INSTITUTE OF ARCHITECTURE AND
CONSTRUCTION OF KAUNAS
UNIVERSITY OF TECHNOLOGY

BUILDING PHYSICS LABORATORY

CALCULATION REPORT No. 111 SF/23

Date: 06 of June 2023

Determination of installed thermal resistance into a roof and into a wall of ATI COMBI PRO TOITURE according to EN ISO 6946:2017

(test name)

Test method: Determination of installed thermal resistance into a roof and into a wall according to EN ISO 6946:2017
(number of normative document or test method, description of test procedure, test uncertainty)

Product name: **ATI COMBI PRO TOITURE**
(identification of the specimen)

Customer: SAS ATI FRANCE, 146 Avenue du Bicentenaire – FR-01120 Dagneux, France
(name and address of enterprise)

Manufacturer: SAS ATI FRANCE, 146 Avenue du Bicentenaire – FR-01120 Dagneux, France

Calculation results:

Roof slope angle, α	Calculation method reference no.	Calculation result, R, $(m^2 \cdot K)/W$
Flat roof (α = 0°)	EN ISO 6946:2017	**6.36**
Pitched roof (α = 30°)		**6,46**
Pitched roof (α = 45°)		**6,51**
Wall (α = 90°)		**6.73**
R value for others pitched sloop (different α value) can be determined by linear interpolation between two calculated R values		

Calculation made by: Building Physics Laboratory, Institute of Architecture and Construction of Kaunas University of Technology
(Name of the organization)

Products used in calculation:
Ventilated air layer (external surface resistance R_{se}).
Multilayer reflective insulation product **ATI PRO BASIC P** (test report no. 082 SF/23 U). Emissivity of ATI PRO BASIC P upper surface $\varepsilon = 0.75$*; lower surface $\varepsilon = 0.15$*;
Unventilated air layer 20 mm;
Multilayer reflective insulation product **ATI PRO PREMIUM** (test report no. 106 SF/23 U). Emissivity of ATI PRO PREMIUM upper surface $\varepsilon = 0.10$*; lower surface $\varepsilon = 0.10$*;
Unventilated air layer 20 mm.
* Declared by the manufacturer

Additional information: Application, 2023-06-02
Annex: *Annex 1. Calculation results*
(the numbers of the annexes should be pointed out)

Head of Laboratory: K. Banionis
(approves the test results) (n., surname) (signature)

Calculated by J. Ramanauskas
(calculation made by) (n., surname) (signature)

S.P.

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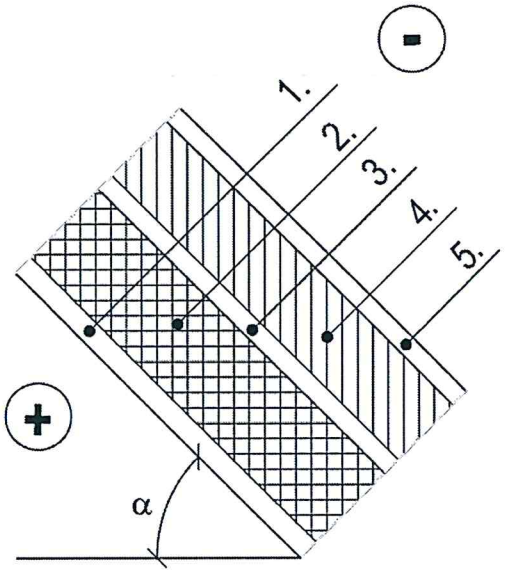
Annex 1: Calculation results

Table 1: Products R- values

Product	Thermal resistance R, (m²·K)/W
ATI PRO BASIC P (test report n° 082 SF/23 U)	$\mathbf{R_{core90/90} = 1.91}$
ATI PRO PREMIUM (test report no. 106 SF/23 U)	$\mathbf{R_{core90/90} = 3.52}$
"Rcore90/90" is the declared R core value following EN 16012 + A1. *"Rcore90/90" is calculated on 4 results of 4 samples came from 4 different fabrication dates following EN 16012 + A1 (and using the fractile 90/90 calculation rules* $S_{R-prod} = \sqrt{\frac{\Sigma(R_i - R_{average})^2}{n-1}}$*;).*	



Temperature regime *20°C / 0°C*	
1.	**Unventilated Air cavity #1, 20 mm**
2.	**ATI PRO PREMIUM**
3.	**Unventilated Air cavity #2, 20 mm**
4.	**ATI PRO BASIC P**
5.	**Ventilated Air cavity #3, 20 mm**

Figure 1. Roof construction design

Table 2: Roof construction calculation results for slope α = 0° (EN ISO 6946)

ATI COMBI PRO TOITURE installed on roof			
Angle: α = 0°	**Layer**	**R value**	**Unit**
Ascendant Heat Flux (Winter period)	Unventilated Air cavity # 1	0.3987	m²·K/W
	ATI PRO PREMIUM	**3.52**	m²·K/W
	Unventilated Air cavity # 2	0.4132	m²·K/W
	ATI PRO BASIC P	**1.91**	m²·K/W
	Ventilated Air cavity # 3 (the thermal resistance of external surface R_{se})	0.1180	m²·K/W
	R Total	**6.36**	**m²·K/W**

Table 3: Roof construction calculation results for slope α = 30° (EN ISO 6946)

ATI COMBI PRO TOITURE installed on roof			
Angle: α = 30°	**Layer**	**R value**	**Unit**
Ascendant Heat Flux (Winter period)	Unventilated Air cavity # 1	0.4396	m²·K/W
	ATI PRO PREMIUM	**3.52**	m²·K/W
	Unventilated Air cavity # 2	0.4573	m²·K/W
	ATI PRO BASIC P	**1.91**	m²·K/W
	Ventilated Air cavity # 3 (the thermal resistance of external surface R_{se})	0.1303	m²·K/W
	R_{Total}	**6.46**	**m²·K/W**

Table 2: Roof construction calculation results for slope α = 45° (EN ISO 6946)

ATI COMBI PRO TOITURE installed on roof			
Angle: α = 45°	**Layer**	**R value**	**Unit**
Ascendant Heat Flux (Winter period)	Unventilated Air cavity # 1	0.4634	m²·K/W
	ATI PRO PREMIUM	**3.52**	m²·K/W
	Unventilated Air cavity # 2	0.4830	m²·K/W
	ATI PRO BASIC P	**1.91**	m²·K/W
	Ventilated Air cavity # 3 (the thermal resistance of external surface R_{se})	0.1374	m²·K/W
	R_{Total}	**6.51**	**m²·K/W**

Table 3: Wall construction calculation results for slope α = 90° (EN ISO 6946)

ATI COMBI PRO TOITURE installed on wall			
Angle: α = 90°	**Layer**	**R value**	**Unit**
Ascendant Heat Flux (Winter period)	Unventilated Air cavity # 1	0.5531	m²·K/W
	ATI PRO PREMIUM	**3.52**	m²·K/W
	Unventilated Air cavity # 2	0.5813	m²·K/W
	ATI PRO BASIC P	**1.91**	m²·K/W
	Ventilated Air cavity # 3 (the thermal resistance of external surface R_{se})	0.1673	m²·K/W
	R_{Total}	**6.73**	**m²·K/W**

Requirements for calculation validity:

- Calculations of R values are valid for a pitched roof (α is generally from 0° to 90°).
- Calculations of R values are valid when ATI PRO is installed in agreement with the installation guidelines described into the manufacturer brochure.