INSTITUTE OF ARCHITECTURE AND
CONSTRUCTION OF KAUNAS
UNIVERSITY OF TECHNOLOGY

BUILDING PHYSICS LABORATORY

CALCULATION REPORT No. 060 SF/23

Date: 29 of March 2023

Determination of installed thermal resistance into a roof according to EN ISO 6946:2017

(test name)

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

Product name: Type of products: reflective insulation product (Type 3)

Names of insulation system:

- **TRISO TOITURE** (ACTIS SA)
- **TOP TOIT DUO** (ISO 2000 SAS)

(identification of the specimen)

Customer: SA Orion financement – Avenue de la Gare – FR-11230 CHALABRE, France
(name and address of enterprise)

Manufacturer: ACTIS SA : 30 Avenue de Catalogne - 11300 LIMOUX, France
(name and address of enterprise)

Calculation results for roof construction design without unventilated air cavities (Figure 1):

Roof slope angle, α	Calculation method reference no.	Calculation result, *R*, (m²·K)/W
Flat roof (α = 0°)	EN ISO 6946:2017	**6.26**
Pitched roof (α = 20°)		**6.27**
Pitched roof (α = 30°)		**6.27**
Pitched roof (α = 45°)		**6.28**
R value for others pitched sloop (different α value) can be determined by linear interpolation between two calculated R values		

Calculation results for roof construction design with unventilated air cavities (Figure 2):

Roof slope angle, α	Calculation method reference no.	Calculation result, *R*, (m²·K)/W
Flat roof (α = 0°)	EN ISO 6946:2017	**7.18**
Pitched roof (α = 20°)		**7.26**
Pitched roof (α = 30°)		**7.31**
Pitched roof (α = 45°)		**7.38**
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: TRISO HYBRID / TOP COMBLES (test report no. 199 SF/21 U)
BOOST'R HYBRID / TOP TOIT (test report no. 046B SF/22 U)

Additions information: Application, 2023-04-24

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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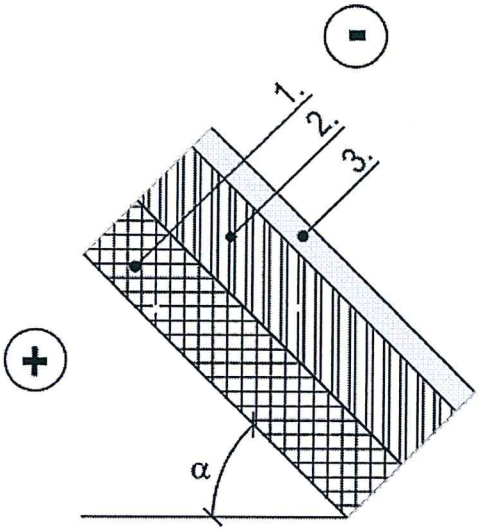
Annex 1: Calculation results

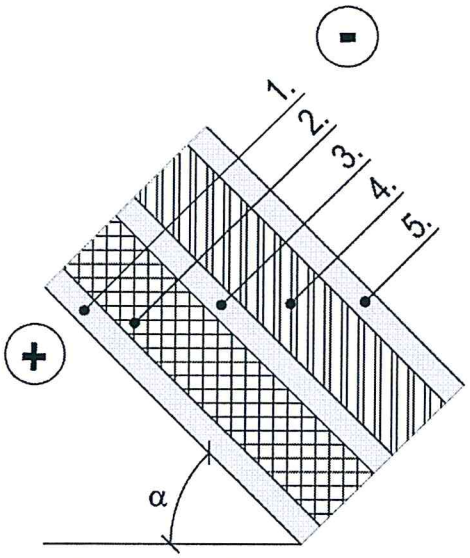
Table 1: Products R_{core} 90/90 values according to LST EN 16012:2012+A1:2015 and EN ISO 10456:2008

Product	Declared R_{core} 90/90 thermal resistance, $(m^2 \cdot K)/W$
TRISO HYBRID / TOP COMBLES (test report no. 199 SF/21 U)	**3.15**
BOOST'R HYBRID / TOP TOIT (test report no. 046B SF/22 U)	**3.00**



1.	TRISO HYBRID / TOP COMBLES
2.	BOOST'R HYBRID / TOP TOIT
3.	Ventilated Air cavity #3

Figure 1. Roof construction design without unventilated air cavities



1.	Unventilated Air cavity #1
2.	TRISO HYBRID / TOP COMBLES
3.	Unventilated Air cavity #2
4.	BOOST'R HYBRID / TOP TOIT
5.	Ventilated Air cavity #3

Figure 2. Roof construction design with unventilated air cavities

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

Insulation system TRISO TOITURE or TOPTOIT DUO installed on roof			
Angle: α = 0°	**Layer**	**R value**	**Unit**
Ascendant Heat Flux (Winter period)	TRISO HYBRID / TOP COMBLES	3.15	m²·K/W
	BOOST'R HYBRID / TOP TOIT	3.00	m²·K/W
	Ventilated Air cavity # 3	0.112	m²·K/W
	R_{Total}	**6.26**	**m²·K/W**

Table 3: Roof construction calculation results for slope α = 20° (EN ISO 6946)

Insulation system TRISO TOITURE or TOPTOIT DUO installed on roof			
Angle: α = 20°	**Layer**	**R value**	**Unit**
Ascendant Heat Flux (Winter period)	TRISO HYBRID / TOP COMBLES	3.15	m²·K/W
	BOOST'R HYBRID / TOP TOIT	3.00	m²·K/W
	Ventilated Air cavity # 3	0.118	m²·K/W
	R_{Total}	**6.27**	**m²·K/W**

Table 4: Roof construction calculation results for slope α = 30° (EN ISO 6946)

Insulation system TRISO TOITURE or TOPTOIT DUO installed on roof			
Angle: α = 30°	**Layer**	**R value**	**Unit**
Ascendant Heat Flux (Winter period)	TRISO HYBRID / TOP COMBLES	3.15	m²·K/W
	BOOST'R HYBRID / TOP TOIT	3.00	m²·K/W
	Ventilated Air cavity # 3	0.123	m²·K/W
	R_{Total}	**6.27**	**m²·K/W**

Table 5: Roof construction calculation results for slope α = 45° (EN ISO 6946)

Insulation system TRISO TOITURE or TOPTOIT DUO installed on roof			
Angle: α = 45°	**Layer**	**R value**	**Unit**
Ascendant Heat Flux (Winter period)	TRISO HYBRID / TOP COMBLES	3.15	m²·K/W
	BOOST'R HYBRID / TOP TOIT	3.00	m²·K/W
	Ventilated Air cavity # 3	0.129	m²·K/W
	R_{Total}	**6.28**	**m²·K/W**

Table 6: Roof construction calculation results for slope α = 0° (EN ISO 6946)

Insulation system TRISO TOITURE or TOPTOIT DUO installed on roof			
Angle: α = 0°	**Layer**	**R value**	**Unit**
Ascendant Heat Flux (Winter period)	Unventilated Air cavity # 1	0.448	m²·K/W
	TRISO HYBRID / TOP COMBLES	3.15	m²·K/W
	Unventilated Air cavity # 2	0.474	m²·K/W
	BOOST'R HYBRID / TOP TOIT	3.00	m²·K/W
	Ventilated Air cavity # 3	0.112	m²·K/W
	R_{Total}	**7.18**	**m²·K/W**

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Table 7: Roof construction calculation results for slope α = 20° (EN ISO 6946)

Insulation system TRISO TOITURE or TOPTOIT DUO installed on roof			
Angle: α = 20°	**Layer**	**R value**	**Unit**
Ascendant Heat Flux (Winter period)	Unventilated Air cavity # 1	0.482	m²·K/W
	TRISO HYBRID / TOP COMBLES	3.15	m²·K/W
	Unventilated Air cavity # 2	0.511	m²·K/W
	BOOST'R HYBRID / TOP TOIT	3.00	m²·K/W
	Ventilated Air cavity # 3	0.118	m²·K/W
	R_{Total}	**7.26**	**m²·K/W**

Table 8: Roof construction calculation results for slope α = 30° (EN ISO 6946)

Insulation system TRISO TOITURE or TOPTOIT DUO installed on roof			
Angle: α = 30°	**Layer**	**R value**	**Unit**
Ascendant Heat Flux (Winter period)	Unventilated Air cavity # 1	0.501	m²·K/W
	TRISO HYBRID / TOP COMBLES	3.15	m²·K/W
	Unventilated Air cavity # 2	0.533	m²·K/W
	BOOST'R HYBRID / TOP TOIT	3.00	m²·K/W
	Ventilated Air cavity # 3	0.123	m²·K/W
	R_{Total}	**7.31**	**m²·K/W**

Table 9: Roof construction calculation results for slope α = 45° (EN ISO 6946)

Insulation system TRISO TOITURE or TOPTOIT DUO installed on roof			
Angle: α = 45°	**Layer**	**R value**	**Unit**
Ascendant Heat Flux (Winter period)	Unventilated Air cavity # 1	0.532	m²·K/W
	TRISO HYBRID / TOP COMBLES	3.15	m²·K/W
	Unventilated Air cavity # 2	0.568	m²·K/W
	BOOST'R HYBRID / TOP TOIT	3.00	m²·K/W
	Ventilated Air cavity # 3	0.129	m²·K/W
	R_{Total}	**7.38**	**m²·K/W**

Requirements for calculation validity:

- Calculations of R values are valid for a pitched roof (α is generally from 10° to 45°), and Ceiling (α is equal to 0°).
- Calculations of R values are valid when TRISO TOITURE or TOPTOIT DUO is installed from the internal side of the Roof or the external part of the Roof.
- Calculations of R values are valid when TRISO TOITURE or TOPTOIT DUO is installed in agreement with the installation guidelines described into the manufacturer brochure.
- Calculations of R values are valid when unventilated air cavity is at least 20 mm thick.
- Calculations of R values with different properties than in this report must be recalculate according to EN ISO 6946.

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