iBMB MPA TU BRAUNSCHWEIG
Institut für Baustoffe, Massivbau und Brandschutz | Materialprüfanstalt für das Bauwesen

Assessment Report

- Translation -

Document No.:	(5098/835/14-1) – Wob of 30/07/2014
Client:	Alchimica SA 13, Oryzomylon Street GR 12244 Athens
Order date:	12/02/2014
Order Ref.:	-
Order received:	12/02/2014
Subject:	Determination of thermal conductivity and water vapour diffusion for the Aquasmart Thermo and Aquasmart Paint products
Test basis:	DIN EN 12667
Test material received:	11/04/2014
Sampling:	Made by the client
Test material marking:	Specimen 1: Aquasmart Thermo 1K-PU insulating system Specimen 2: Aquasmart Paint 2K-PU system
Assessment period:	27/05/2014 until 30/07/2014

This Assessment Report consists of 7 pages, including the cover sheet, and 3 annexes.

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Notified body (0761-CPD)
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1 General information

With their letter of 12/02/2014, Alchimica SA, Athens, Greece commissioned the Civil Engineering Materials Testing Institute (MPA) in Braunschweig to determine the thermal conductivity and water vapour diffusion of their coating system, consisting of the materials Aquasmart Thermo 1K-PU insulating system and Aquasmart Paint 2K-PU system. This report contains the results of the thermal conductivity test.

2 Material used for testing

The following materials were used for testing:

Specimen 1: Aquasmart Thermo 1K-PU insulating system, batch No. 24101322
Specimen 2: Aquasmart Paint 2K-PU system, component A: batch No. LDC 1300016
component B: batch No. LOT 02121301

3 Determination of thermal conductivity

3.1 Specimen preparation

The supporting layer for the coating system consisted of commercial gypsum plasterboards, 13 mm thick, that covered an area of 150 x 150 mm. For preparation of the specimens, 22.6 grams each of the Aquasmart Thermo material were applied to six gypsum plasterboards in one application process. This corresponds to a consumption rate of 2 l/m^2. After the specimens had dried, two coats of Aquasmart Paint (mass ratio: comp. B : comp A = 10 : 1) were applied to three of the boards at a consumption rate of 15.8 g/board (0.7 kg/m^2). The specimens were dried at ambient temperature until the weight remained constant. For calculating the layer thickness of the coating system, the total layer thickness of the different specimens was determined before and after coating.

3.2 Testing and test results

At first, the thermal conductivity of the used gypsum plasterboards was determined for two example specimens. After that, the coated specimens were examined. The thermal conductivity was determined at the mean temperatures 10, 20 and 30 °C. The thicknesses and the values for the thermal conductivity and the thermal resistance of the coated and the non-coated specimens, which were calculated from the measured data, are shown in the table below for 10 °C.

Table 1: Results for the gypsum plasterboards (base material)

	Specimen 1.1	Specimen 1.2	**Mean value**
Thickness, base material [m]	0.0128	0.0127	
λ_{10} [w/m*K]	0.2034	0.2019	**0.2026**
R_{10} [m2*K/w]	0.0629	0.0629	**0.0629**

Table 2: Results for the gypsum plasterboards plus Aquasmart Thermo

	Specimen 2.1	Specimen 2.2	Specimen 2.3	**Mean value**
Thickness, base material [m]	0.0127	0.0127	0.0126	**0.0127**
Thickn. base material + Aquas. Thermo [m]	0.0143	0.0145	0.0146	**0.0145**
λ_{10} base material + Aquas. Thermo [W/m*K]	0.1531	0.1483	0.1555	**0.1523**
R_{10} base material + Aquas. Thermo [m2*k/W]	0.0934	0.0978	0.0945	**0.0952**
R_{10} Aquas. Thermo [m2*k/W]	0.0305	0.0349	0.0324	**0.0326**
Thickness Aquas. Thermo [m]	0.00160	0.00175	0.00200	**0.00178**
λ_{10} Aquas. Thermo [W/m*K]	0.052	0.050	0.062	**0.055**

Table 3: Results for the gypsum plasterboards plus Aquasmart Thermo and Aquasmart Paint

	Specimen 3.1	Specimen 3.2	Specimen 3.3	**Mean value**
Thickness, base material [m]	0.0128	0.0128	0.0127	**0.0128**
Thickn. base material + Aquas. Thermo + Aquas. Paint [m]	0.0151	0.0151	0.0152	**0.0151**
λ_{10} base material + Aquas. Thermo + Aquas. Paint [W/m*K]	0.1459	0.1557	0.1548	**0.1521**
R_{10} base material + Aquas. Thermo + Aquas. Paint [m2*k/W]	0.1035	0.0970	0.0982	**0.0996**
R_{10} Aquas. Thermo + Aquas. Paint [m2*k/W]	0.0406	0.0341	0.0360	**0.0369**
Thickness Aquas. Thermo + Aquas. Paint [m]	0.00230	0.00233	0.00246	**0.00236**
λ_{10} Aquas. Thermo + Aquas. Paint [W/m*K]	0.057	0.068	0.068	**0.065**

4 Assessment

Coating a commercial gypsum plasterboard with Aquasmart Thermo or Aquasmart Thermo and Aquasmart Paint considerably reduces the thermal conductivity of the complete system from λ_{10} = 0.203 W/m*K to λ_{10} = 0.152 W/m*K, at a coating thickness of 1.8 and 2.4 mm, respectively. The calculated thermal conductivity for the material Aquasmart Thermo 1K-PU insulating system is about λ_{10} = 0.055 W/m*K, and for the system with Aquasmart Paint 2K-PU system about λ_{10} = 0.065 W/m*K.

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Braunschweig, 30 July 2014

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Annex 1: Test conditions and results of gypsum plasterboard

Pre-measurement material details

Test method	Method with the single-specimen guarded hot plate based on DIN EN 12667
Measuring unit/test set-up:	λ meter EP 500, supplier: Lambda, Dresden/Germany, in accordance with DIN EN 1946-2
Air conditioning/change in weight during the drying process:	at room temperature
Inspector:	Dr. M. Wobst on 21/05 and 26/05/14
Installation thickness:	0.0127 m / 0.0126 m
Other sample preparations:	• Use of a vapour-proof covering (household plastic film) • Use of a thermally conductive paste to improve the connection of the specimens with the measuring geometry
Accuracy:	< 3 %

Post-measurement material details

Thickness:	-0.84 %
Volume:	-0.54 %
Weight:	0.05 %
Density:	0.59 %

Table 4: Thermal conductivity

Sample	Heat flux density [W/m^2]	Temperature difference [°C]	Mean temp. [°C]	Lambda [W/mK]	r [m^{2}K/W]
1.1	158.9	10	10	0.2034	0.0629
1.1	157.2	10	20	0.2012	0.0636
1.1	156.0	10	30	0.1996	0.0641
1.2	157.7	10	10	0.0191	0.0629
1.2	156.7	10	20	0.0063	0.0633
1.2	156.0	10	30	0.1997	0.0636
mean	-*	10	10	0.2067	-*
	-*	10	20	0.2009	-*
	-*	10	30	0.1997	-*

* Since the samples had different thicknesses, mean values for the heat flux density and the thermal resistance cannot be specified.

Annex 2: Test conditions and results of gypsum plasterboard+ Aquasmart Thermo

Pre-measurement material details

Test method	Method with the single-specimen guarded hot plate based on DIN EN 12667
Measuring unit/test set-up:	λ meter EP 500, supplier: Lambda, Dresden/Germany, in accordance with DIN EN 1946-2
Air conditioning/change in weight during the drying process:	at room temperature
Inspector:	Dr. M. Wobst from 11/06 until 13/06/14
Installation thickness:	0.0143 m / 0.0145 m / 0.0146
Other sample preparations:	• Use of a vapour-proof covering (household plastic film) • Use of a thermally conductive paste to improve the connection of the specimens with the measuring geometry
Accuracy:	< 3 %

Post-measurement material details

Thickness:	0.74 %
Volume:	0.64 %
Weight:	0.04 %
Density:	-0.66 %

Table 5: Thermal conductivity

Sample	Heat flux density [W/m^2]	Temperature difference [°C]	Mean temp. [°C]	Lambda [W/mK]	r [m^{2}K/W]
2.1	107.0	10	10	0.1530	0.0935
2.1	107.2	10	20	0.1533	0.0933
2.1	107.2	10	30	0.1533	0.0933
2.2	102.4	10	10	0.1485	0.0977
2.2	102.3	10	20	0.1483	0.0978
2.2	102.5	10	30	0.1486	0.0976
2.3	106.0	10	10	0.1558	0.0934
2.3	104.7	10	20	0.1539	0.0955
2.3	104.3	10	30	0.1534	0.0958
mean	-*	10	10	0.1524	-*
	-*	10	20	0.1518	-*
	-*	10	30	0.1518	-*

* Since the samples had different thicknesses, mean values for the heat flux density and the thermal resistance cannot be specified.

Annex 3: Test conditions and results of gypsum plasterboard+ Aquasmart Thermo and Paint

Pre-measurement material details

Test method	Method with the single-specimen guarded hot plate based on DIN EN 12667
Measuring unit/test set-up:	λ meter EP 500, supplier: Lambda, Dresden/Germany, in accordance with DIN EN 1946-2
Air conditioning/change in weight during the drying process:	at room temperature
Inspector:	Dr. M. Wobst on 01/07 until 04/07/14
Installation thickness:	0.0156 m / 0.0155 m / 0.0154
Other sample preparations:	• Verwendung einer dampfdichten Hülle, Haushaltsfolie • Verwendung einer Wärmeleitfähigkeitspaste zur besseren Ankopplung der Probekörper an die Messgeometrie
Accuracy:	< 3 %

Post-measurement material details

Thickness:	-0.21 %
Volume:	-0.17 %
Weight:	-0.22 %
Density:	-0.05 %

Table 6: Thermal conductivity

Sample	Heat flux density [W/m^2]	Temperature difference [°C]	Mean temp. [°C]	Lambda [W/mK]	r [m^{2}K/W]
3.1	96.4	10	14.3	0.1456	0.0935
3.1	96.0	10	20	0.1449	0.0933
3.1	95.6	10	30	0.1444	0.0933
3.2	103.2	10	10	0.1559	0.0977
3.2	102.3	10	20	0.1544	0.0978
3.2	101.3	10	30	0.1530	0.0976
3.3	101.9	10	10	0.1548	0.0934
3.3	100.9	10	20	0.1534	0.0955
3.3	100.2	10	30	0.1523	0.0958
mean	-	10	10	0.1521	-
	-	10	20	0.1509	-
	-	10	30	0.1499	-

* Since the samples had different thicknesses, mean values for the heat flux density and the thermal resistance cannot be specified.