance shall be in accordance with ANSI FM 4881, *American National Standard for Evaluating Exterior Wall Systems*.

Cavity wall systems having an exterior surface that is made from concrete, masonry, or similar components shall not be subject to this test and shall be considered meeting the Very Severe Hail (VSH) requirements of FM Approvals Examination Standard 4881.

4.5.2 Conditions of Acceptance

The specimen shall be considered to meet the test criteria if there is no sign of cracking or splitting.

4.6 Determination of pH of Aqueous Insulation Extraction

4.6.1 Test Method for Determination of pH of Aqueous Insulation Extraction

Insulation materials must demonstrate a limited contribution to corrosion of metallic components in the cavity wall system. Testing samples for determination of pH value shall be in accordance with ASTM C871 *Standard Test Methods for Chemical Analysis of Thermal Insulation Materials for Leachable Chloride, Fluoride, Silicate and Sodium Ions*.

4.6.2 Conditions of Acceptance

The average of 3 tests shall have a pH value greater than or equal to 4.0.

4.7 Noncombustible Rated Insulation (optional)

Homogeneous and non-homogenous insulation may be rated as noncombustible when it meets the noncombustible core requirements of FM Approvals Examination Standard 4880, *Class 1 Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings, and Exterior Wall Systems*. This testing applies to both the insulation inside of the cavity and the core insulation of any insulated panels.

4.8 Manufacturing Quality Control Tests

The data developed from the following small scale quality control tests shall be maintained on file by the certification agency. The certification agency places no limits on the results of these tests. Results of these tests will be considered nominal for the certified product. Should periodic control testing of the certified product at any time yield different results from the original small scale test, re-examination of the certified product may be necessary.

4.8.1 Convective Flame Spread Parameter

For thermoset plastic or other combustible components of the cavity wall system, the chemical heat of combustion (ΔH_{ch}), critical heat flux for ignition (\dot{q}_{cr}''), thermal response parameter (TRP) and convective flame spread parameter (FSP_c) shall be determined using ASTM E2058, *Standard Test Method for Measurement of Material Flammability Using a Fire Propagation Apparatus (FPA)*.

4.8.2 Density of Insulating Core

The density of the bare insulating core shall be determined using ASTM C167, *Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations*, ASTM C303, *Standard Test Method for Dimensions and Density of Preformed Block or Broad-Type Thermal Insulation* or ASTM D1622, *Standard Test Method for Apparent Density of Rigid Cellular Plastics*.

4.8.3 Ignition Properties of Plastic Components (optional)

For all plastic components (foam core, facings, etc), the self-ignition and flash-ignition temperatures shall be determined using ASTM D1929, *Standard Test Method for Determining Ignition Temperature of Plastics*.

4.8.4 Heat Content of Plastic Components (optional except for noncombustible rating)

For all plastic components (foam core, facings, etc), the heat content shall be determined using ISO 1716, *Reaction-to-Fire tests for Building Products – Determination of the Heat of Combustion*.

4.8.5 Ash Content of Plastic Components (optional except for noncombustible rating)

For all plastic components (foam core, facings, etc), the total ash content shall be determined using ASTM D482, *Standard Test Method for Ash of Petroleum Products*.

4.9 Identification Tests - Standard Practice for General Techniques for Obtaining Infrared Spectra for Qualitative Analysis, ASTM E1252

4.9.1 Requirement:

For sheet materials, adhesives and other components as applicable, FTIR spectra shall be determined and reported at the discretion of the certification agency¹.

Test/Verification: *Standard Practice for General Techniques for Obtaining Infrared Spectra for Qualitative Analysis, ASTM E1252*

Note 1: These tests are conducted for identification purposes. The certification agency places no limits on the values obtained.

4.10 Identification Test – FM Approvals Thermal Desorption Gas Chromatography Mass Spectrometry (TD/GC/MS)

4.10.1 Requirement:

For foam plastic and other applicable materials TD/GC/MS Spectrograms shall be determined and reported at the sole discretion of the certification agency ¹.

Test/Verification: *Standard Practice for General Techniques of Gas Chromatography Infrared (GC/IR) Analysis, ASTM E1642*

Note 1: These tests are conducted for identification purposes. The certification agency places no limits on the values obtained.

4.11 Additional Tests

Additional tests may be required, at the discretion of the certification agency, depending on design features and results of any foregoing tests.

Any test following a failure shall be acceptable only at the discretion of the certification agency and with a technical justification of the conditions or reasons for failure.

5 OPERATIONS REQUIREMENTS

5.1 Demonstrated Quality Control Program

5.1.1 A quality assurance program is required to assure that subsequent cavity wall systems produced by the manufacturer shall present the same quality and reliability as the specific construction examined. Design quality, conformance to design, and performance are the areas of primary concern.

- Design quality is determined during the examination and tests, and may be documented in the certification report.
- Continued conformance to this standard is verified by certifier's surveillance program.
- Quality of performance is determined by field performance and by periodic re-examination and testing.

5.1.2 The manufacturer shall demonstrate a quality assurance program which specifies controls for at least the following areas:

- existence of corporate quality assurance guidelines;
- incoming quality assurance, including testing;
- in-process quality assurance, including testing;
- final inspection and tests;
- equipment calibration;
- drawing and change control;
- packaging and shipping; and
- handling and disposition of non-conforming materials.

5.1.3 Documentation/Manual

There should be an authoritative collection of procedures/policies. It should provide an accurate description of the quality management system while serving as a permanent reference for implementation and maintenance of that system. The system should require that sufficient records are maintained to demonstrate achievement of the required quality and verify operation of the quality system.

5.1.4 Records

To assure adequate traceability of materials and products, the manufacturer shall maintain a record of all quality assurance tests performed, for a minimum period of two years from the date of manufacture.

5.1.5 Drawing and Change Control

- The manufacturer shall establish a system of product configuration control that shall allow no unauthorized changes to the product. Changes to critical documents, identified in the certification report, must be reported to, and authorized by the certification agency prior to implementation for production.
- Records of all revisions to all certified products shall be maintained.

5.2 Surveillance Audit

5.2.1 An audit of the manufacturing facility may be part of the certification agency's surveillance requirements to verify implementation of the quality assurance program. Its purpose is to determine that the manufacturer's equipment, procedures, and quality program are maintained to ensure a uniform product consistent with that which was tested and certified.

5.2.2 Certified products or services shall be produced or provided at, or provided from, location(s) disclosed as part of the certification examination. Manufacture of products bearing a certification mark is not permitted at any other location prior to disclosure to the certification agency.

5.3 Installation Inspections

Field inspections may be conducted to review an installation. The inspections are conducted to assess ease of application, and conformance to written specifications. When more than one application technique is used, one or all may be inspected at the discretion of the certification agency.

5.4 Manufacturer's Responsibilities

The manufacturer shall notify the certification agency of changes in product construction, components, raw materials, physical characteristics, coatings, component formulation or quality assurance procedures prior to implementation.

6 BIBLIOGRAPHY

ISO/IEC 17025, *General Requirements for the Competence of Testing and Calibration Laboratories*.