

SERVICES

# Building Physics

Laboratory for the development of technological solutions for energy-efficient buildings

Free University of Bolzano-Bozen  
Faculty of Engineering

Head of Laboratory:  
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## TEST OF THERMAL AND ACOUSTIC PROPERTIES OF BUILDING MATERIALS AND COMPONENTS | BUILDING ENVELOPE LAB

All prices quoted are exclusive of VAT

### (1) Test of thermal conductivity of materials

Measurement of the specific thermal resistance and thermal conductivity of a specimen of material with dimensions between 20 x 20 cm and 30 x 30 cm (recommended 30 x 30 cm), with planar surfaces and with a thickness between 1 and 9 cm (recommended thickness between 2 and 5 cm), at an agreed average temperature (usually 10 °C or 23 °C) and a thermal gradient of 20 °C, with moisture content "as received", according to the method with heat flow meter apparatus, in accordance with ISO 8301, 1946-3 and ASTM C518 standards.

€ 250  
per test

Notes on additional services and non-standard tests, for which you are invited to contact the staff of the "Building Envelope Lab" for advice and a specific quotation:

- High-conductivity or non-homogeneous materials cannot be tested with the heat flow meter method available in the laboratory. It is recommended to attach an indication of the nature of the material to be tested together with the request for quotation. Other more suitable solutions could be offered by the laboratory.
- The service does not include drying the material in a ventilated oven. Where this is required, if specified it will be integrated into the quotation.
- The tests can also be carried out at different average temperatures, in a range between 10 °C and 50 °C, to determine the variation in the conductivity of the material at different average temperatures.
- The tests can be carried out at different humidity conditions of the material, after conditioning of the sample in a climatic chamber whose duration depends on the characteristics of the material itself and on the desired moisture content.

### (2) Test of thermal diffusivity of materials

Measurement of the thermal diffusivity of materials according to the LFA method (Laser Flash Analysis) in accordance with the standards ASTM E1461, DIN EN 821, DIN 30905 and ISO 22007-4. It is necessary to provide 4 samples with a radius of 12.7 mm and a thickness of 1 mm. Alternatively, it is recommended to provide a sample of homogeneous material with dimensions of 20 x 20 cm and a thickness of at least 2 cm from which the laboratory staff will extract the specimens for the LFA test; in this case the workability of the material with normal laboratory tools must be guaranteed.

€ 350  
per test

Notes on additional services and non-standard tests, for which you are invited to contact the staff of the "Building Envelope Lab" for advice and a specific quotation:

#### LAB DESK

NOI TECHPARK  
SÜDTIROL / ALTO ADIGE  
A.-VOLTA-STR. 13/A  
VIA A. VOLTA, 13/A  
I-39100 BOZEN / BOLZANO

T +39 0471 066 643  
[LABS@NOI.BZ.IT](mailto:LABS@NOI.BZ.IT)  
[NOI.BZ.IT](http://NOI.BZ.IT)

- Non-homogeneous materials cannot be tested with the LFA method provided in the laboratory. It is recommended to attach an indication of the nature of the material to be tested together with the request for quotation. Other more suitable solutions could be offered by the laboratory.

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| <b>(3) Absorption and desorption of moisture in materials</b>                                                        | <p>Determination of the moisture absorption and desorption curve of the material, after drying the material sample in a ventilated oven and by conditioning in a climatic chamber and precision weighing in accordance with UNI EN ISO 12571.</p> <p>Notes on the service and its price. The cost of the test depends on the following variables:</p> <ul style="list-style-type: none"> <li>– The type and shape of the material specimen strongly affect the achievement of equilibrium conditions. Whereas testing of fibrous and porous materials such as thermal insulators could take a few weeks, a detailed test for other materials (e.g., wood) could take months.</li> <li>– The specimens to be tested are at least 3 per test. If of interest, it is suggested to adopt the same dimensions prescribed for the thermal conductivity test to allow both tests to be carried out. For materials with a particularly low density or in any case less than 300 kg m<sup>-3</sup>, it is recommended to ask the staff of the "Building Envelope Lab" for directions.</li> <li>– The absorption tests are carried out in a range of relative humidity from 30% to 95%, testing at least 4 different conditions. More conditions require more time and cost.</li> </ul> | <p>Lump sum quotation.</p> <p>Starting from € 5.000</p> |
| <b>(4) Test of the thermal conductance and thermal transmittance of opaque elements with homogeneous composition</b> | <p>Determination of the thermal transmittance and conductance of opaque components with homogeneous composition through the method of the double climatic chamber (hotbox) with a heat flow meter according to the standards EN 1934, EN 1946-3 and ASTM C518.</p> <p>Notes on the service. It is recommended to contact the staff of the "Building Envelope Lab" for specific advice on the creation of the specimen to be tested:</p> <ul style="list-style-type: none"> <li>– The wall specimen has a maximum size of 1.7 x 1.7 m. For a better accuracy of the measurement, it is suggested to make the specimen with an insulating guard ring of at least 10 cm per side, with an effective dimension of the wall stratigraphy to be tested not greater than 1.5 x 1.5 m.</li> <li>– The supply and disposal of the specimen is the responsibility of the customer.</li> <li>– Walls with non-homogeneous (frame) stratigraphy cannot be tested with this methodology; other more suitable solutions could be offered by the laboratory (see test 6).</li> <li>– Walls with phase change materials must be tested according to the dynamic procedure (see test 5).</li> </ul>                                                                                            | € 2.000                                                 |
| <b>(5) Test of the periodic thermal transmittance of opaque elements with homogeneous composition</b>                | <p>Determination of periodic thermal transmittance, phase shift and attenuation factor of opaque components with homogeneous composition according to experimental methodology based on modified hot-box and heat flow meter.</p> <p>Notes on the service. It is recommended to contact the staff of the "Building Envelope Lab" for specific advice on the creation of the specimen to be tested:</p> <ul style="list-style-type: none"> <li>– The wall specimen has a maximum size of 1.7 x 1.7 m. For a better accuracy of the measurement, it is suggested to make the specimen with an insulating guard ring of at least 10 cm per side, with an effective dimension of the wall element to be tested not greater than 1.5 x 1.5 m.</li> <li>– The supply and disposal of the specimen is the responsibility of the customer.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                 | € 3.000                                                 |

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| <b>(6) Characterization of the steady-state thermal behavior of walls, floors and doors/windows on a 1:1 scale</b>        | <p>Characterization of the thermal behavior of specimens in a controlled environment and in a steady-state conditions. Testing of walls, floors (including non-homogeneous elements) and doors/windows on a 1:1 scale.</p> <p>Notes on the service. It is recommended to contact the staff of the "Building Envelope Lab" for specific advice on the construction of the specimen to be tested in the triple thermal-acoustic climate of the "Building Envelope Lab".</p> <ul style="list-style-type: none"> <li>- The supply, installation, de-installation, and disposal of the wall/floor/frame specimen is the responsibility of the customer.</li> <li>- The price is quoted based on the specific objective of the analysis, the complexity of the item to be tested and the duration of the test.</li> </ul> | <p>Lump sum quotation.</p> <p>Starting from € 5.000</p> |
| <b>(7) Characterization of the steady-state thermal behavior of thermal bridges and construction nodes on a 1:1 scale</b> | <p>Characterization of the thermal behavior of thermal bridges in correspondence with constructive nodes (2D) in a controlled environment and in steady-state regime.</p> <p>Notes on the service. It is recommended to contact the staff of the "Building Envelope Lab" for specific advice on the thermal bridge to be tested in the triple thermal-acoustic climate of the "Building Envelope Lab".</p> <ul style="list-style-type: none"> <li>- The installation and subsequent removal of the construction node is the responsibility of the client.</li> <li>- The price is quoted based on the specific objective of the analysis, the complexity of the item to be tested and the duration of the test.</li> </ul>                                                                                          | <p>Lump sum quotation.</p> <p>Starting from € 6.000</p> |
| <b>(8) Characterization of the dynamic thermal behavior of walls, floors and doors/windows on a 1:1 scale</b>             | <p>Characterization of the thermal behavior of specimens in a controlled environment and in dynamic regime. Testing of walls, floors (including non-homogeneous elements) and doors/windows on a 1:1 scale.</p> <p>Notes on the service. It is recommended to contact the staff of the "Building Envelope Lab" for specific advice on the construction of the specimen to be tested in the triple thermal-acoustic climate of the "Building Envelope Lab".</p> <ul style="list-style-type: none"> <li>- The supply, installation, removal, and disposal of the wall/floor/frame specimen is the responsibility of the customer.</li> <li>- The price is quoted based on the specific objective of the analysis, the complexity of the element to be tested and the duration of the test.</li> </ul>                 | <p>Lump sum quotation.</p> <p>Starting from € 7.000</p> |
| <b>(9) Characterization of the dynamic thermal behavior of thermal bridges and construction nodes on a 1:1 scale</b>      | <p>Characterization of the thermal behavior of thermal bridges in correspondence of construction nodes (2D) in a controlled environment and in a dynamic regime.</p> <p>Notes on the service. It is recommended to contact the staff of the "Building Envelope Lab" for specific advice on the thermal bridge to be tested in the triple thermal-acoustic climate of the "Building Envelope Lab".</p> <ul style="list-style-type: none"> <li>- The installation and subsequent removal of the constituent elements of the construction node is the responsibility of the client.</li> <li>- The price is quoted based on the specific objective of the analysis, the complexity of the element to be tested and the duration of the test.</li> </ul>                                                                | <p>Lump sum quotation.</p> <p>Starting from € 8.000</p> |
| <b>(10) Determination of the air flow resistivity of materials</b>                                                        | <p>Determination of air flow resistivity of materials according to the measurement method with alternating piston at a frequency of 2 Hz. The test is performed on 3 circular specimens with a diameter of 10 cm.</p> <p>Notes on the service. It is recommended to attach an indication of the nature of the material to be tested together with the request for quotation.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p>€ 400 per test</p>                                   |

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| <b>(11) Measurement of the apparent sound absorption coefficient under diffused field conditions</b> | <p>Determination of the apparent sound absorption coefficient under diffuse field conditions according to EN ISO 354. The measurement is carried out in the reverberation chamber on a sample of material covering a surface between 10 and 12 m<sup>2</sup>.</p> <p>Notes on the service. It is recommended to attach an indication of the nature of the material to be tested together with the request for quotation.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | € 1.100 per test                          |
| <b>(12) Measurement of airborne sound insulation of walls and floors</b>                             | <p>Measurement of the sound reduction index of walls and floors in laboratory conditions according to EN ISO 10140-2. The dimensions of the wall element to be tested are: 3.38 x 3.01 m.</p> <p>Notes on the service. It is recommended to contact the staff of the "Building Envelope Lab" to evaluate the feasibility of the installation of monolithic elements and/or characterized by non-standard dimensions. It is also specified that:</p> <ul style="list-style-type: none"> <li>- The service does not include the construction, demolition and disposal of the elements to be tested.</li> <li>- The reference floor installed in the laboratory is a 200 mm CLT floor.</li> <li>- The characterization of the construction element can be integrated by accelerometric and sound intensity measurements. The quotation of these tests will have to be assessed for the specific case.</li> </ul>                    | € 1.100 per test                          |
| <b>(13) Measurement of impact sound insulation of floors</b>                                         | <p>Measurement of the impact sound insulation and the reduction of the impact noise of CLT floors according to EN ISO 10140-3. The dimensions of the floor element to be tested are: 3.23 x 4.25 m.</p> <p>Notes on the service. It is recommended to contact the staff of the "Building Envelope Lab" to evaluate the feasibility of the installation of monolithic elements and/or characterized by non-standard dimensions. It is also specified that:</p> <ul style="list-style-type: none"> <li>- The service does not include the construction, demolition, and disposal of the elements to be tested.</li> <li>- The reference floor installed in the laboratory is a 200 mm CLT floor.</li> <li>- The characterization of the construction element can be integrated by accelerometric and sound intensity measurements. The quotation of these tests will have to be assessed for the specific case.</li> </ul>         | € 900 per test                            |
| <b>(14) Characterization of thermal resistance and water vapor diffusion resistance of garments</b>  | <p>Characterization of thermal resistance and vapor diffusion resistance of clothing through the use of thermal manikin according to EN 342, ISO 15831, ISO 9920. The tests will be carried out in controlled environmental conditions defined in the reference standards. The test can be carried out in dry mode or in sweating mode, in motion or in static conditions, and with/without activated breathing.</p> <p>Notes on the service. It is recommended to contact the staff of the "Building Envelope Lab" to evaluate the most representative test conditions. It is also reported that:</p> <ul style="list-style-type: none"> <li>- The characterization of the garments can be integrated with a thermographic analysis.</li> <li>- It is also possible to use thermoregulation models to simulate the interaction between manikin and environment and evaluate physiological and perceptual parameters.</li> </ul> | Lump sum quotation. Starting from € 1.500 |