
**Thermal insulation products —
Exterior insulation and finish
systems —**

**Part 1:
Materials and systems**

iTeh STANDARD PREVIEW
*Produits isolants thermiques — Systèmes de finition et d'isolation
externe —*
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Partie 1: Matériaux et systèmes

ISO 17738-1:2017

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html. (standards.iteh.ai)

This document was prepared by ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 3, *Thermal insulation products*.

A list of all parts in the ISO 17738 series can be found on the ISO website.

Introduction

ISO 17738 comprises three parts: this document deals with the material performance of exterior insulation and finish systems (EIFS), ISO 17738-2¹⁾ provides guidance on installation and ISO 17738-3¹⁾ gives guidance on the design of an EIFS system.

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Thermal insulation products — Exterior insulation and finish systems —

Part 1: Materials and systems

1 Scope

This document outlines requirements for exterior insulation and finish systems (EIFS), used in combination with a drained air space as an exterior wall cladding system. It also outlines the requirements for water resistive barrier systems that are to be used with EIFS.

The EIFS wall cladding system is comprised of liquid-applied water resistive barrier, an adhesive for attachment of the thermal insulation boards to the substrate, rigid thermal insulation boards, a glass fibre reinforcing mesh embedded in a base coat on the face of the thermal insulation boards and a finish coat.

The use of mechanical fasteners is outside the scope of this document, but is acceptable as a complement and/or as an alternate to adhesive for attachment where the substrate will not support adhesive attachment of the EIFS.

In EIFS, the thermal insulation boards support the base coat with integral glass fibre reinforcing mesh. Systems where the reinforcement is the supporting element of the rendering, e.g. conventional stucco, are not covered by this document.

This document does not purport to address all the health and safety aspects associated with its use. Anyone using this document has the responsibility to consult the appropriate authorities and to establish health and safety practices, in conjunction with any existing applicable regulatory requirements, prior to its use.

2 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 edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 846, *Plastics — Evaluation of the action of microorganisms*

ISO 1463, *Metallic and oxide coatings — Measurement of coating thickness — Microscopical method*

ISO 1663:2007, *Rigid cellular plastics — Determination of water vapour transmission properties*

ISO 1926, *Rigid cellular plastics — Determination of tensile properties*

ISO 3451-1, *Plastics — Determination of ash — Part 1: General methods*

ISO 4606, *Textile glass — Woven fabric — Determination of tensile breaking force and elongation at break by the strip method*

ISO 4611, *Plastics — Determination of the effects of exposure to damp heat, water spray, and salt mist*

ISO 4628:2016, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 4: Assessment of degree of cracking*

ISO 4650, *Rubber — Identification — Infrared spectrometric methods*

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ISO 4898, *Rigid cellular plastics — Thermal insulation products for buildings — Specifications*

ISO 8145, *Thermal insulation — Mineral wool board for overdeck insulation of roofs — Specification*

ISO 15148, *Hygrothermal performance of building materials and products — Determination of water absorption coefficient by partial immersion*

ISO 15821, *Doorsets and windows — Water-tightness test under dynamic pressure — Cyclonic aspects*

ISO 16474-3, *Paints and varnishes — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7345 and ISO 9229 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 adhesive
product for adhering the thermal insulation board (3.21) to the water resistive barrier system (3.23)

3.2 base coat
polymer-based coating, either *factory-blended* (3.10) or *field-mixed* (3.11), applied directly to the *thermal insulation board* (3.21), fully embedding the *reinforcing mesh* (3.17) providing the primary barrier to water penetration

3.3 cure
develop the ultimate properties of an initial wet state material by a chemical process

3.4 drainage cavity
space between the WRB and *thermal insulation board* (3.21) that allows for the free drainage of water that penetrates the *EIFS* (3.9)

3.5 dry
develop the ultimate properties of an initial wet state material solely by evaporation of volatile ingredients

3.6 durability
ability of a building or any of its components to perform its required functions in its service environment over a period of time without unforeseen cost for maintenance or repair

3.7 EIFS manufacturer
producer of the materials and components forming a proprietary *EIFS* (3.9)

3.8 embed
press into and encapsulate the *reinforcing mesh* (3.17) in the *wet base coat* (3.2)

3.9 exterior insulation and finish system EIFS

non-load-bearing wall cladding system comprised of *LA-WRB* (3.15), an *adhesive* (3.1) for attachment of the *thermal insulation board* (3.21) to the LA-WRB, rigid thermal insulation board, a glass fibre *reinforcing mesh* (3.17) embedded in a *base coat* (3.2) on the face of the thermal insulation board and a *finish coat* (3.12)

3.10 factory-blended

material that arrives from the manufacturer requiring no additions apart from water to produce the wet state material

3.11 field-mixed

materials that are mixed in the field by combining two or more materials, other than, or in addition to water

3.12 finish coat

outermost coat applied over the *base coat* (3.2), which gives the wall its colour and texture, exclusive of sealers and paints

3.13 geometrically defined drainage cavity GDCC

path created between the WRB and *thermal insulation board* (3.21) through the use of thermal insulation board that has a pattern cut into its back

3.14 lamina

composite of *base coat* (3.2), *reinforcing mesh* (3.17) and *finish coat* (3.12)

3.15 liquid applied water resistive barrier LA-WRB

fluid material applied by spray, roller or trowel, that dries to a membrane possessing low water absorption properties becoming a component of the *water resistive barrier system* (3.23)

3.16 manufacturer's installation instructions

written installation instructions provided by the *EIFS manufacturer* (3.7) that include information that will assist in the correct use and installation of the materials and components that comprise their system

3.17 reinforcing mesh

woven or non-woven glass fibre fabric component of the *EIFS* (3.9) encapsulated in the *base coat* (3.2) to strengthen the system

3.18 substrate

structural component supporting the *EIFS* (3.9), which is resistant to deterioration caused by water or is protected by a *water resistive barrier system* (3.23)

3.19 test sample

prepared materials or systems from which *test specimens* (3.20) are taken

3.20 test specimen

portion of a *test sample* (3.19) taken for measurement of a given property or characteristic

3.21

thermal insulation board

component that functions to reduce heat flow through the wall and serves as the surface to receive the *base coat* (3.2)

3.22

water absorption coefficient

mass of water absorbed by a *test specimen* (3.20) under specified time and pressure, per unit area and per square root of time

3.23

water resistive barrier system

WRB

material(s) possessing low water absorption properties that are applied over *substrates* (3.18) susceptible to water absorption to create a continuous surface that prevents water penetration into the wall assembly

3.24

water retention ratio

weight of water retained in the *test specimen* (3.20) following the drainage capacity test divided by the projected area of wetted wall

3.25

wrap

protect the exposed edges of *thermal insulation board* (3.21) by back-wrapping or edge-wrapping

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4 Requirements

4.1 EIFS constituent products

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4.1.1 The constituent products of EIFS shall meet the technical requirements listed in [Table 1](#).

4.1.2 Rigid cellular plastic thermal insulation board shall meet the requirements of ISO 4898.

4.1.3 Semi-rigid mineral fibre thermal insulation board shall meet the requirements of ISO 8145.

4.2 LA-WRB

The LA-WRB shall meet the technical requirements listed in [Table 2](#). Where the LA-WRB is not intended by the EIFS manufacturer for application to a wood substrate, the LA-WRB does not have to meet the requirements for the following:

- a) joint durability test;
- b) nail popping resistance test.

The type of wood substrate can have an effect on the adhesion of the LA-WRB to the substrate. Given its nature of manufacture, oriented strand board (OSB) is deemed to represent a worst-case scenario in this regard. Therefore, any LA-WRB that passes the tests required in [5.4](#), when applied to OSB, shall be deemed suitable for use on plywood.

4.3 EIFS

The EIFS shall be tested as an assembly as required in [5.5](#); the associated technical requirements for the system are listed in [Table 3](#).

4.4 Special applications

Special applications may require properties other than, or in addition to, those specified in this document. These properties, when agreed upon by the interested parties, may be added to the requirements of this document.

5 Testing

5.1 Sampling

Random sampling, of a minimum number of material components, as required to complete the necessary testing, shall be carried out by an organization determining compliance with this document. A random selection of materials is to be obtained from the production or main storage facility for identification before they are sent to the testing laboratory. The identified samples are then to be forwarded directly to the testing laboratory.

5.2 Preparation of sample panels

5.2.1 As a minimum, the following test sample panels shall be prepared.

5.2.1.1 One nominal 610 mm × 610 mm panel consisting of 25 mm thick thermal insulation board and base coat, including reinforcing mesh shall be prepared. The base coat and reinforcing mesh shall be applied at the thickness stipulated by the EIFS manufacturer, determined for the purpose of confirmation as a mass per unit area, as per 5.2.5. This test sample panel shall be used for preparation of the test specimens for the following tests:

- a) bond strength test of the base coat;
- b) base coat water impermeability test;
- c) water absorption of the base coat test.

5.2.1.2 Five nominal 610 mm × 610 mm panels consisting of 25 mm thick thermal insulation board and base coat, including reinforcing mesh, and finish coat. The edges of four of the panels shall be wrapped with base coat, reinforcing mesh and finish coat. The base coat shall be allowed to cure for a minimum of 24 h prior to application of the finish coat. The base coat and reinforcing mesh and finish coat shall be applied at the thicknesses stipulated by the EIFS manufacturer, determined for the purpose of confirmation as a mass per unit area, as per 5.2.5. This test sample panel shall be used for preparation of the test specimens for the following tests:

- a) bond strength test of the finish coat;
- b) water vapour permeance of the lamina test;
- c) lamina salt spray resistance test;
- d) lamina ultraviolet resistance test;
- e) EIFS impact resistance test (the wrapped panels).

5.2.1.3 One nominal 610 mm × 1 220 mm vertical wood frame to which is attached 19 mm thick OSB sheathing meeting the requirements of ISO 16894 and having a water absorption coefficient of $(0,002 \pm 0,001) \text{ kg/m}^2 \text{ s}^{1/2}$. The OSB sheathing shall include a joint with a width of 3,2 mm, as shown in Figure 1. The OSB shall be free of any dirt, dust or other deleterious substances that may affect the adhesion of the LA-WRB. The LA-WRB shall be applied to the OSB in strict accordance with the manufacturer's installation instructions and at the minimum thickness recommended by the manufacturer, determined

for the purpose of confirmation as a weight per unit area, as per 5.2.5. This test sample panel shall be used for preparation of the test specimens for the following tests:

- a) bond strength test of the LA-WRB;
- b) water absorption coefficient of the LA-WRB test;
- c) joint durability test;
- d) accelerated weathering resistance test of the LA-WRB.

5.2.1.4 One nominal 610 mm × 610 mm panel consisting of LA-WRB applied to nominally 13 mm thick glass mat gypsum sheathing. The LA-WRB shall be applied in accordance with the manufacturers installation instructions and at the thickness stipulated by the EIFS manufacturer, determined for the purpose of confirmation as a mass per unit area, as per 5.2.5. This test sample panel shall be used for preparation of the test specimens to test the water vapour permeance of the LA-WRB.

5.2.2 The test sample panels shall be prepared in a vertical orientation to simulate installation in the field.

5.2.3 For the installation requirements of EIFS and LA-WRB, see ISO 17738-2²⁾.

5.2.4 The test sample panels shall be conditioned at (23 ± 2) °C and (50 ± 5) % relative humidity for a minimum of 14 d.

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5.2.5 The applied material thickness shall be verified as a mass per unit area, as follows. In determining the area of the test sample panel, its linear dimensions shall be measured to an accuracy of 1 mm.

5.2.6 Using the thickness stipulated by the EIFS manufacturer, and the density of the material as provided by the EIFS manufacturer, the required mass of material to be applied to the test sample panel shall be determined as follows:

$$\text{Mass (g)} = \text{Density (kg/m}^3\text{)} \times \text{area of test sample panel (mm}^2\text{)} \times \text{thickness (mm)} \times 10^{-6}.$$

The initial mass of the material including its storage container shall be measured to an accuracy of 1/1 00 of the mass.

Material shall be removed from the storage container and applied uniformly to the test sample panel until the mass of material removed is equal to the mass determined. The mass of material removed shall be determined by measuring the mass of the remaining material, including its storage container, until the difference between the initial mass and the final mass is equal to the mass determined to an accuracy of 1/1 00 of the mass.

Care shall be taken in removing material from the storage container and in its application that all material is applied to the test sample panel. If any material is lost (i.e. dropped before it reaches the test sample panel), its mass shall be determined and taken into consideration when determining the amount of material applied to the test sample panel.

5.2.7 Test specimens, unless otherwise specified in the test methods, shall be obtained from the conditioned test sample panels described in 5.2.1.1 through 5.2.1.4. Care and caution shall be exercised when cutting the test specimens from the test sample panels so that the bond between materials is not affected. The speed of the saw blade, the number of teeth per inch and other cutting variables shall be considered in test specimen preparation in order to avoid excess vibrations or heat build-up.

2) Under preparation.

5.3 EIFS constituent material tests

5.3.1 Ash content

5.3.1.1 This test shall be conducted only if deemed necessary by the testing agency as a means of identification of the test sample materials submitted.

5.3.1.2 When conducted, test specimens shall be prepared and the ash content of the base coat and finish coat material shall be determined in accordance with ISO 3451-1 and the results shall be expressed as a percentage of the initial weight of the dry test specimen.

5.3.2 Infrared analysis

5.3.2.1 This test shall be conducted only if deemed necessary by the testing agency as a means of identification of the test sample materials submitted.

5.3.2.2 Test specimens shall be prepared and the absorption spectrum of the organic fraction of the binder used in the formulation of the base coat and finish coat shall be determined in accordance with ISO 4650 and the results shall be recorded on a plot of percent transmittance vs. wavelength.

Test specimen preparation for infrared analysis is provided in [Annex H](#).

5.3.3 Bond strength tests

5.3.3.1 Test specimen preparation and testing of the bond strength of the adhesive, base coat and finish coat shall be according to [Annex A](#).

5.3.3.2 The average of the results of the bond strength test shall be reported in Pa for each state tested (initial, wet and dry).

5.3.4 Water vapour permeance of the lamina

5.3.4.1 Three test specimens of a size suitable for the test equipment to be used shall be cut from the test sample panel specified in [5.2.1.2](#) and the lamina carefully removed from the thermal insulation board. The dry thickness of the lamina shall be measured in at least five locations on each test specimen and the average thickness reported.

5.3.4.2 The water vapour permeance of the lamina shall be determined according to ISO 1663 with the face coat of the lamina exposed to the test chamber.

5.3.4.3 The average water vapour permeance of the lamina shall be reported in $\text{ng}/(\text{Pa}\cdot\text{s}\cdot\text{m}^2)$.

5.3.5 Base coat water impermeability test

5.3.5.1 Three test specimens measuring 200 mm × 200 mm shall be cut from the test sample panel described in [5.2.1.1](#). The edges of each test specimen shall be sealed with wax or other suitable vapour impermeable material.

NOTE A wax meeting the requirements of ISO 1663:2007, 5.8, “sealant wax”, would be a suitable material to use for sealing the edges of the test specimens.

5.3.5.2 Over a surface area of 100 mm × 100 mm in the centre of the test specimens, the thermal insulation board shall be removed, by scraping, down to the back of the base coat. Methyl Violet 2B powder shall be brushed onto the back of the base coat.

5.3.5.3 The test specimens, with the coatings facing downward, shall be placed in a tank of water to a depth of $(5 \pm 0,25)$ mm for at least 2 h.

5.3.5.4 After two hours, the area of dampness on the test specimen as determined by a colour change in the Methyl Violet 2B powder shall be recorded as a percentage of the total exposed base coat area. Any observation of liquid water shall be recorded.

5.3.6 Water absorption of the base coat

5.3.6.1 Two test specimens measuring 100 mm × 100 mm shall be cut from the test sample panel described in [5.2.1.1](#) and the thermal insulation board shall be detached from each of them.

5.3.6.2 The test specimens shall be dried in a well-ventilated oven for 24 h at a temperature of (105 ± 2) °C. After cooling at room temperature for 15 min, the dry weight of the test specimens shall be measured and reported to the nearest 0,01 g.

5.3.6.3 Each test specimen shall then be immersed flat, 5 mm below the surface of distilled (20 ± 5) °C water for a period of 48 h.

5.3.6.4 After 48 h immersion, the weight of each test specimen shall be measured to the nearest 0,01 g. The water absorption shall be determined by the increase in mass in relation to the dry weight of the specimen expressed as a percentage of the dry weight of the test specimen. The average percentage water absorption of the two test specimens shall be reported.

5.3.7 Finish coat fungus resistance test

5.3.7.1 One test specimen shall be prepared by applying finish coat onto a clean 50 mm × 50 mm glass slide. The finish coat shall be applied according to manufacturer's installation instructions.

5.3.7.2 The fungus resistance test shall be conducted according to ISO 846. The test specimen shall be incubated for a minimum of 28 d.

5.3.7.3 At the end of the test period, the test specimen shall be examined for fungal growth on the finish coat material and the observations recorded according to the requirements of ISO 846.

5.3.8 Lamina salt resistance test

5.3.8.1 Three test specimens measuring 100 mm × 300 mm shall be cut from the test sample panel described in [5.2.1.2](#). The edges of each test specimen shall be sealed with wax.

5.3.8.2 The test specimens shall be tested according to ISO 4611 for 300 h.

5.3.8.3 The test specimens shall be visually examined without magnification.

5.3.8.4 Any deleterious effects, such as cracking or flaking, shall be recorded.

5.3.9 Lamina ultraviolet resistance test

5.3.9.1 Three test specimens measuring 100 mm × 300 mm shall be cut from the test sample panel described in [5.2.1.2](#). The edges of each test specimen shall be sealed with wax.

5.3.9.2 The test specimens shall be tested according to ISO 16474-3. The xenon arc device shall be used with a borosilicate inner filter and a borosilicate outer filter. The parameters of testing shall be as follows:

- a) 102 minutes of light exposure with no water spray [black panel temperature of (63 ± 2) °C and $(50 \% \pm 5 \%)$ RH];
- b) 18 min of light exposure with water spray [water temperature at (16 ± 3) °C];
- c) the above cycle (A and B) is repeated for 18 h;
- d) 6 h of darkness, no water spray [black panel temperature of (24 ± 2) °C and $(95 \pm 5) \%$ RH];
- e) the above cycle (A through D) represents 24 h or 1 d exposure. The cycle is repeated for a total of at least 1 998 h of light exposure (2 664 h or 111 d total).

5.3.9.3 At the end of the testing, the test specimens shall be visually examined without magnification.

5.3.9.4 Any deleterious effects, such as cracking or flaking, shall be recorded.

5.3.10 Reinforcing mesh strength and alkalinity resistance

5.3.10.1 A minimum of 20 test specimens, each measuring 50 mm wide and 300 mm long, shall be prepared from the lightest weight of mesh used with a proprietary system. At least 10 test specimens shall have the long dimension in the direction of the weft and 10 test specimens shall have the long dimension in the direction of the warp. At least five of each type of test specimen shall be exposed to an alkaline solution for 28 d and then allowed to dry for 7 d in accordance with ISO 4606.

5.3.10.2 The clamps of the testing machine shall be covered with a suitable rubber surface and be sufficiently rigid to resist deformation during the test. The clamps shall hold the whole width of the test specimens.

The results of test specimens that slip in the jaws of the testing machine, which break at the edge of or in the jaws, or which tear in a cascading effect, shall be discarded. Therefore, it is recommended that more than the minimum number of test specimens be prepared to ensure five acceptable test results are obtained for each state.

5.3.10.3 The strength of the reinforcing mesh shall be tested according to ISO 4606 and the results determined in N/mm, for the following:

- a) five test specimens in their initial state in the weft;
- b) five test specimens in their initial state in the warp;
- c) five test specimens after exposure in the weft;
- d) five test specimens after exposure in the warp.

5.3.10.4 The strength of each test specimen and the average strength of the test specimens in their initial state shall be reported in N/mm for both the weft and warp.

5.3.10.5 The strength of each test specimen and the average strength of the test specimens after exposure to the alkaline solution shall be reported in N/mm for both the weft and warp.