TECHNICKÝ A ZKUŠEBNÍ ÚSTAV STAVEBNÍ PRAHA, s.p.
Technical and Test Institute for Construction Prague
Akreditovaná zkušební laboratoř, Autorizovaná osoba, Notifikovaná osoba, Oznámený subjekt, Subjekt pro technické posuzování, Certifikační orgán, Inspekční orgán / Accredited Testing Laboratory, Authorized Body, Notified Body, Technical Assessment Body, Certification Body, Inspection Body. Prosecká 811/76a, 190 00 Praha 9, Czech Republic

Laboratory tests for thermal insulation coatings

1. Unique idenficaon code of the product-type: Insulang coang ASTRATEK

2. Intended use: Mulfunconal composion for various purposes. For insulaon of brick, concrete, metal, plasc, wooden and other surfaces.

3. Manufacturer: NPP Termalkom, LLC Address: 1, 25-leya Oktyabrya str., Volgograd, Russia, 400119

4. Authorized representave: Pienne Services Srl via Maria 230 - 03029 Veroli (FR) Italia p.iva 02971050600

5. Nofied Body: NB 1020 TZUS Praha, s.p. Prosecka 811/76a 190 00 Praha 9 – ProsekClassification

6. Report No.: UL-6815

7. Test No.: 1/2

8. Test methods: EN 12667 ISO 8302

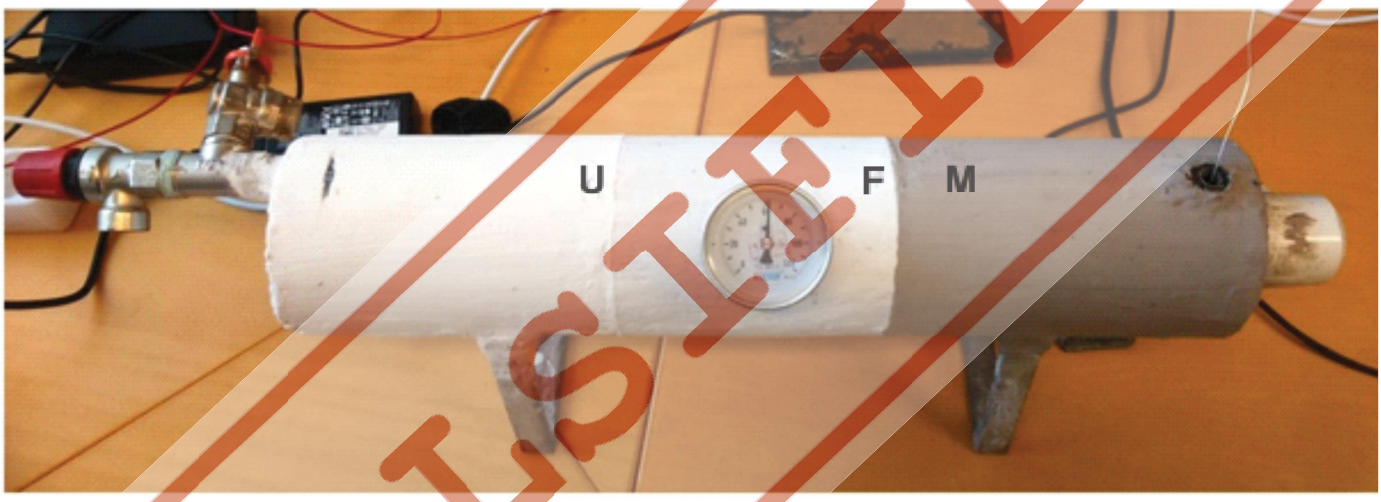
Date of issue: 29.09.2020

Laboratory tests were performed for thermal insulation coatings:

ASTRATEK Metal (M)
ASTRATEK Facade (F)
ASTRATEK Universal (U)

Experimental setup:

Water filled tube (Figure 1) was heated with internal heat source. Temperature was controlled with external controller unit that was connected to thermocouple in the tube (on the right side of the tube). Temperature of tube Metal was measured with thermometer installed into the tube. Room temperature and surface temperature on ASTRATEK coating were measured with Elcometer G319-S temperature gauge.



Calculations:

The following equation is adopted from a patent *Method of determining thermal conductivity coefficient of liquid heat-insulating coatings*.

$$\lambda = \frac{\delta \cdot \alpha \cdot (T - T_{int})}{T_{in} - T}$$

λ = thermal conductivity, W/(m·K)

δ = thickness of the coating, m

α = heat transfer coefficient, W/(m²·K)

T = surface temperature, °C

T_{int} = room temperature, °C

T_{in} = non-coated surface temperature, °C

α = 1,38 W/(m²·K) value given by the manufacturer

Example of calculations

$$\lambda = \frac{0{,}6 \cdot 10^{-3} \cdot 1{,}38 \cdot (46{,}2 - 21)}{64 - 46{,}2} = 0{,}0012$$

Results:

Tn = 64 °C

measurement	thickness of the coating (mm)	surface temperature (°C)	thermal conductivity (W/(m·K)} α = 1,38 W/ (m²·K)
Metal I	0,6	46,2	0,0012
Metal 2	0,7	40,6	0,0008
Metal 3	0,7	42	0,0009
Metal 4	0,9	42,2	0,0012
Metal S	0,6	41,1	0,0007
average			**0,0010**
Facadel	2	29,7	0,0007
Facade2	2	28,2	0,0006
Facade3	0,9	38,6	0,0009
Facade4	1,1	36,1	0,0008
FacadeS	1	38,7	0,0010
average			**0,0008**
Universall	0,9	38,5	0,0008
Universal2	0,8	39,1	0,0008
Universal3	1,3	35,3	0,0009
Universal4	0,8	40,3	0,0009
UniversalS	0,7	40,6	0,0008
average			**0,0008**

n = 77 °C

measurement	thickness of the coating	surface temperature	thermal conductivity (W/(m·K))
	(mm)	(°C)	α= 1,38 W/(m^2·K)
Metal I	0,4	54,3	0,0008
Metal 2	1,7	38,7	0,0011
Metal 3	0,6	47,7	0,0007
Mmetal 4	0,6	51,1	0,0010
METALS	0,6	50,3	0,0009
average			**0,0009**
Facadel	2	37,2	0,0011
Facade2	2	36,2	0,0010
Facade3	0,8	49,1	0,0011
Facade4	1,1	42,1	0,0009
FacadeS	1	44,1	0,0010
average			**0,0010**
Universall	0,9	40	0,0006
Universal2	0,8	43	0,0007
Universal3	1	40,9	0,0008
Universal4	0,9	43,2	0,0008
UniversalS	0,7	46,5	0,0008
average			**0,0007**

Tn = 90 °C

measurement	thickness of the coating	surface temperature	thermal conductivity (W/(m·K))
	(mm)	(°C)	α = 1,38 W/ (m^2·K)
Metal I	0,4	64	0,0009
Metal 2	1,7	44,9	0,0012
Metal 3	0,8	52,7	0,0009
Metal 4	0,7	55,1	0,0009
Mmetal S	0,8	55,5	0,0011
average			**0,0010**
Facadel	1,9	37,6	0,0008
Facade2	2	36,3	0,0008
Facade3	0,7	51,3	0,0008
Facade4	0,9	49,1	0,0008
FacadeS	1,2	46	0,0009
average			**0,0008**
Universall	0,9	45,6	0,0007
Universal2	0,8	49 , 2	0,0008
Universal3	1	47,9	0,0009
Universal4	0,6	54,7	0,0008
UniversalS	0,8	49,2	0,0008
average			**0,0008**

Tn = 95 °C

measurement	thicknessof the coating	surface temperature	thermal conductivity (W/ (m·K))
	(mm)	(°C)	α = 1,38 W/ (m^2·K)
Metal I	0,6	68,1	0,0014
Metal 2	0,6	64,5	0,0012
Metal 3	0,7	60,4	0,0011
Metal 4	1,5	48,9	0,0012
Metal S	0, 5	62,5	0,0009
average			**0, 0012**
Facadel	2	45,1	0,0013
Facade2	2	43,6	0,0012
Facade3	0,8	58,6	0,0009
Facade4	1,2	52,7	0,0012
FacadeS	1	54,9	0,00 12
average			**0, 0012**
Universall	0,9	58,2	0,0013
Universal2	0,9	58,8	0,0013
Universal3	1,1	60,1	0,0017
Universal4	0,7	61,5	0,0012
UniversalS	1	56,9	0,00 08
average			**0, 0013**

T;n = 97 °C

measurement	thickness of the coating	surface temperature	thermal conductivity (W/(m·K))
	(mm)	(°C)	α = 1,38 W/ (m^2·K)
Metal I	0,7	64,9	0,0013
Metal 2	0,6	63,3	0,0010
Metal 3	0,5	63,1	0,0009
Metal 4	0,6	60,6	0,0009
Metal S	1	56,2	0,0012
average			**0,0011**
Facadel	1,5	53,4	0,0015
Facade2	1,1	54,3	0,0012
Facade3	2	45,2	0,0013
Facade4	1,9	43,6	0,0011
FacadeS	1,2	47	0,0009
average			**0,0012**
Universall	1	63	0,0017
Universal2	1,2	61,5	0,0019
Universal3	0,6	64	0,0011
Universal4	1	58,3	0,0013
UniversalS	0,9	60,5	0,0013
average			**0,0015**

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One has to take into account that these measurements do not experimentally determine the absolute value of λ .In these calculations the order of magnitude of λ is determined by one of the

factor a provided by manufacturer, other inaccuracy comes from the measurement of temperatures.
Now calculated average values for thermal conductivity coefficient λ are in all measured temperatures in line with the value provided by the manufacturer, **0,0012 W/(m·K).**

As a conclusion, now performed temperature measurements show out the thermal insulation properties of the thermal insulation coatings ASTRATEK Metal, ASTRATEK Facade and ASTRATEK Universal.

Taina Laiho, Dr.

Materials Research Laboratory