DEFINITIONS

Abrasion resistance

In construction, abrasion resistance describes the loss of mass or volume under the influence of an abrasive factor. The abrasion resistance is an important parameter for materials used for flooring. Manufacturers of construction materials usually define the abrasion resistance with the Böhme method. This is also the method used by ATLAS. For floors, the loss of volume is measured in cm^3 per surface of 50 cm^2. The abrasion resistance of screeds is indicated with the letter A and the number. **Attention! The higher the number given with the symbol “A”, the lower the resistance of the material against abrasion.**

Wet mass

The wet mass W_m is the quotient of the mass of water contained in a material to the mass of dry material:

$$w_m = \frac{m_w - m_s}{m_s} \cdot 100\% = \frac{m_{water}}{m_s} \cdot 100\%$$

when:
w_m – wet mass [%]
m_w – weight of the wet sample [kg]
m_s – weight of the sample after drying to constant weight [kg]
m_{wody} – mass of water contained in the sample [kg]

Absorbency

Absorbency of a material depends on the size and structure of pores. In construction, absorbency is usually determined in terms of weight. It describes the amount of water a material can absorb. In practice, it means the maximum moisture content of a material. The weight-related water absorption determines the ratio of the maximum mass of the water absorbed by a material to the weight of the material in its dry state and is given in percentages. Consequently, an absorbency of 15% means that the material in its wet state is 15% heavier than in the dry state.

Diffusion resistance coefficient μ

This parameter allows to assess the tightness of a building structure (layer) for water vapour. The essence of this phenomenon consists in the "passing" of water vapour through the building structure as a result of the pressure difference on both sides of the building structure. It can be defined as a number indicating how many times in specific thermal conditions the diffusion resistance (resistance to water vapour) of a material layer is greater than the diffusion resistance of an air layer of the same thickness. The μ-factor is a dimensionless quantity, its knowledge alone does not say anything about the water vapour permeability of a building structure. It is therefore important to set it in relation to the thickness of the building structure and to establish the water vapour diffusion equivalent air layer thickness S_d.

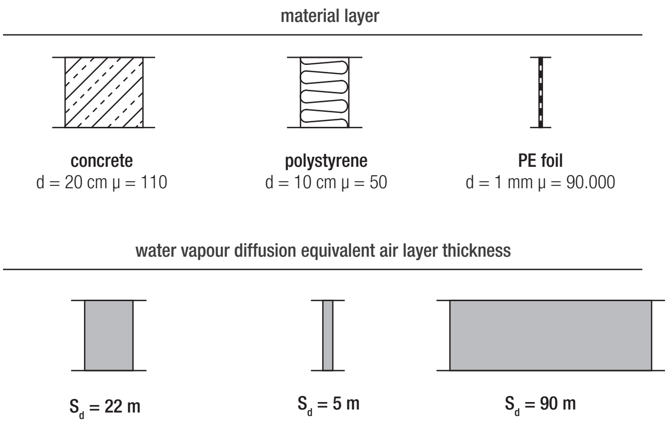
Water vapour diffusion equivalent air layer thickness S_d

The parameter S_d defines the thickness of a stationary air layer characterised by the same diffusion resistance as a layer of the given material with the thickness d.

$$S_d = \mu \cdot d$$

when:
S_d – water vapour diffusion equivalent air layer thickness [m]
μ – diffusion resistance coefficient of the material
d – thickness of the building structure [m]

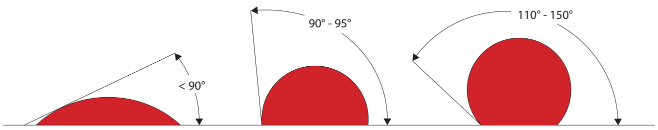
material	Coefficient “μ”	Thickness d [m]	Water vapour diffusion equivalent air layer thickness S_d
air	1.0	1.0	1.0
mineral wool	1.3	0.2	0.26
gypsum	10	0.015	0.15
solid ceramic brick	10	0.5	5
polystyrene	50	0.2	10
concrete	110	0.2	22
plywood	150	0.012	1.8
acrylic render	150	0.003	0.45
bitumimous sheeting	from 6000	0.004	24
PE foil	from 22000	0.001	22



Wetting angle of contact

The wetting angle of contact allows to classify a given material as hydrophobic, i.e. less susceptible to wetting (contact angle > 90°) or hydrophilic, i.e. susceptible to wetting (contact angle < 90°). When a material has a wetting angle of contact of over 110°, it is called superhydrophobic.

The larger the contact angle, the stronger the surface repels water and the substances contained in it, including all kinds of dirt. Water coming into contact with such a surface (e.g. rain) runs off the material together with the contaminations on the surface (dust, pollen and other solid impurities) – the material is therefore self-cleaning.



hydrophilic surface **hydrophobic surface** **hydrophobic-superhydrophobic surface**

Thermal conductivity coefficient "λ"

The thermal conductivity coefficient λ describes the ability of a material to conduct warmth. It is determined by measuring the amount of heat passing through 1 m^2 of a material with a thickness of 1 m at a temperature difference of 1K. A low value of the coefficient λ characterises materials with a low thermal conductivity, which are therefore good thermal insulators. Below a list of the coefficients λ for selected building materials.

Coefficients "λ" for selected building materials

Material	Thermal conductivity coefficient λ [W/mK]
Concrete with stone aggregate	1.00
Wall of solid ceramic bricks	0.77
Wall of hollow ceramic brick with cement-lime masonry mortar	0.33
Pine timber in transverse direction	0.16
Polystyrene	0.031 – 0.045
Mineral wool	0.031 – 0.045

The values given in the table apply to medium-humid materials.

Thermal resistance

The thermal resistance R (m^{2}K/W) depends on the thickness of a layer of material and the coefficient λ and is described with the formula:

$$R = \frac{d}{\lambda}$$

List of layer thicknesses of selected building materials, for which the thermal resistance is the same:

R = 0,25 (m²K/W)

LAYER THICKNESS OF SELECTED MATERIALS WITH THE SAME THERMAL RESISTANCE

Material	Layer thickness [cm] for a thermal resistance of R = 0,25
Polystyrene	1.0
Pine timber in transverse direction	4.0
Wall of hollow ceramic brick	8.0
Wall of solid bricks	19.3
Concrete with stone aggregate	25

Thermal transmittance "U"

The thermal transmittance of a building structure is described with the coefficient "U" [W/(m^{2}K)], which defines the amount of heat passing through 1 m^2 of the structure. In physical terms, the coefficient "U" is the inverse of the thermal resistance "R" of a structure:

$$U = \frac{1}{R}$$

A low U-value means that little heat passes through building structure, e.g. the exterior wall of a building. Therefore, the lower the U-value, the better the thermal insulation of the building structure. As the thermal insulation of walls is key to energy efficiency, it is not surprising that the U-value and, in fact, its limit value are prescribed by the technical conditions to which buildings and their location should conform. Currently, the limit value Uc_{max} for the exterior walls of a residential building must not be greater than 0.23 [W/(m^{2}K)].

HBW – (from the German term *Hellbezugswert*) lightness coefficient (in %)

HBW = 100 means that the entire amount of scattered light is reflected by a surface. The lower the HBW, the more energy is accumulated in the given material, meaning that surface is exposed to greater thermal stresses and therefore more suscetible to cracking.

Intense, especially dark colouors, absorb more light than light colours.

According to the recommendations of the Polish Building Research Institute ITB, colours with an HBW < 20 can be applied on maximum 10%* of a façade surface.

*Atlas Silicone Render can be used for the entire surface of a façade, owing to its special composition and the combination with a suitable adhesive mortar in the reinforcement layer.

DEFINITIONS

Impact resistance

The impact resistance is a material's resistance to impact. This value is important for thermal insulation systems, as they are directly exposed to external mechanical influences during their operation. The higher the impact strength, the better the protection against incidental damage (e.g. vandalism), but also the protection of areas permanently exposed to damage.

Definitions of application categories.

APPLICATION CATEGORY	DESCRIPTION
I	Areas directly accessible from the ground and exposed to possible impacts from hard bodies but not subject to abnormally severe strain
II	Areas exposed to possible impacts caused by thrown or kicked objects but, owing to their public location and height, with a limited degree of exposure, or at lower levels where access is easier, up to places requiring permanent protection
III	Areas unlikely to be damaged by a simple impact (man) or a thrown or kicked object

The purpose of steel ball impact and dynamic puncture tests (Perfotest) is to simulate the effect of heavy objects with a permanent shape (non-deforming) or sharp edges accidentally hitting a thermal insulation system. Based on the results, the system must be assigned to one of the following three categories I, II or III:

	CATEGORY III	CATEGORY II	CATEGORY I
Impact with an energy of 10 J		no fracture**	no damage*
Impact with an energy of 3 J	no fracture**	no cracks	no damage*
Perfotest	no puncture*** with a punch of 20 mm	no puncture*** with a punch of 12 mm	no puncture*** with a punch of 6 mm

* Surface damage without cracks is defined as: “no damage”.
**The test result is assessed as: "fracture occurs", if circular cracks are visible which pass through the render layers to the insulation.
***The test result is assessed as: "puncture occurs", if the render is damaged to a level below the reinforcement layer in at least three of the five test sites.

The values given in the table are taken from ETAG 004 (guidelines for technical approval)

For systems with higher technical parameters, maximum impact loads are determined, to which they can be subjected without any changes in properties, including their appearance. For example, for the system ATLAS ETICS PLUS the maximum impact load is 140 J (when reinforced with the meshes 150 + 340 and with the dispersion adhesive ATLAS STOPTER K100).

UNITS OF MEASUREMENT USED IN CONSTRUCTION

The current system of measurements is the SI system – the International System of Units of Measurement approved in 1960 by the General Conference on Weights and Measures. The SI units are divided into basic and derived units. The table below presents basic SI units as well as selected derived units used in technology, in particular in construction.

Basic and selected derived SI units

BASIC UNITS		
VALUE	**NAME**	**SYMBOL**
Length	metre	m
Weight	kilogramme	kg
Time	second	s
Temperature	Kelvin	K
DERIVED UNITS		
VALUE	**NAME**	**SYMBOL**
Force	Newton	N
Pressure	Pascal	Pa (N/m^2)

Regardless of the official measuring system, there is still a generic system describing primarily stresses, where the unit of stress is a kilogram per unit area expressed in centimetres or in metres. Below are the conversion factors from the SI system to the "generic" system.

CONVERSION OF LOAD AND STRESS UNITS

10 N ≈ 1 kG
1 MPa = 1 N/mm^2
1 MPa ≈ 10 kG/cm^2

EXAMPLE:
the compressive strength of the screed ATLAS Postar 40 is:
30 N/mm^2 = 30 MPa ≈ 300 kG/cm^2

CONVERSION OF THE UNIT OF PRESSURE

1 MPa = 100 000 mm water column = 100 m water column

EXAMPLE:
the resistance to pressurised water of ATLAS Woder Duo is:
0.7 MPa = 70 m water column