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ENERGYSHIELD.

FIBRAN
Technical Presentation

ENERGYSHIELD.

FIBRAN Group

Greek Company with productions

- 9 lines of extruded polystyrene FIBRAN*xps*
- 2 lines – 3 electrical furnaces of stonewool FIBRAN*geo*
- 1 line of gypsum boards and gypsum products
- 1 line of expanded polystyrene FIBRAN*eps*

ENERGY**SHIELD.**

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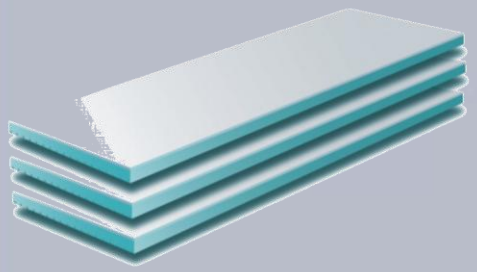
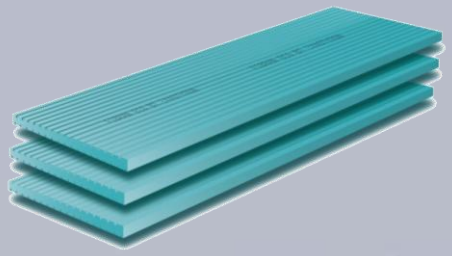
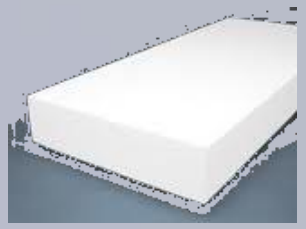
fibranXPS



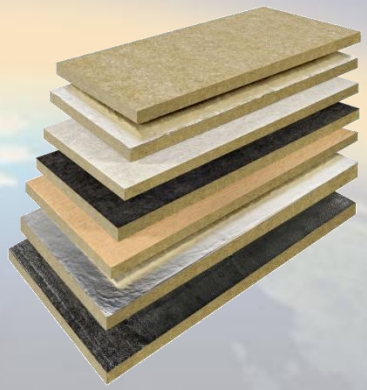


fibranEPS



fibranGYPS

fibranGEO



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Collaboration with Institutes

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Collaboration with Organizations

eurima
European Insulation Manufacturers Association

eXiba

Active participation of FIBRAN members:

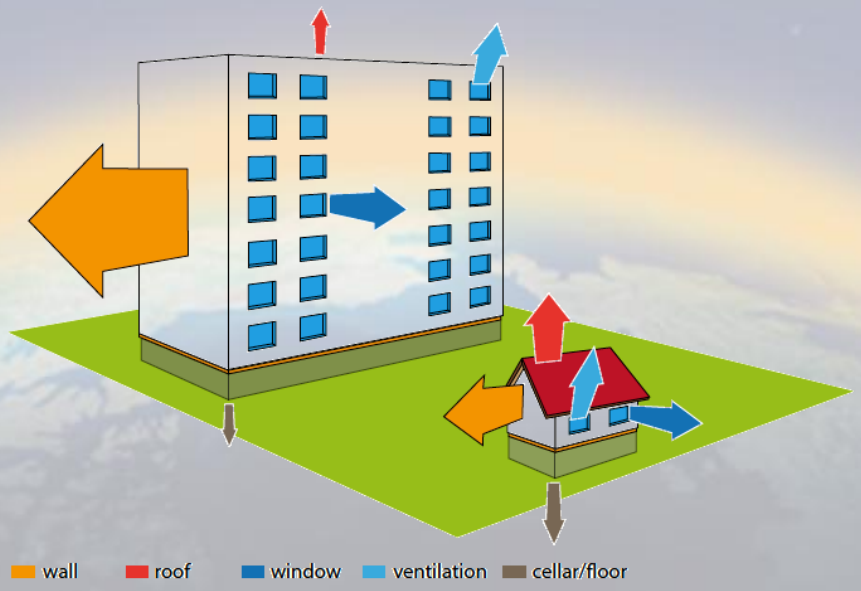
-To *technical* committees

-To *environmental* committees

-To *health and safety* committees

New message….

ENERGY**SHIELD.**



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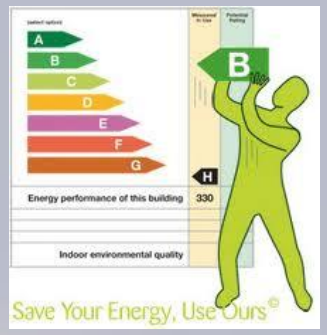
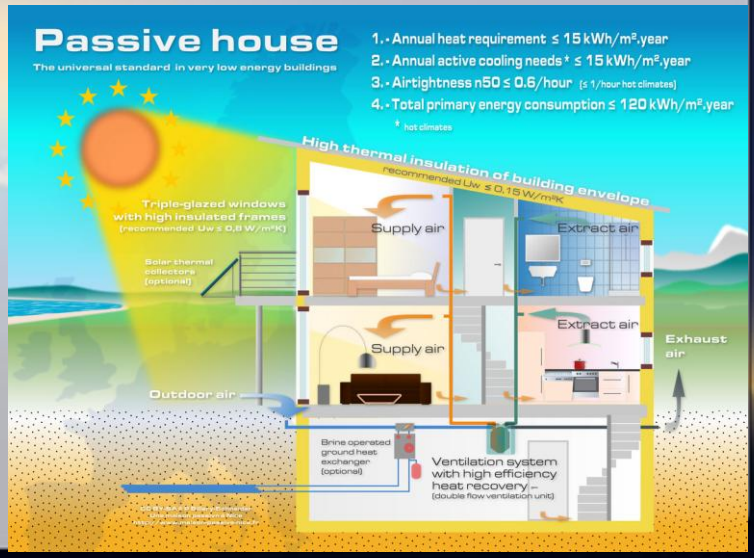
Passive Houses 0





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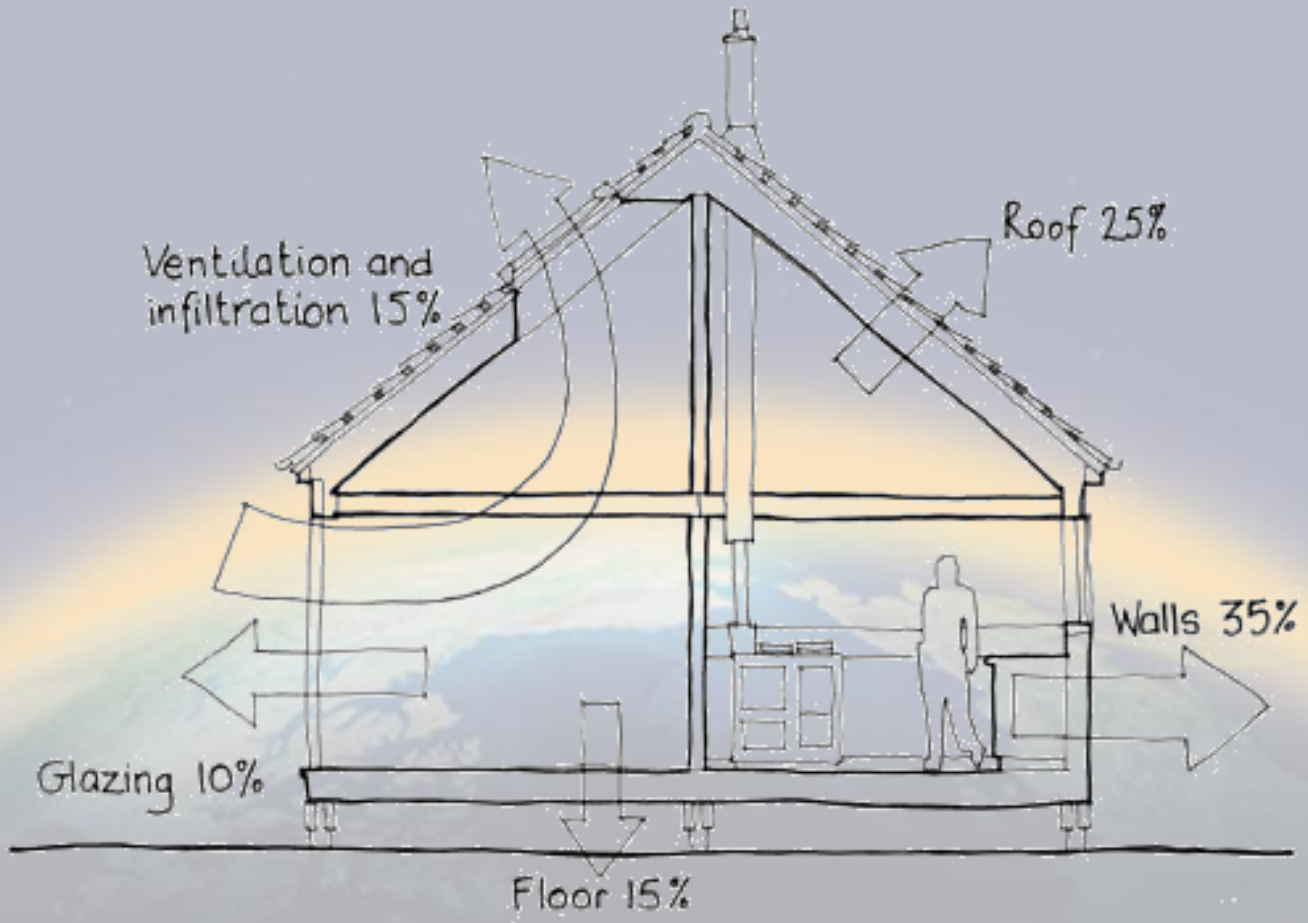
Heat Losses from Buildings…



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Theory

Thermal Insulation is any construction solution applied in building construction in order to decrease the heat transfer between the spaces with different temperature or with the external air

Thermal Conductivity Coefficient λ:

Thermal conductivity λ (W/mK) is the heat amount transmitted through a layer of material, with 1 m² surface area and 1 m thickness, when a constant temperature difference of 1 K is maintained between the layer's faces.

$$\lambda = W/(m*K) \text{ ή } kcal/(m*h*^oC)$$

Thermal Transmittance U:

Thermal transmittance, also known as U value, is the rate of transfer of heat (W) through one square metre of a structure divided by the difference in temperature across the structure. It is expressed in watts per metres squared kelvin, or W/m²K

$$U = W/(m^2*K) \text{ ή } kcal/(m^2*h*\ ^oC)$$

Thermal Resistance R:

The ratio between the thickness d of the material to its thermal conductivity coefficient λ (m²K/W)

$$R = (m^2*K)/\ W \text{ ή } (m^2*h*\ ^oC)/\ kcal$$

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Insulation Materials

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Thermal Insulation Materials

Materials	Density ρ [kg/m^3]	Thermal Conductivity λ [W/m K]
Expanded Polystyrene	15 - 30	0,040
Extruded Polystyrene	25 - 35	0,028 – 0,032
PIR	30 - 35	0,025 – 0,030
PUR	35 - 50	0,030 – 0,035
Glasswool	18 - 40	0,035 – 0,050
Stonewool	30 - 200	0,032 – 0,025

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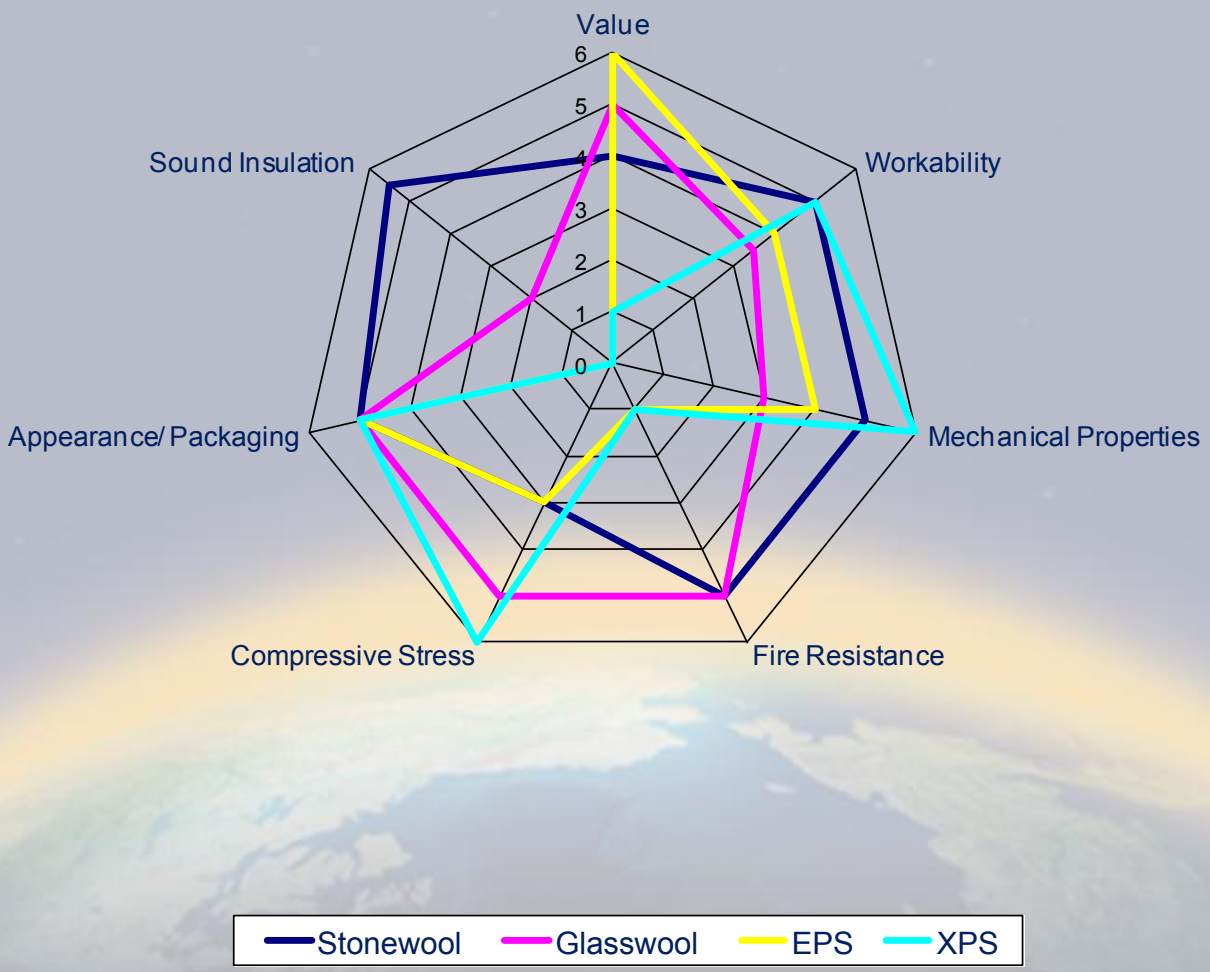

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Material	Organic			Inorganic	
	EPS	XPS	PIR	Stonewool	Glass wool
Thermal Conductivity (W/mK)	0,040 – 0,048	0,033 – 0,038	0,040	0,033 – 0,035	0,035 – 0,040
Fire Reaction	F	E	F	A1	A1
Compression Strength	Good	Very Good	N.A.	Good *	Poor
Water Absorption	Poor	Very Good	N.A.	Good	Poor
Sound Reduction	None	None	None	Very Good	Very Good
Mechanical Properties	Good	Very Good	N.A.	Good *	Poor
Passive Ventilation	None	None	N.A.	Very Good	Good

N.A. = Not Applicable
***= Depends on the fiber orientation**

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The importance of the "CE" mark

Technical Characteristics	Values	EN Standards
Fire Classification	A1, A2 B,C,D,E,F	EN 13501-2
Thermal Conductivity	Max (W/mK) (after aging for the foamed materials)	EN 12667 & EN 12939
Compressive Stress	Min (kPa)	EN 826
Water Absorption	% v.v.	EN 12087 –EN 1609 – EN 12088
Mechanical Properties	Min (kPa) or N	EN 1608 – EN 1607 – EN 12430 – EN 12431

These tests are compulsory, there are others that are not and is in the judgment of the producers

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Certification

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ENERGYSHIELD.

Certification

All FIBRAN*geo stonewool insulation products conform to the European Directive 89/106/EEC since 2004. In compliance with the above Construction* Products Directive, all types of FIBRAN*geo stonewool products hold the CE marking and are in conformity with the European Norm EN 13162, which* refers to mineral wool insulation products used in building applications. In accordance with the aforementioned European Standard, every insulation product acquires a designation code which declares its technical characteristics.

For example:

MW - EN 13162 – Ti - CS(10)i – TRi - PL(5)i – CPi – WS - WL(P) – MUi – SDi - AFri – AWi

• MW – Factory made mineral wool insulation material, industrially manufactured from molten rock, slag or glass.
• EN 13162 – The European Standard number.
• Ti – Thickness Tolerances. Classes for thickness tolerances from the nominal thickness (e.g. Class T4 : - 3mm + 5mm).
• CS(10)i – Minimum compressive stress at 10% thickness deformation (kPa).
• TRi – Minimum tensile strength perpendicular to faces (kPa).
• PL (5)i – Point Load (N). Minimum compressive load (applied on a small area of 50 cm²) at 5 mm thickness deformation.
• CPi – Compressibility (mm). The max. difference between the thickness dL, under a light load of 0.25 kPa, and the thickness dB, under a load of 2 kPa (+ - 48 kPa).
• WS – Short Term Water Absorption (kg/m²) with partial immersion in water for 24 hours <1 kg/m².
• WL(P) – Long Term Water Absorption (kg/m²) with partial immersion in water for 28 days <3 kg/m².
• MUi – Water Vapour Transmission. The maximum ratio (factor μ) of water vapour diffusion resistance of the material to the resistance of an equal thickness of air.
• SDi – Dynamic Stiffness (MN/m³). The maximum ratio (factor s') of dynamic compressive stress to dynamic change in thickness.
• AFri – Air flow resistivity (kPa s/m²). The minimum air flow resistance coefficient of 1m thickness material >5 kPa s/m².
• AWi -Weighted Sound Absorption Coefficient. The value of the sound absorption coefficient αw in the frequency of 500Hz, measured on the standard weighted sound absorption curve.

EUCEB

CE FIW 0751

iBMB MPA TU BRAUNSCHWEIG

FIW München

TÜV CERT EN ISO 9001

ISTITUTO GIORDANO Qualità al Plurale.

FhG Gesellschaft

ZAG LJUBLJANA

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ENERGYSHIELD.

Forschungsinstitut für Wärmeschutz e.V.
München

FIW München

EC Certificate of Conformity

Reg.-No.: K1-0751-CPD-223.0-01-01/13

In compliance the Directive 89/106/EEC of the Council of European Communities of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to the construction products (Construction Products Directive - CPD), amended by the Directive 93/68/EEC of the Council of European Communities of 28 April 1998, it has been stated that the

construction product — **FIBRANgeo**
mineral wool products according to EN 13162
(details see annex)

placed on the market by — **FIBRAN S.A. Insulating Materials Industry**
56010 Thessaloniki
GREECE

and produced in the factory — **Terpni Serres / Greece**

is submitted by the manufacturer to a factory production control and to the further testing of samples taken at the factory in accordance with a prescribed test plan and that the approved bodies:

Forschungsinstitut für Wärmeschutz e.V. München - Identification No. 0751 and Materialprüfanstalt für das Bauwesen Hannover - Identification No. 0764

performed the initial type-testing for the relevant characteristics of the product, the initial inspection of the factory and of the factory production control and performs the continuous surveillance, assessment and approval of the factory production control and an audit-testing of samples taken at the factory, on the market or at the construction site.

This certificate attests that all provisions concerning the attestation of conformity and the performances described in Annex ZA of the standard

EN 13162:2008

were applied and that the product fulfills all the prescribed requirements.

This certificate was first issued on 30 March 2011 and remains valid as long as the conditions laid down in the harmonised technical specification in reference or the manufacturing conditions in the factory or the FPC itself are not modified significantly.

Gräfelfing, 24 January 2013

Head of Certification Body

Dipl.-Ing. (FH) Wolfgang Albrecht

Forschungsinstitut für Wärmeschutz e. V. München
Lochhamer Schlag 4 · 82166 Gräfelfing

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CE - FIBRAN*geo*

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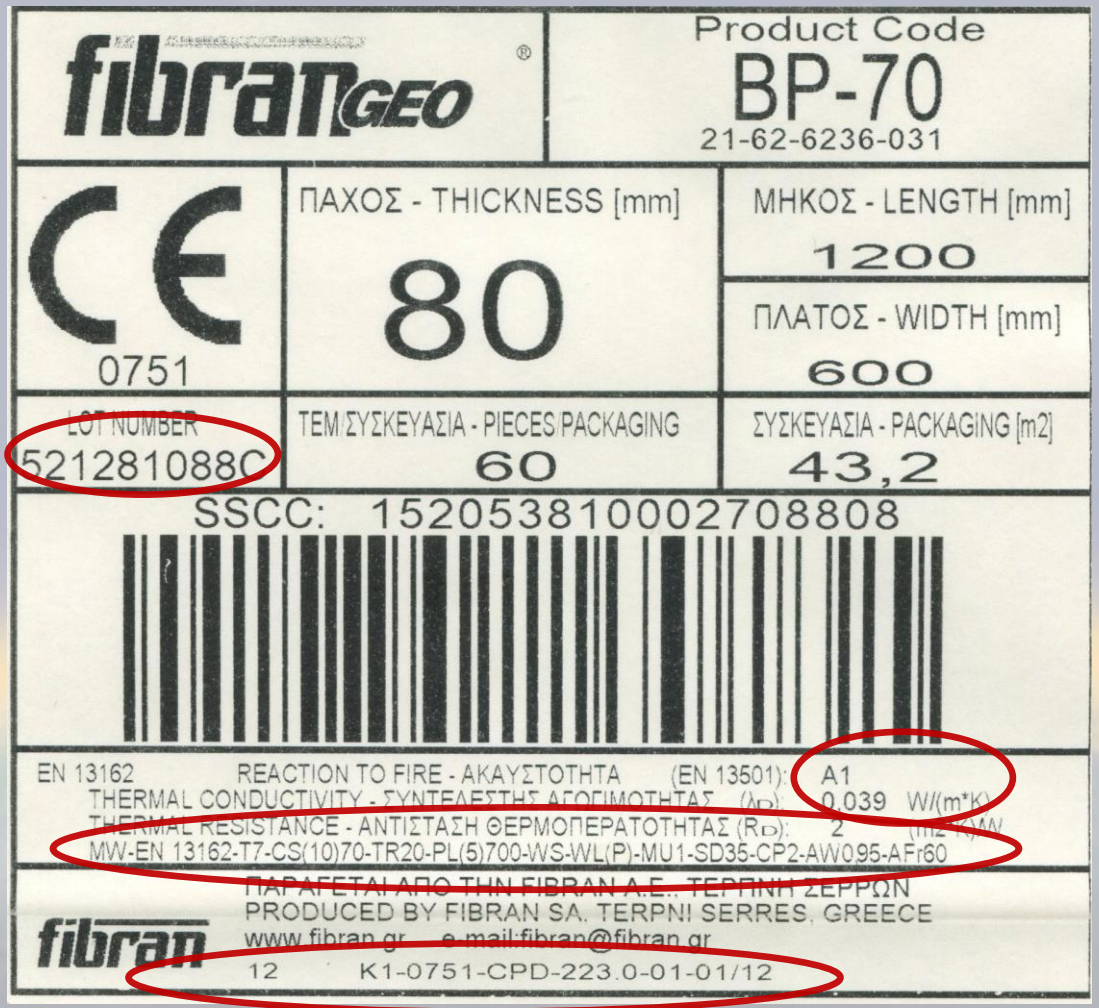
label



Forschungsinstitut für Wärmeschutz e.V.
München

FIW München

Annex to EC Certificate of Conformity

Reg.-No.: K1-0751-CPD-223.0-01-01/13

construction product — **FIBRANgeo**
mineral wool products according to EN 13162

placed on the market by — **FIBRAN S.A. Insulating Materials Industry**
56010 Thessaloniki

and produced in the factory — **Terpni Serres / Greece**

At the date of issue of the annex, the attestation of conformity relates on the following products without facings:

TYPES	FACINGS	THICK-NESS	THICK-NESS TOLER-ANCES	THERMAL CONDUC-TIVITY λ_D	REACTION TO FIRE	SHORT WATER ABSORP-TION	LONG WATER ABSORP-TION	AIR FLOW RESIS-TIVITY	COMP-RESSIVE STRESS	SHEAR STRENGTH	TENSILE STRENGTH PERP. TO FACES	TENSILE STRENGTH PARALEL TO FACES	COMP-RESSI-BILITY	POINT LOAD	DYNAMIC STIFFNESS	WEIGHTED SOUND ABSORPTION COEFFICIENT α_w
		[mm]		[W/(m·K)]	EN 13501-1 [-]	EN 1609 [kg/m²]	EN 12087 [kg/m²]	EN 29053 [(kPa·s)/m²]	EN 826 [kPa]	EN 12090 [kPa]	EN 1607 [kPa]	EN 1608 [kPa]	EN 12431 [mm]	EN 12430 [N]	EN 29052-1 [MN/m³]	ISO 11654 [-]
B-030	AX, AL, YM, YA, XA	40-160	T4	0,035	A1	< 1	< 3	10				10				1 [50mm]
B-040		40-160	T4					15				12				1 [50mm]
B-050		40-160	T4					30				14				1 [50mm]
B-060		30-160	T4					35				16				1 [50mm]
R-040	AX, AL	30-80	T4					15				5				1 [50mm]
R-050		30-80	T4					30				5				1 [50mm]
B-570	AX, AL, YM, YA, XA	30-160	T4	0,033				50								1 [50mm]
B-080		20-160	T4					55								1 [50mm]
B-090		20-160	T4					60								1 [50mm]
B-001		20-60	T4						5							1 [50mm]
		70-160	T4						10						5 [80 mm]	1 [50mm]
B-021		20-160	T4						10					150	10 [50 mm]	0,95 [50mm]

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info@fiw-muenchen.de · www.fiw-muenchen.de

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Forschungsinstitut für Wärmeschutz e.V.
München

TYPES	FACINGS	THICK-NESS	THICK-NESS TOLER-ANCES	THERMAL CONDUC-TIVITY λ_D	REACTION TO FIRE	SHORT WATER ABSORP-TION	LONG WATER ABSORP-TION	AIR FLOW RESIS-TIVITY	COMP-RESSIVE STRESS	SHEAR STRENGTH	TENSILE STRENGTH PERP. TO FACES	TENSILE STRENGT PARALEL TO FACES	COMP-RESSI-BILITY	POINT LOAD	DYNAMIC STIFF-NESS	WEIGHTED SOUND ABSORPTION COEFFICIENT α_W
		[mm]		[W/(m·K)]	EN 13501-1 [-]	EN 1609 [kg/m²]	EN 12087 [kg/m³]	EN 29053 [(kPa·s)/m²]	EN 826 [kPa]	EN 12090 [kPa]	EN 1607 [kPa]	EN 1608 [kPa]	EN 12431 [mm]	EN 12430 [N]	EN 29052-1 [MN/m³]	ISO 11654 [-]
B-051	AX, AL, YM, YA, XA	20-120	T6	0,035	A1	< 1	< 3	60	20				CP2	200	10 [50mm]	0,95 [50mm]
B-571		20-120	T7						25				CP2	350	9 [80mm]	0,95 [50mm]
B-002		20-120							50				CP2	550	23 [50 mm]	0,95 [50mm]
BP-001	AX, AL, XA	40-160		0,036					20		7,5		CP2	250	18 [50 mm]	0,95 [50mm]
BP-021		40-160							30	20	10		CP2	400	20 [50mm]	0,95 [50mm]
BP 30		40-160							30	20	10		CP2	400	20 [50mm]	0,95 [50mm]
BP-051		40-160		0,039					40	20	15		CP2	550	27 [50mm]	0,95 [50mm]
BP 40		40-160							40		15		CP2	550	27 [50mm]	0,95 [50mm]
BP 50		40-160		0,038					50		15		CP2	600	32 [40mm]	0,95 [50mm]
BP 70		40-160		0,039					70				CP2	700	35 [50mm]	0,95 [50mm]
BP HD		40-60							60		20		CP2	600	30 [50 mm]	0,95 [50mm]
		70-100		0,038									CP2		25 [80 mm]	0,95 [50mm]
		110-160		0,037									CP2		15 [140mm]	0,95 [50mm]

Facings:	
AX	Aluminium craft
AL	Aluminium foil
YM	Black glass tissue
YA	White glass tissue
XA	Craft paper

Gräfelfing, 24 January 2013

Head of Certification Body

W. Albrecht

Dipl.-Ing. (FH) Wolfgang Albrecht

Forschungsinstitut für Wärmeschutz e.V. München FIW MÜNCHEN 1

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Declaration of Performance

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DoP Number	**GR-2025-001**
1 Unique identification code of the product-type	FIBRANgeo B-570
2 Type, batch or serial number or any other element allowing identification of the construction product as required under Article 11(4) of the CPR	B-570
3 Intended use or uses of the construction product, in accordance with the applicable harmonised technical specification, as foreseen by the manufacturer	Thermal insulation for buildings (ThIB)
4 Name, registered trade name or registered trade mark and contact address of the manufacturer as required under Article 11(5)	FIBRAN S.A. 56010, Thessaloniki, Greece
5 Where applicable, name and contact address of the authorised representative whose mandate covers the tasks specified in Article 12(2)	not relevant
6 System or systems of assessment and verification of constancy of performance of the construction product as set out in CPR, Annex V.	AVCP - System 1
7 In case of the declaration of performance concerning a construction product covered by a harmonised standard (Name and identification number of the notified body, if relevant).	FIW No. 0751

FIW No. 0751 performed the determination of the product type, the initial inspection of the manufacturing plant and of factory production control under system (description of the third party tasks as set out in Annex V). The continuous surveillance, assessment and evaluation of factory production controland issued (certificate of constancy of performance, certificate of conformity of the factory production control, test/calculation reports - as relevant).Notified certification body No. 0751 issued the certificate of constancy of performance for reaction to fire.
Notified testing laboratory No. 7456 performed the test reports for the other relevant declared characteristics.

Harmonised standard: EN 13162:2012

8 Declared performance

Essential characteristics	Performance	Abreviation	Unit	Declared performance
Reaction to fire	Reaction to fire	RtF	Euroclass	A1
Realease of Dangerous Substances	Realease of Dangerous Substances			NPD
Acoustic absorption index	Sound absorption			1
Impact Noise Transmission Index	Dynamic stiffness	s'	MN/m³	NPD
	Thickness	d_L	mm	NPD
	Compressibility	c	mm	NPD
	Air flow resistivity	AF_r	kPa.s/m²	50
Direct airborne sound insulation index	Air flow resistivity	AF_r	kPa.s/m²	50
Continous glowing combustion	Continous glowing combustion			NPD
Thermal Resistance	Thermal Resistance	R_D	m² K/W	see attached table
	Thermal Conductivity	λ_D	W/m K	0,033
	Thickness	d_N	mm	30-160
	Thickness Class	T	Class	T4
Water Permeability	Short term Water absorption	W_p	kg/m²	<1
	Long term water absorption	W_p	kg/m²	<3
Water vapour permeability	Water vapour transmission	t or Z	m².h.Pa/mg	1
Compressive strength	Compressive stress or compressive	CS	kPa	NPD
	Point Load	F_p	N	NPD
Durability of reaction to fire against heat, weathering, ageing/degradation	Reaction to fire	RtF	Euroclass	A1
Durability of thermal resistance against heat, weathering, ageing/degradation	Thermal Resistance	R	m² K/W	see attached table
	Thermal Conductivity	λ	W/m K	0,033
	Durability Characteristics	d	mm	30-160
Tensile/Flexural strength	Tensile Strength perpendicular to faces	TR	kPa	NPD
Durability of compressive strength against heat, weathering, ageing/degradation	Compressive creep	Xct, Xt	mm	NPD

The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 8.

Spessore	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160
R (m² K/W)	0,6	0,90	1,20	1,50	1,80	2,10	2,40	2,70	3,00	3,30	3,60	3,90	4,20	4,50	4,80

Name: Stella Chadiarakou
Function: R&D -Quality Assurance Manager

Place: Thessaloniki
Date: 01/07/2013
Signature:

Declaration of Performance

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DoP Number	GR-1010-001
1 Unique identification code of the product-type	FIBRANxps ETICS GF
2 Type, batch or serial number or any other element allowing identification of the construction product as required under Article 11(4) of the CPR	ETICS GF 50-60
3 Intended use or uses of the construction product, in accordance with the applicable harmonised technical specification, as foreseen by the manufacturer	Thermal insulation for buildings, External Thermal Insulation Systems XPS-EN 13164-T3-CS(10Y)300-DS(TH)-TR400-WL(T)1,5
4 Name, registered trade name or registered trade mark and contact address of the manufacturer as required under Article 11(5)	FIBRAN S.A. 56010, Thessaloniki, Greece
5 Where applicable, name and contact address of the authorised representative whose mandate covers the tasks specified in Article 12(2)	not relevant
6 System or systems of assessment and verification of constancy of performance of the construction product as set out in CPR, Annex V.	AVCP - System 3, System 2+
7 In case of the declaration of performance concerning a construction product covered by a harmonised standard (Name and identification number of the notified body, if relevant).	FIW No. 0751, TUV HELLAS No. 0655

Harmonised standard: EN 13164:2008, ETAG005

8 Declared performance

Essential characteristics	Performance	Unit	Declared performance
Thermal Resistance	Thickness	d_N [mm]	50 - 60
	Thickness Class	T	T3
	Thermal Resistance	R_D [m² K/W]	see below table
	Thermal Conductivity	λ_D [W/m K]	0,033
Reaction to fire	Reaction to fire	Euroclass	E
Realease of Dangerous Substances	Realease of Dangerous Substances		NPD
Acoustic absorption index	Sound absorption		NPD
Continous glowing combustion	Continous glowing combustion		NPD
Water Permeability	**long term water absorption by total immersion**	**WL(T) [vol.%]**	1
	long term water absorption by diffusion	WD(V) [vol.%]	NPD
Water vapour permeability	Water vapor diffusion resistance factor	MU	50
Compressive strength	Compressive stress or compressive strength	CS(10Y) [kPa]	300
Tensile/Flexural strength	Tensile Strength perpendicular to faces	TR [kPa]	500
Durability of reaction to fire against heat, weathering, ageing/degradation	Reaction to fire	Euroclass	E
Durability of thermal resistance against heat, weathering, ageing/degradation	Thermal Resistance	R_D [m² K/W]	see below table
	Thermal Conductivity	λ_D [W/m K]	0,033
	freeze-thaw resistance after long term water diffusion test	FTCD	NPD
	freeze/thaw resistance after long term water absorption by total immersion	FTCI	NPD
	dimensional stability under specified temperature and humidity conditions	DS	NPD
	Deformation under specified compressive load and temperature conditions	DLT	NPD
Durability of compressive strength against heat, weathering, ageing/degradation	Compressive creep	CC (2/1,5/50)	NPD

The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 8. This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.

Thickness	50	60
R_D [m² K/W]	1,5	1,8

Name: Stella Chadiarakou
Function: R&D -Quality Assurance Manager

Place: Thessaloniki
Date: 01/07/2013
Signature:

This product contains Hexabromocyclododecane (declaration according to CPR requirement Article 6 Paragraph 5)

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Products and Application

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ENERGYSHIELD.

Types of Metal Roof

Roof is determined as any horizontal element with more that 2% inclination

Roof Application is determined by

- The place of the insulation material
- The type of the substrate of the roof

INSULATION MATERIAL

-Over the structure (Warm Roof)- *the insulation is taking advantage of the thermal conductance of the structure*

-Under/ In the structure (Cold Roof) – *the insulation do not take advantage the thermal conductance of the structure*

TYPE OF STRUCTURE

- Metal
- Concrete
- Wood

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Application – Selection of material

	BP 50	BP70	BP-BIT	BPHD	BP40	BP30
External insulation of concrete roof / steel deck with polymer waterproofing membrane on insulation	✓	✓		✓	✓	✓
External insulation of concrete roof / steel deck with bitumen waterproofing membrane on insulation			✓			
Insulation on roof with floating concrete screed	✓	✓		✓	✓	✓
Exposed internal insulation of steel deck	✓	✓		✓	✓	✓

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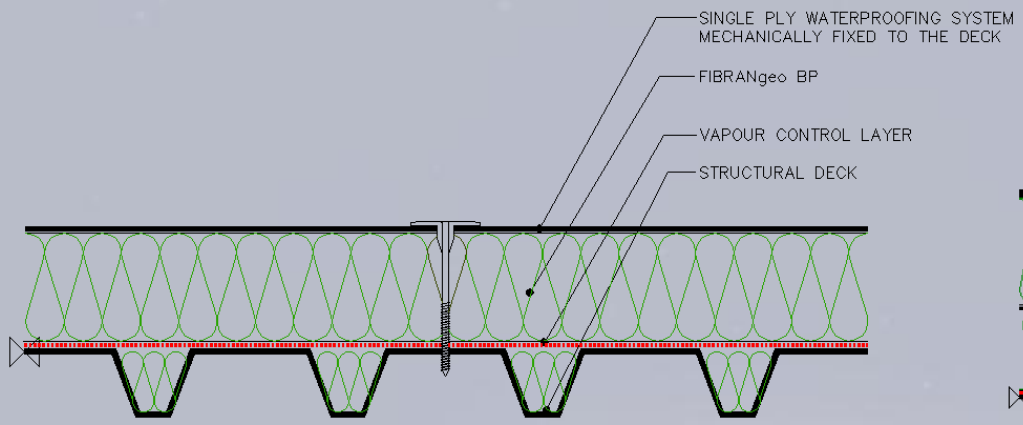
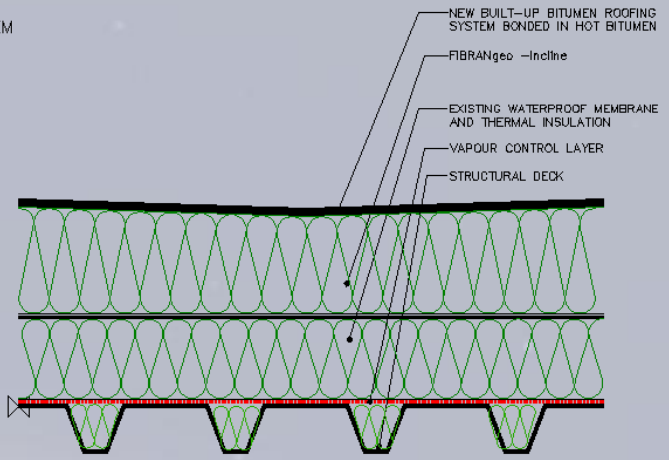
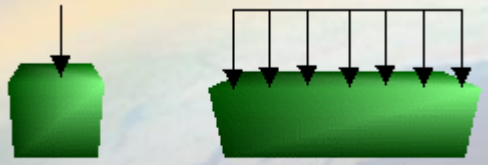
ENERGYSHIELD.

Points to Consider







point load

distributed load

ENERGYSHIELD.

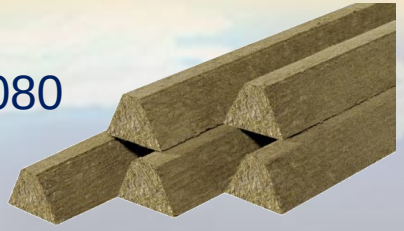
Special Items

- Incline Boards

Single slope, double sloping

Ready made solution based on the data of the construction

- Trapezoidal FIBRAN*geo* SI-080



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ENERGYSHIELD.

Comparison of Products

PRODUCTS	λ (W/mk)	CS (10/Y)	PL (5)	Compressibility	Tensile Strength
FIBRANgeo BP 70	0.039	70 kPa	700 N	CP2	20 kPa
Knauf DDP	0.039	70 kPa	600 N	CP5	10 kPa
FIBRANgeo BP 50	0.038	50 kPa	600 N	CP2	15 kPa
Knauf DDP RT	0.038	50 kPa	500 N	CP5	10 kPa
MONROCKMAX E	0.038	40 kPa	600 N		10 kPa
FIBRANgeo BP 40	0.039 ?	40 kPa	550 N	CP2	15 kPa
Knauf DDP N	0.038	40 kPa	350 N	CP5	7.5 kPa
HARDROCK ENERGY	0.036	30 kPa	500 N		10 kPa
Knauf DDP K	0.037	30 kPa	300 N	CP5	7.5 kPa
FIBRANgeo BP 30	0.036	30 kPa	400 N	CP2	10 kPa
knauf DDP U	0.039	60 kPa	550 N	CP5	10 kPa
FIBRANgeo BP HD	0.037/0.038 0.039	60 kPa	600 N	CP2	20 kPa

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ENERGYSHIELD.

Single layer VS Double layer

In **DOUBLE** layer application:

* Need for controlling the moisture between the 2 layers

* Need for ensuring the flatness of the final surface, since thickness tolerances of 2 boards are accumulated

Argument of cross-placing 2 layers for covering thermal bridges is not valid:

- thermal bridges are generally defined at joints of different material, at angles or breaks of surface, whereas, none of these are met in insulation of flat deck roof
- calculation of possible thermal losses with simulation software like HEAT2 results to almost zero (we can present examples from specific projects)

In **SINGLE** layer application:

* There is one single density with unanimous product with equal properties at all mass (minimize the risk of collapsing)

* There is one layer with Point Load of 700N and 70kPa

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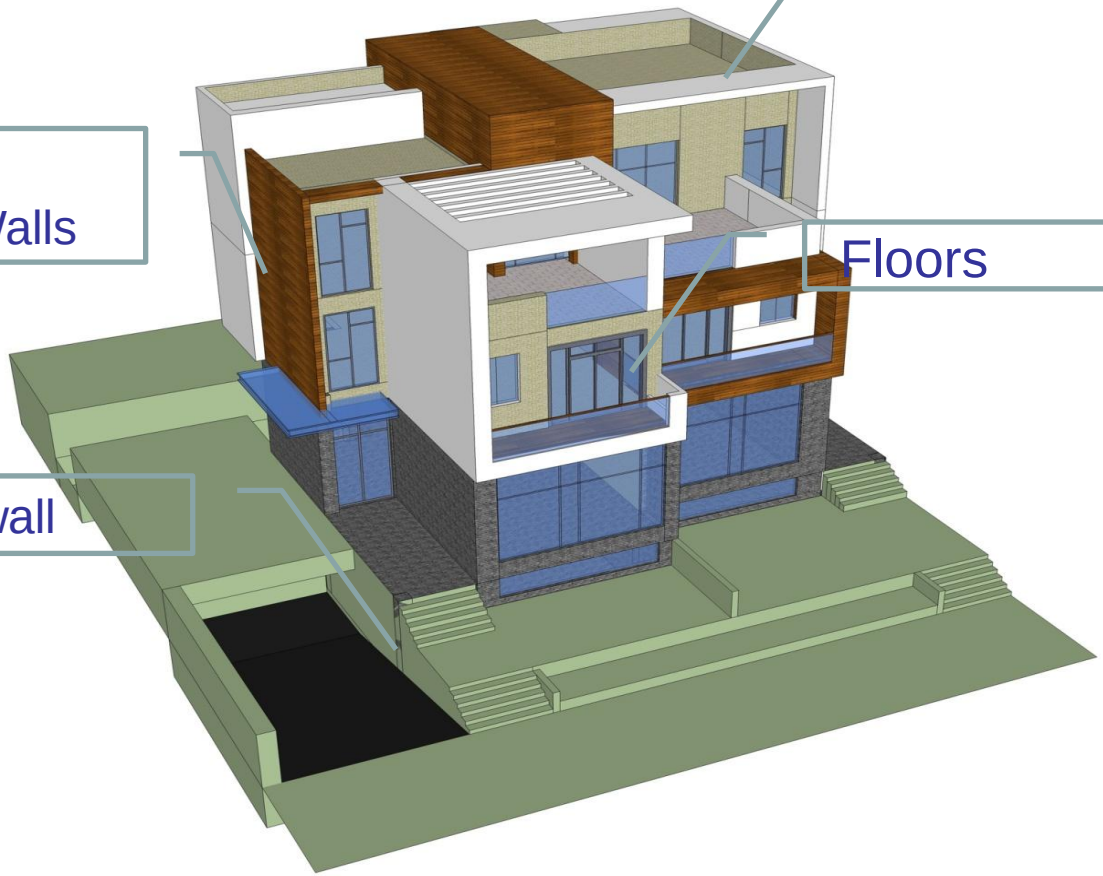
ENERGYSHIELD.

Building Insulation



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ENERGYSHIELD.

Characteristics of the elements

Walls

Thermal Resistance (↑)

Fire Resistance (↑)

Sound Insulation (↑)

Roof – Flat Roof

Water absorption (↓)

Mechanical Properties (↑)

Thermal Resistance (↑)

Sound Insulation (↑)

- **Floor**

  Water absorption (↓)

  Mechanical Properties (↑)

  Sound Insulation (↑)

- **Basement**

  Water absorption (↓)

  Mechanical Properties (↑)

  Thermal Resistance (↑)

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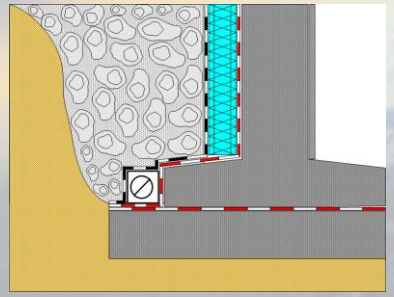
Vertical Building Elements

- **Basement**
  - Water absorption (↓)
  - Mechanical Properties (↑)
  - Thermal Resistance (↑)

- **Proposed Material**
  - FIBRAN*xps* 300L



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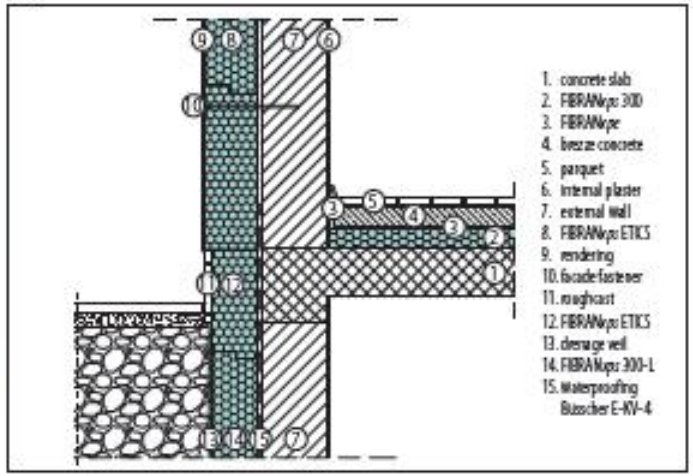
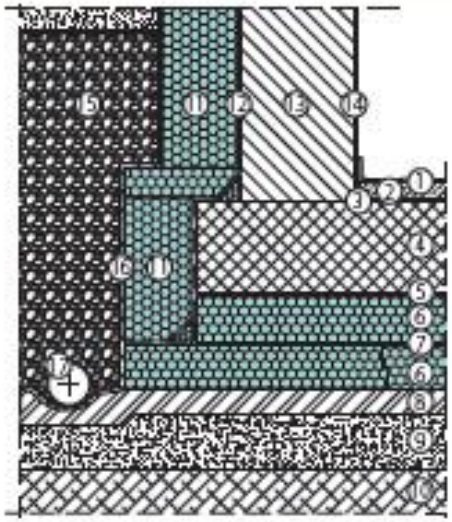
ENERGYSHIELD.



1. ceramic tiles
2. breeze concrete
3. FIBRANxps
4. foundation slab
5. PE foil
6. FIBRANxps 400-L
7. waterproofing Bituscher E-4 sk
8. levelling concrete
9. stone fill
10. soil
11. FIBRANxps 300-L
12. waterproofing Bituscher E-KV-4
13. external wall
14. internal plaster
15. gravel
16. drenage veil
17. drenage tube



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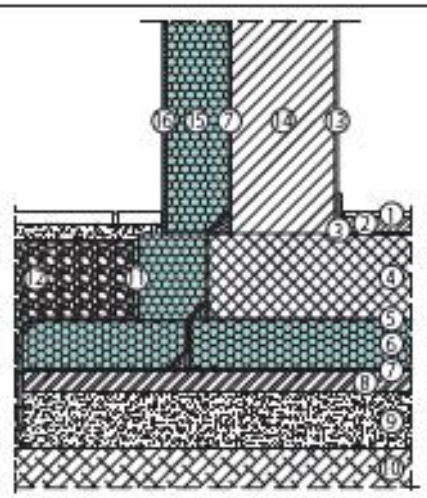
1. ceramic tiles
2. breeze concrete
3. FIBRANxps sound insulation and tide up foil
4. foundation slab
5. PE foil
6. FIBRANxps 400-L
7. waterproofing Bitascher E-KV-4
8. levelling concrete
9. stone fill
10. soil
11. drenage veil
12. gravel
13. internal plaster
14. external wall
15. FIBRANxps ETICS
16. rendering



1. ceramic tiles
2. breeze concrete
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7. waterproofing Bitascher E-4 sk
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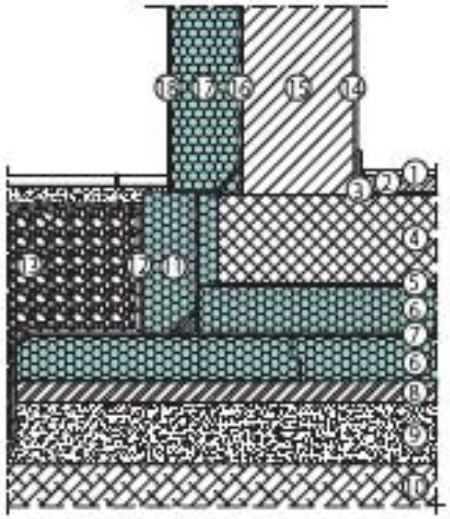
12. drenage veil
13. gravel
14. internal plaster
15. external wall
16. waterproofing Bitascher E-KV-4
17. FIBRANxps ETICS
18. rendering



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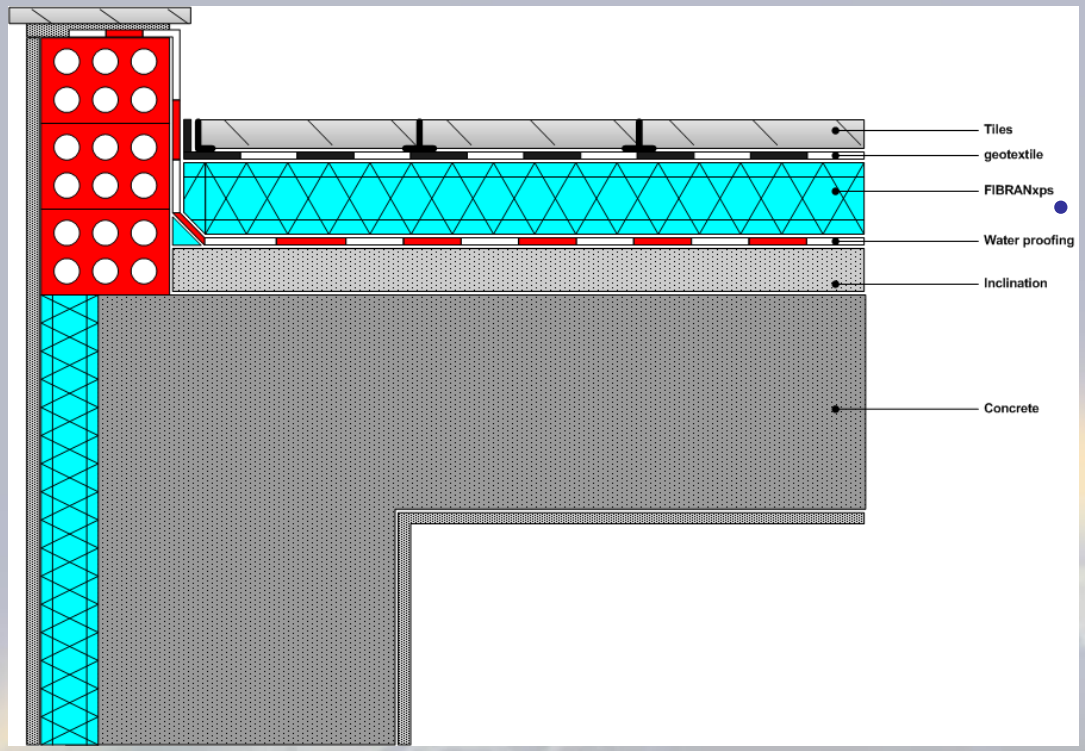
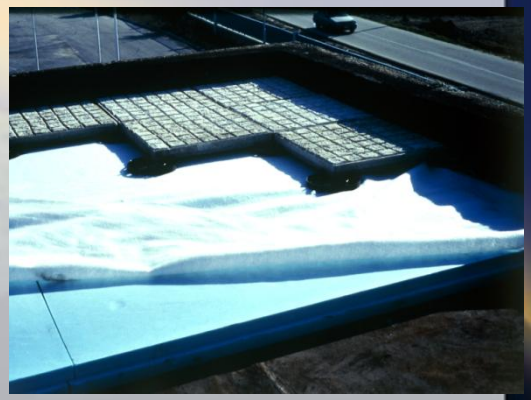
ENERGYSHIELD.

Flat Roof



- **Flat Roof**
  - Water absorption (↓)
  - Mechanical Properties (↑)
  - Thermal Resistance (↑)
- **Proposed Material**
  - FIBRAN*xps* 300 – 400 – 500 – 600 L
  - FIBRAN*xps* Incline



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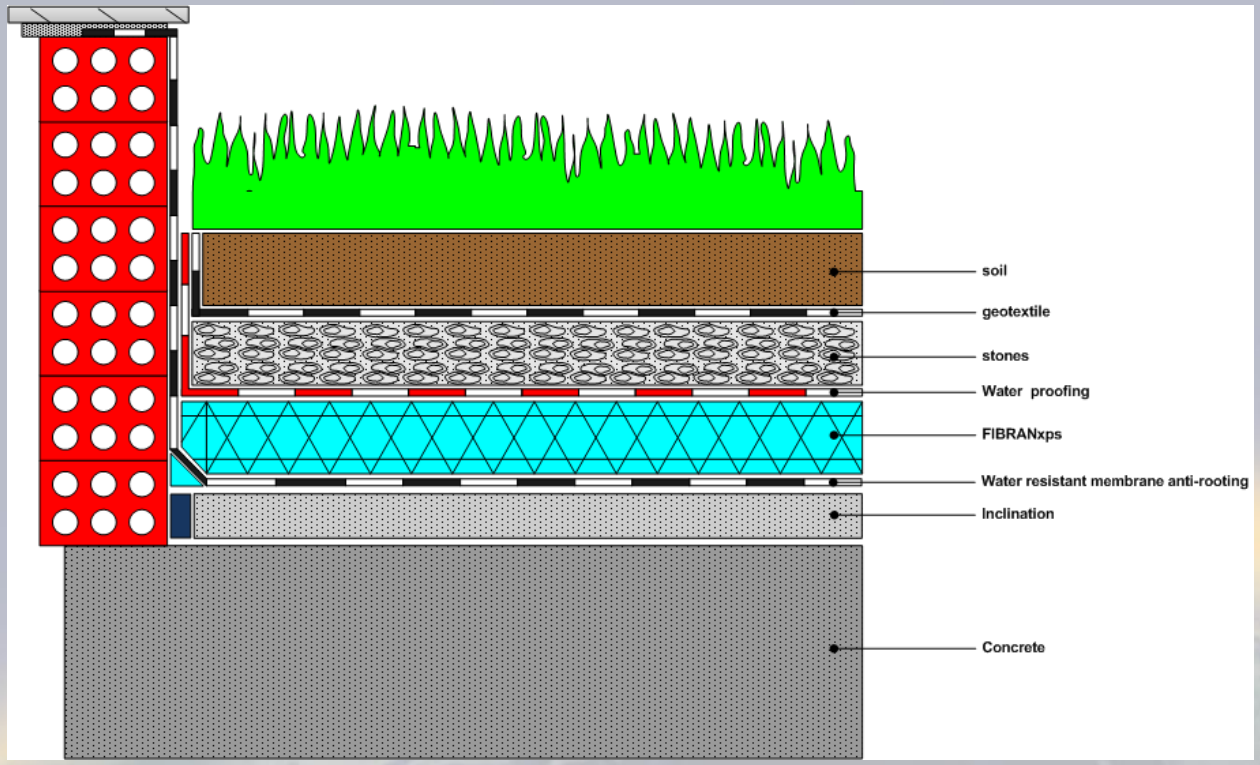
ENERGYSHIELD.

Flat Roof



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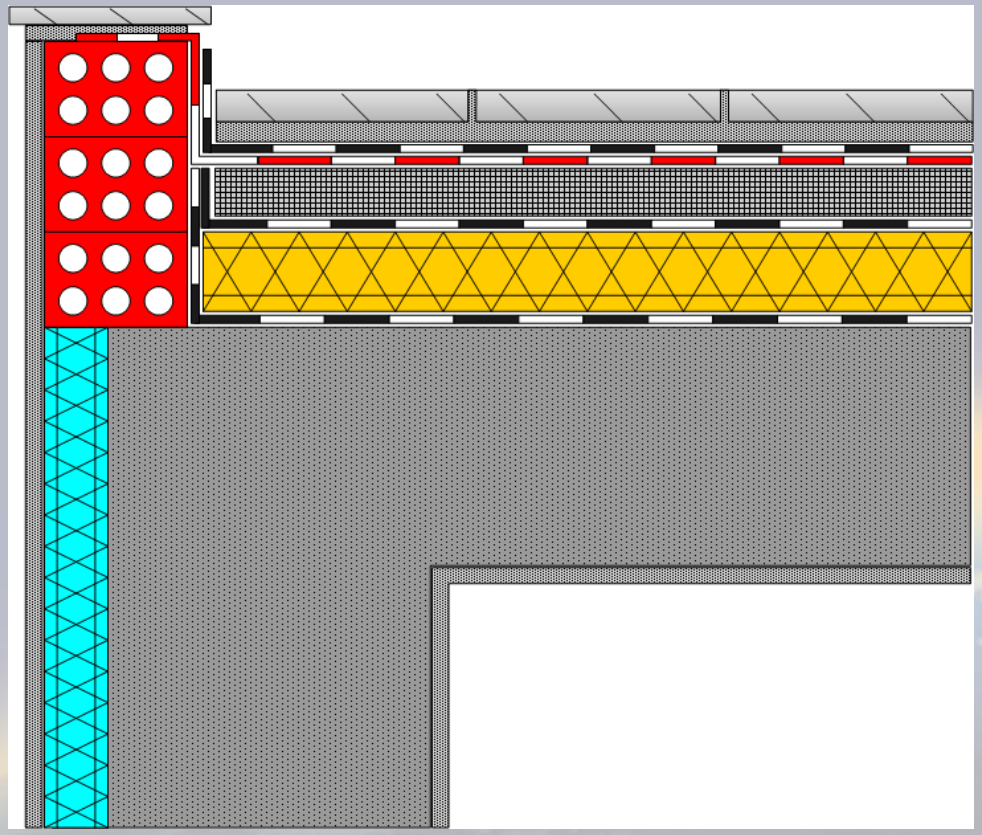
ENERGYSHIELD.

Flat Roof



- **Flat Roof**
  - Water absorption (↓)
  - Mechanical Properties (↑)
  - Thermal Resistance (↑)
- **Proposed Material**
  - FIBRAN*geo* BP 50 – BIT
  - FIBRAN*geo* BP 70 – BIT

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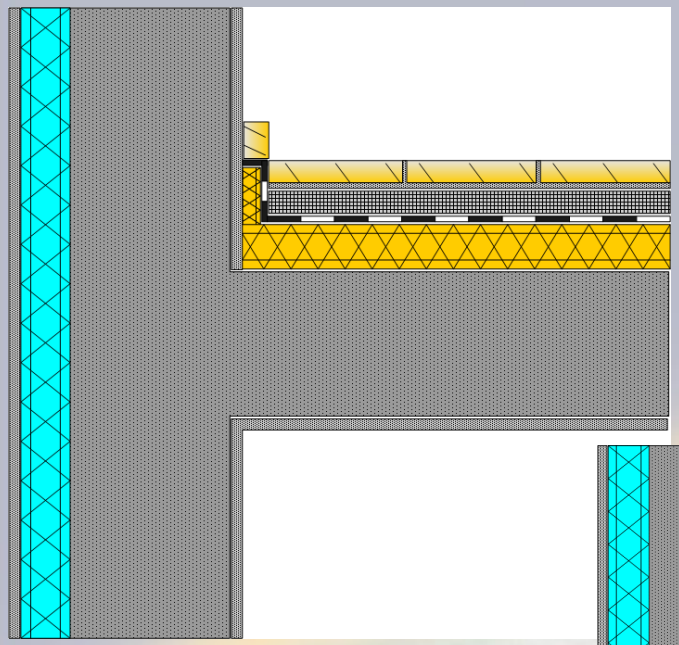
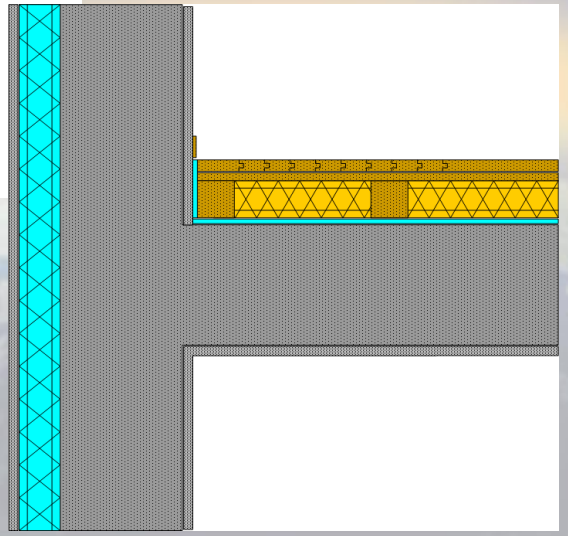
Floor Insulation





- **Floor**
  - Water absorption (↓)
  - Mechanical Properties (↑)
  - Sound Insulation (↑)
- **Proposed Material**
  - FIBRAN*geo* B-571
  - FIBRAN*geo* B-050

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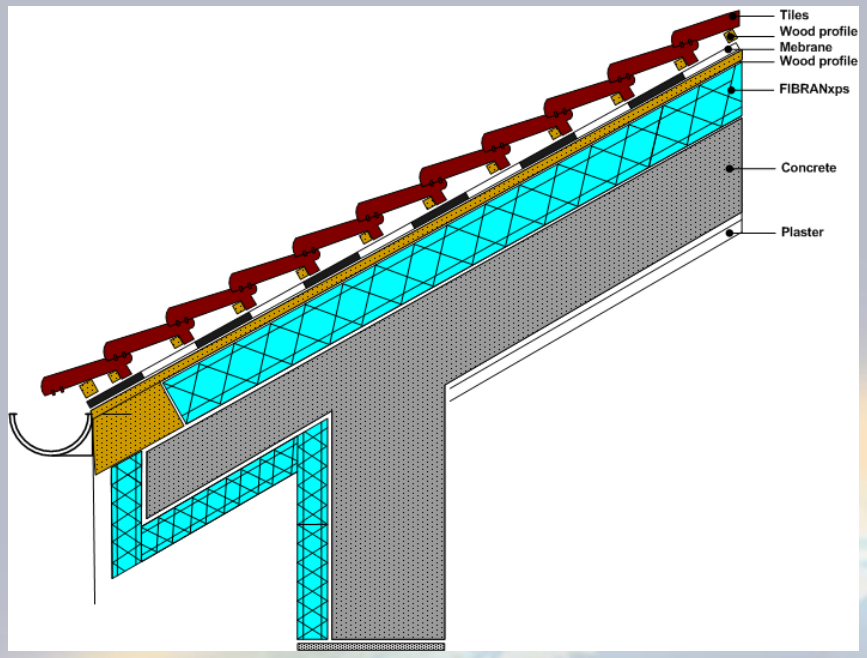
Pitch Roof



- **Pitch Roof**
  - Water absorption (↓)
  - Mechanical Properties (↑)
  - Thermal Resistance (↑)
  - Sound Insulation (↑)
- **Proposed Material**
  - FIBRANxps 300 I/L

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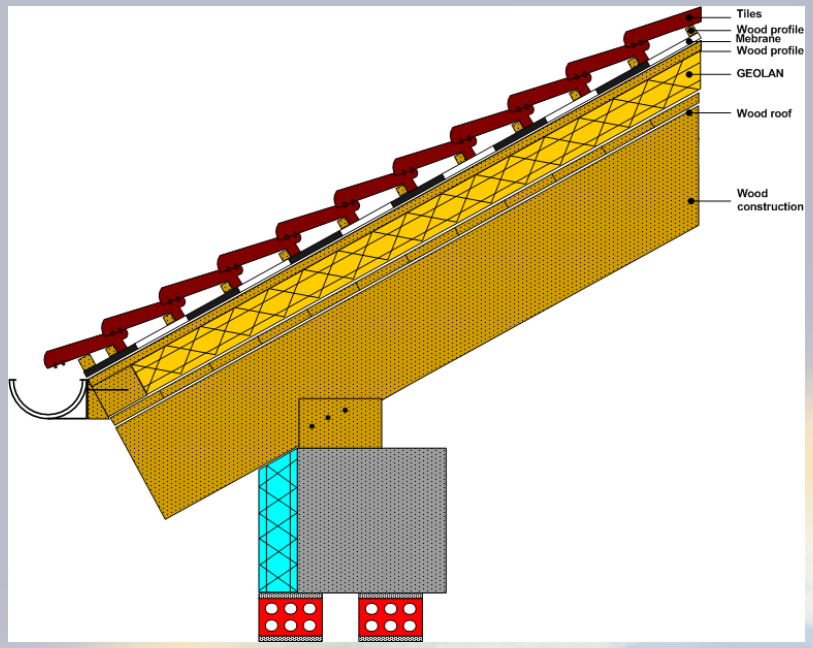
Pitch Roof



- **Pitch Roof**
  - Water absorption (↓)
  - Mechanical Properties (↑)
  - Thermal Resistance (↑)
  - Sound Insulation (↑)
- **Proposed Material**
  - FIBRAN*geo* B-001

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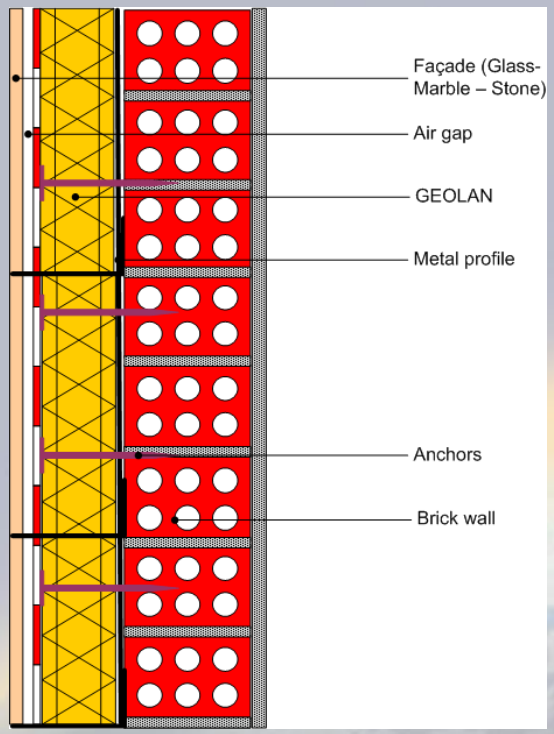
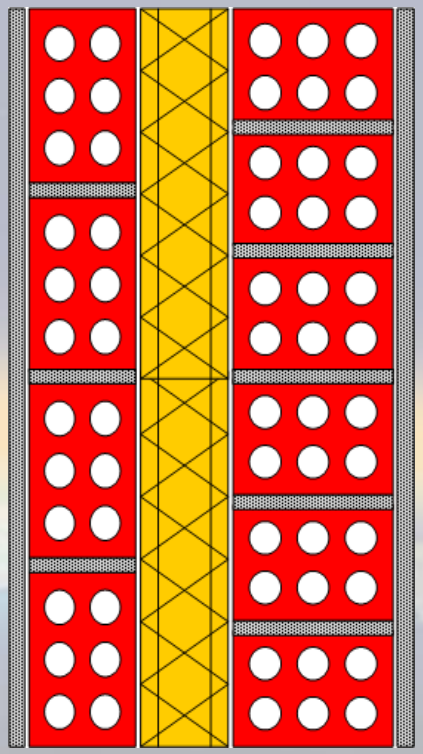
Vertical Building Elements





- **Walls**
  - Thermal Resistance (↑)
  - Fire Resistance (↑)
  - Sound Insulation (↑)
- **Proposed Material**
  - FIBRAN*geo* B-570- YM
  - FIBRAN*geo* B-050
  - FIBRAN*geo* B-001

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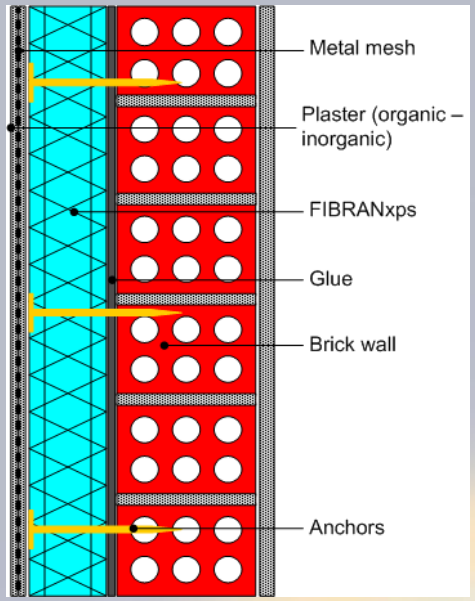
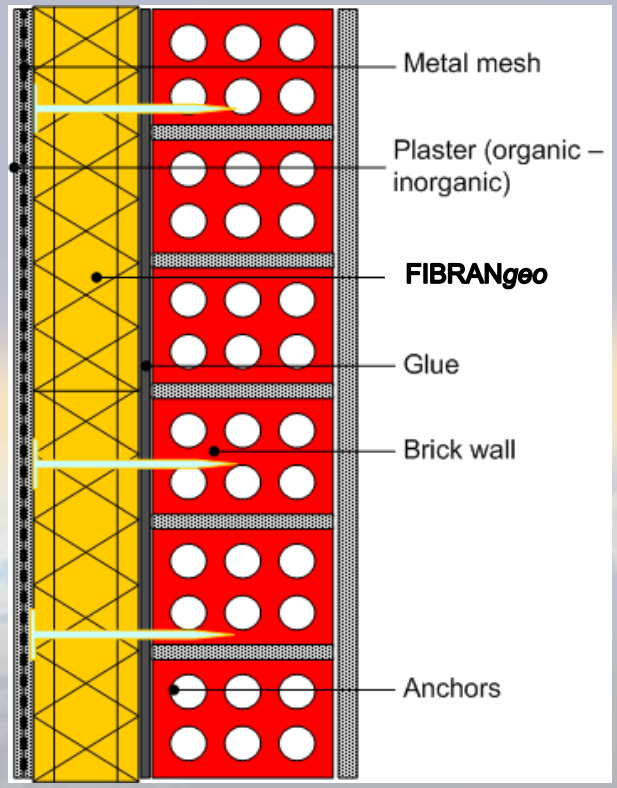
Façade





- **Facade**
  - Thermal Resistance (↑)
  - Tensile Strength ()
  - Delamination Strength (↑)
- **Proposed Material**
  - FIBRAN*geo* BP-021
  - FIBRAN*xps* ETICS GF

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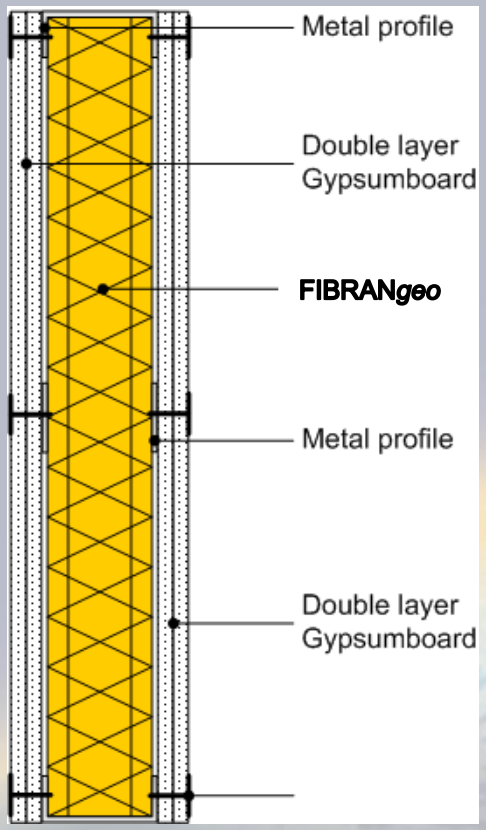
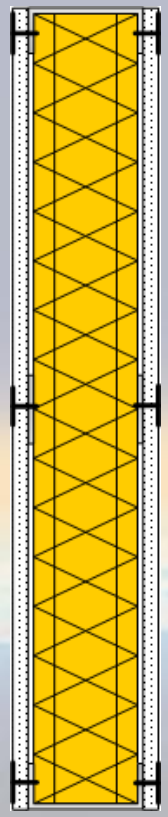
Vertical Building Elements





- **Walls**
  - Thermal Resistance (↑)
  - Fire Resistance (↑)
  - Sound Insulation (↑)
- **Proposed Material**
  - FIBRAN*geo* B-050 (YM)
  - FIBRAN*geo* B-570

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Sound Insulation

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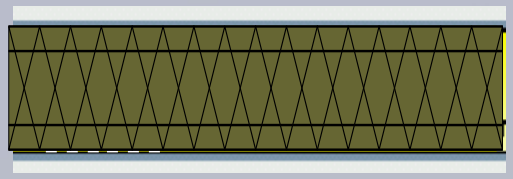
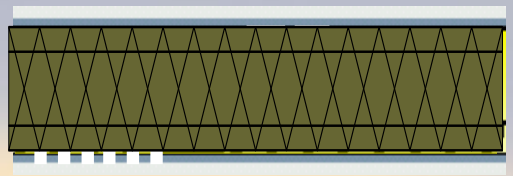
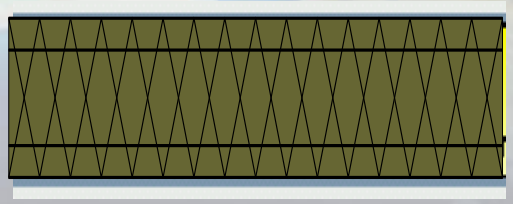
Dry Construstion

50mm  R_w = 41 dB

75mm  R_w = 44 dB

100mm  R_w = 47 dB

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Dry Construction: With and Without insulation

R_W = 38 dB

R_W = 47 dB

R_W = 48 dB

R_W = 56 dB

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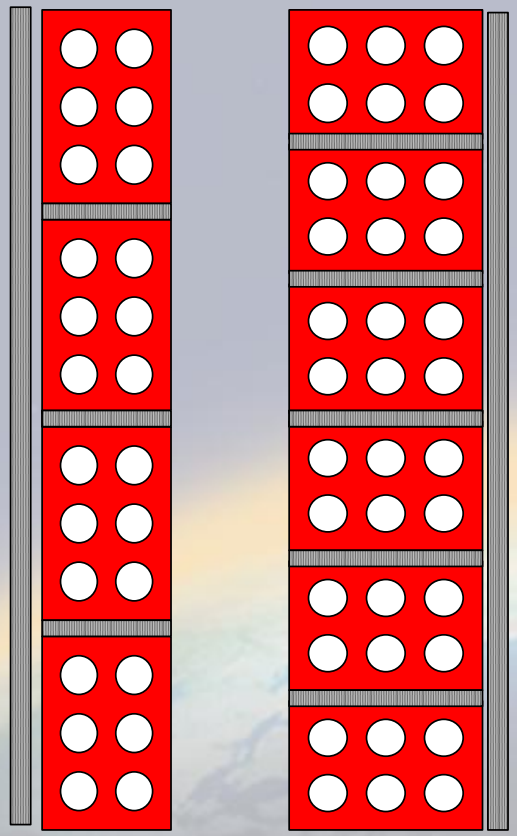
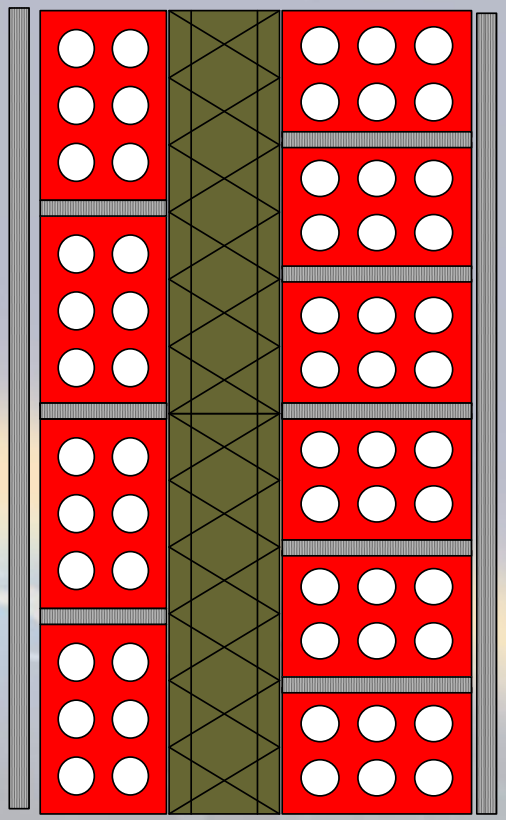
Rw = 52 dB



Rw = 57 dB



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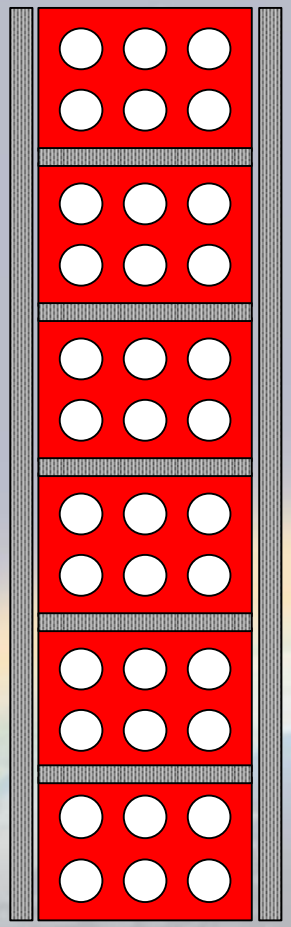
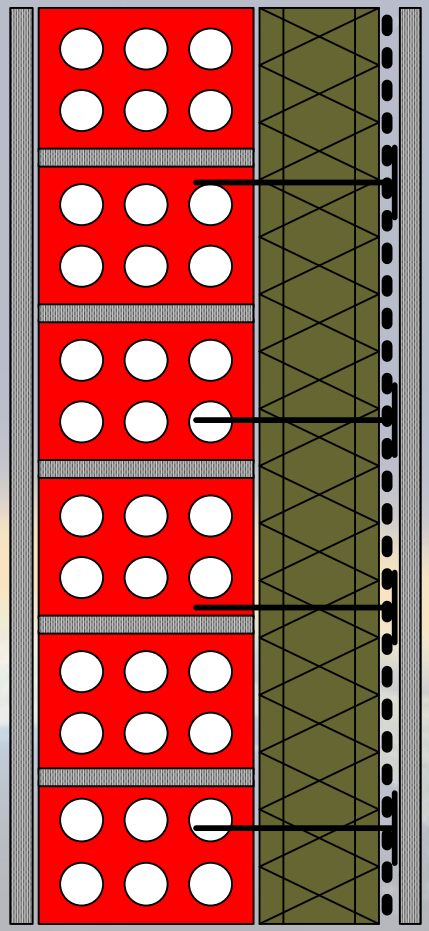
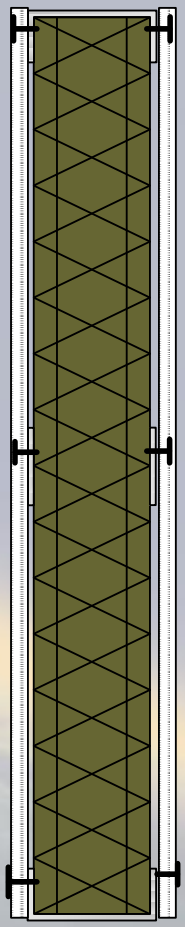
Rw = 39 dB



Rw = 51 dB



Rw = 47 dB



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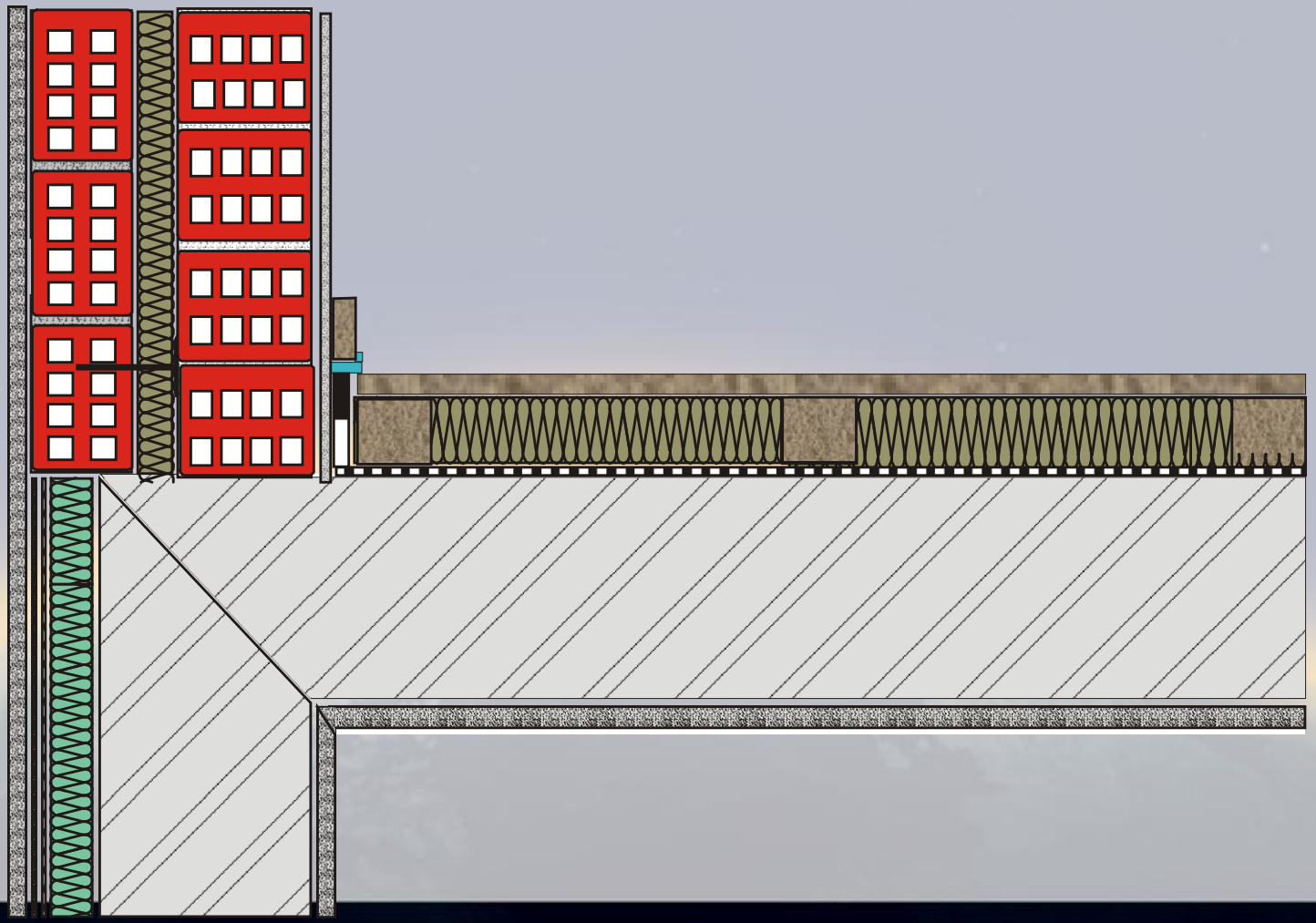
ENERGYSHIELD.

Floor: wood ending



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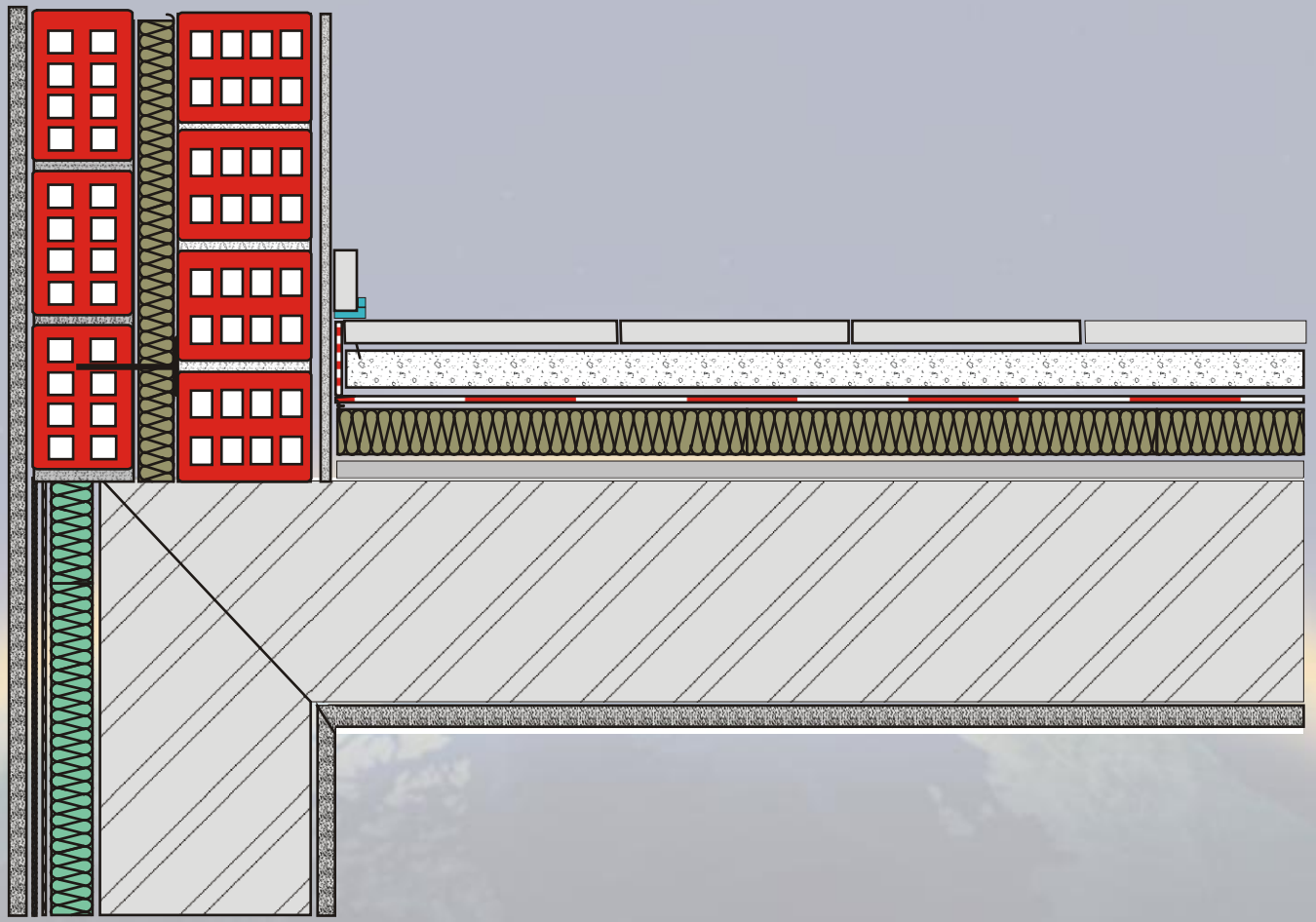
ENERGYSHIELD.

Floor: marble ending

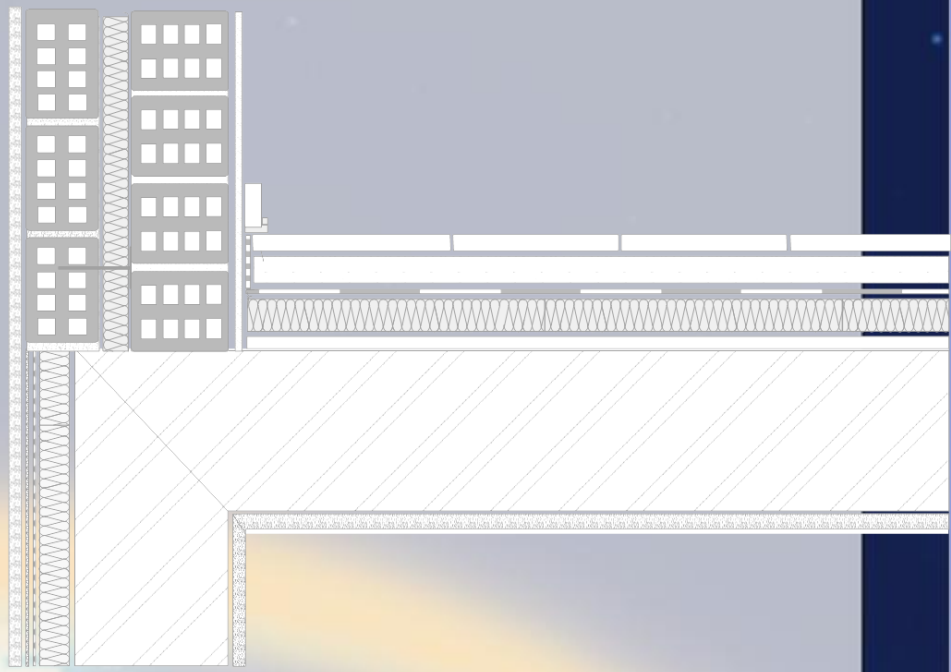


ENERGYSHIELD.

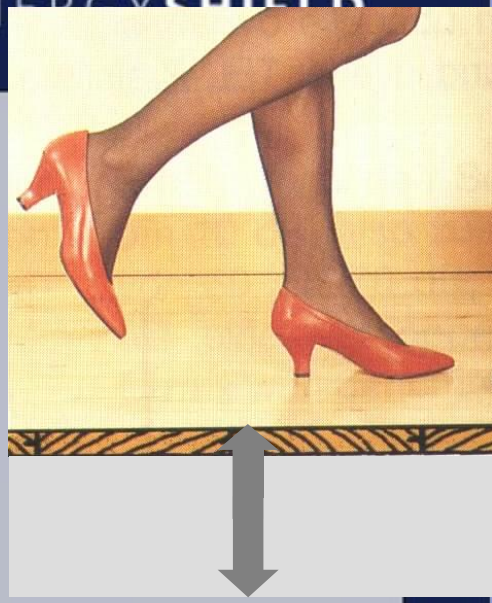
Δάπεδο

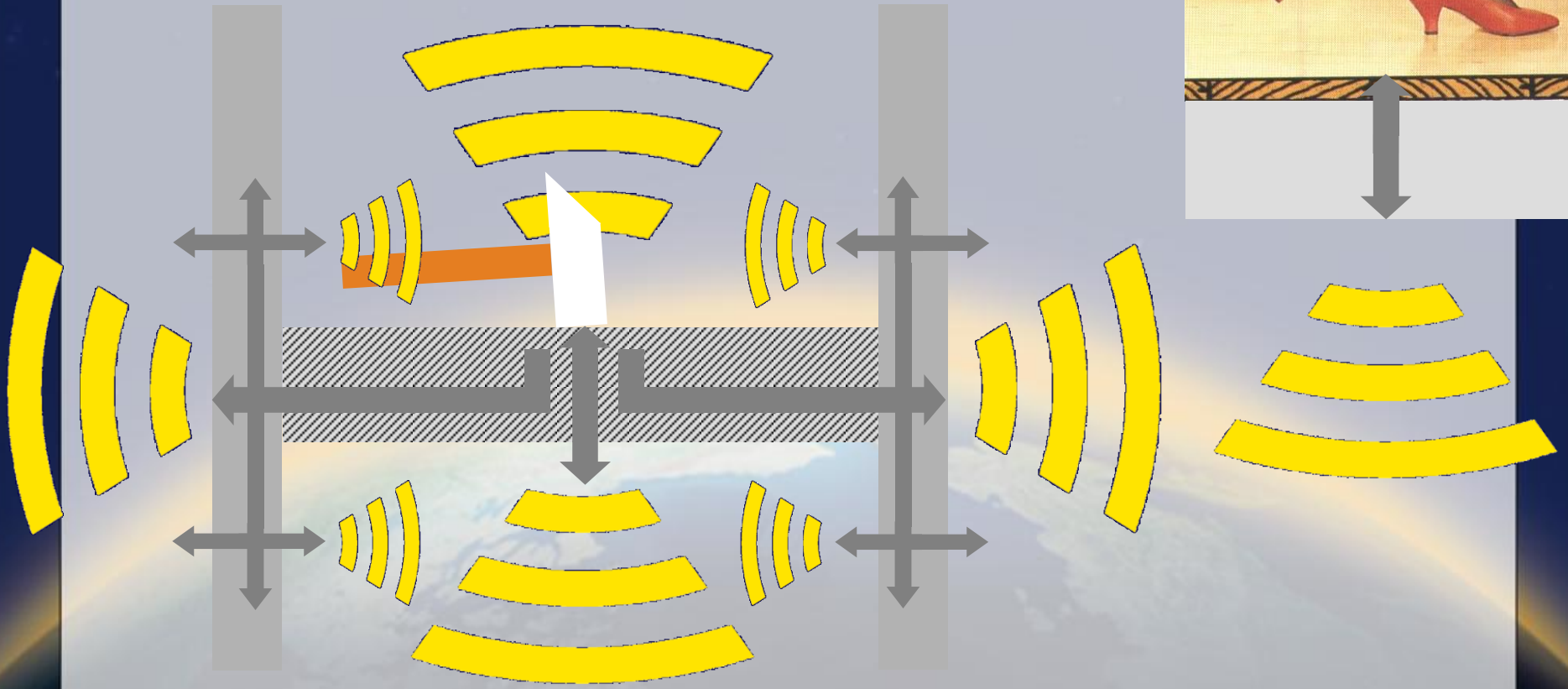
Καταπολέμηση Κτυπογενούς θορύβου

- Δημιουργία Πλωτού Δαπέδου
- Ηχομονωτικά προϊόντα με δναμική ακαμψία <= 10 MN/m3

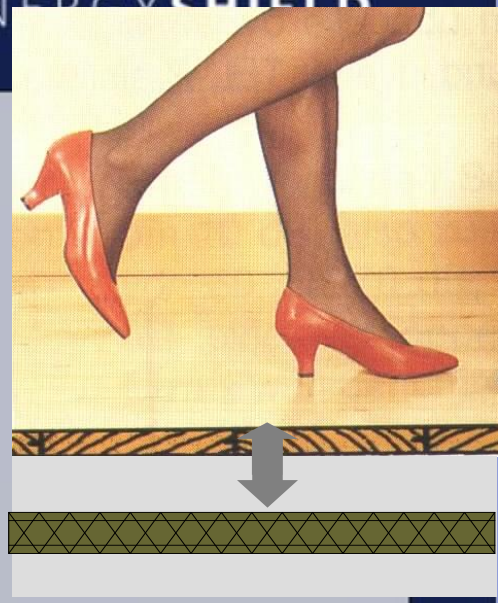


Ηχομόνωση Δαπέδων





Ηχομόνωση Δαπέδων



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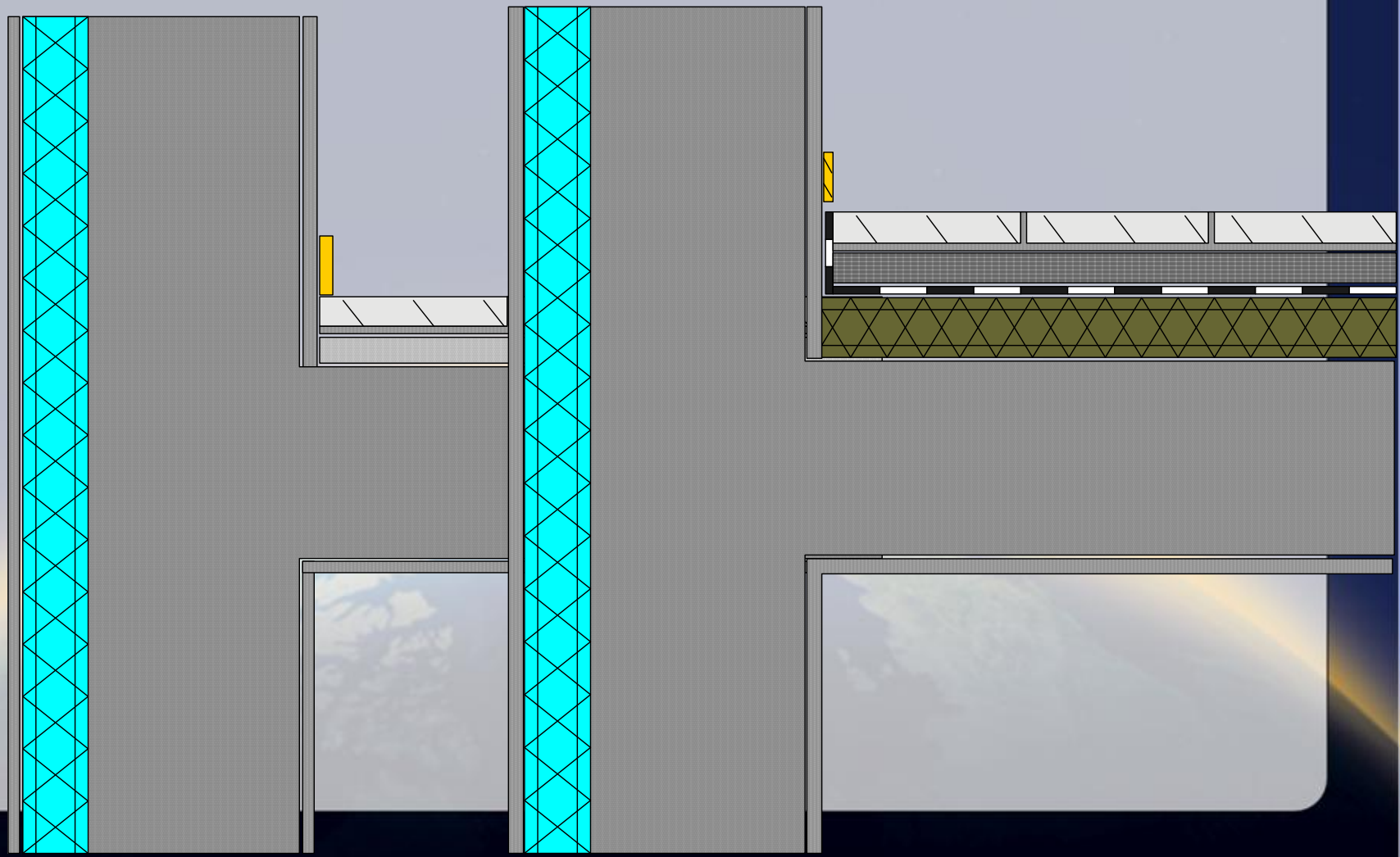
ENERGYSHIELD.

Με ή χωρίς πχοατπορροφητικό Υλικό

Ln,w = 45 dB

Ln,w =53 dB



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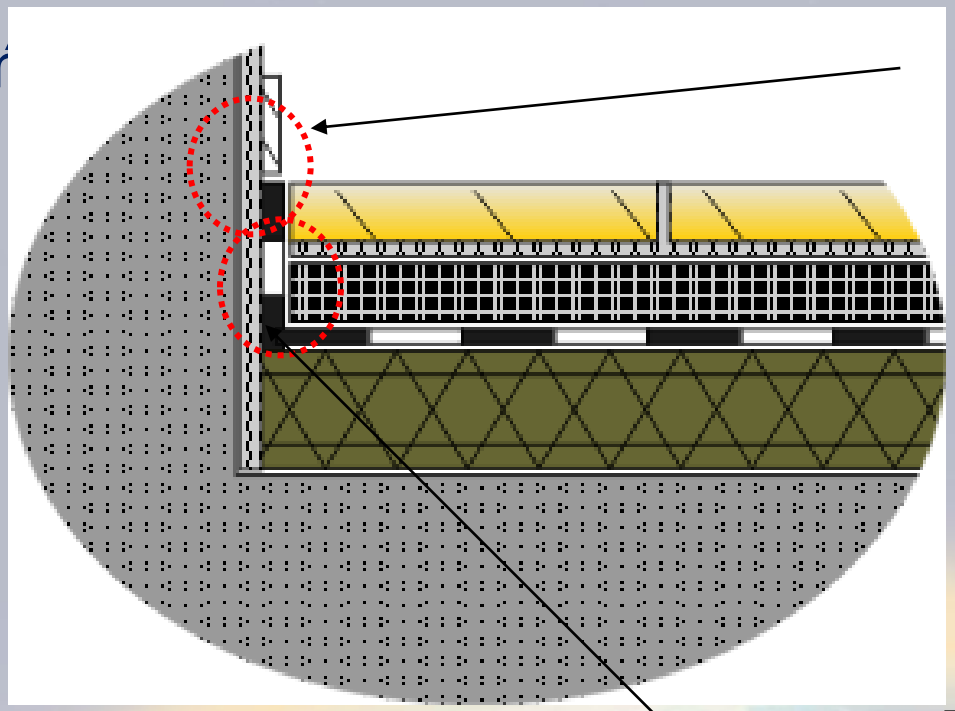
ENERGYSHIELD.

Με η



Σοβατεπί: Η επαφή του με την τελική επιφάνεια του δαπέδου δημιουργεί Ηχογέφυρα

Η αντικραδασμική μεμβράνη πρέπει να καλύπτει όλο το ύψος του δαπέδου

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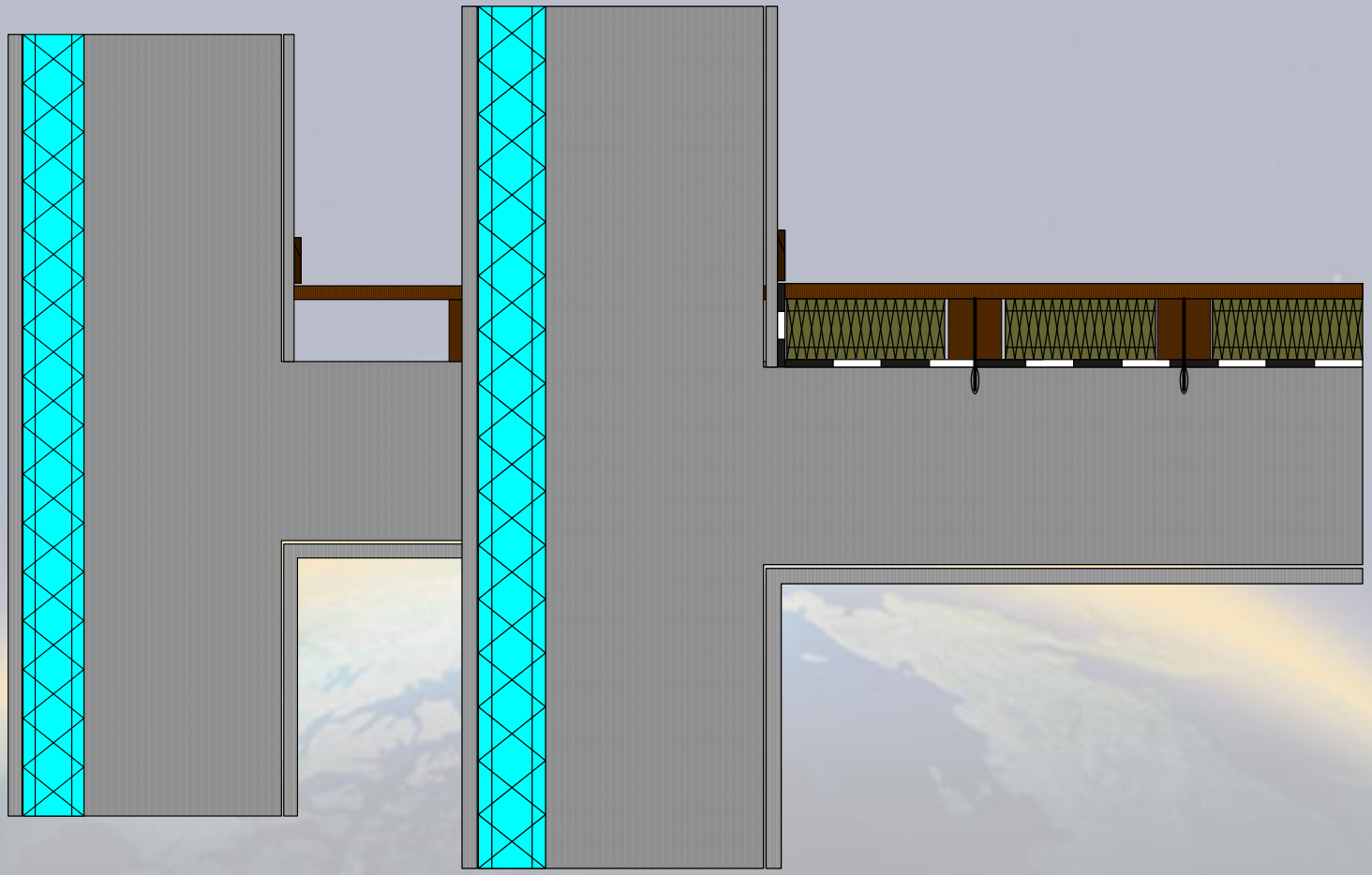
ENERGYSHIELD.

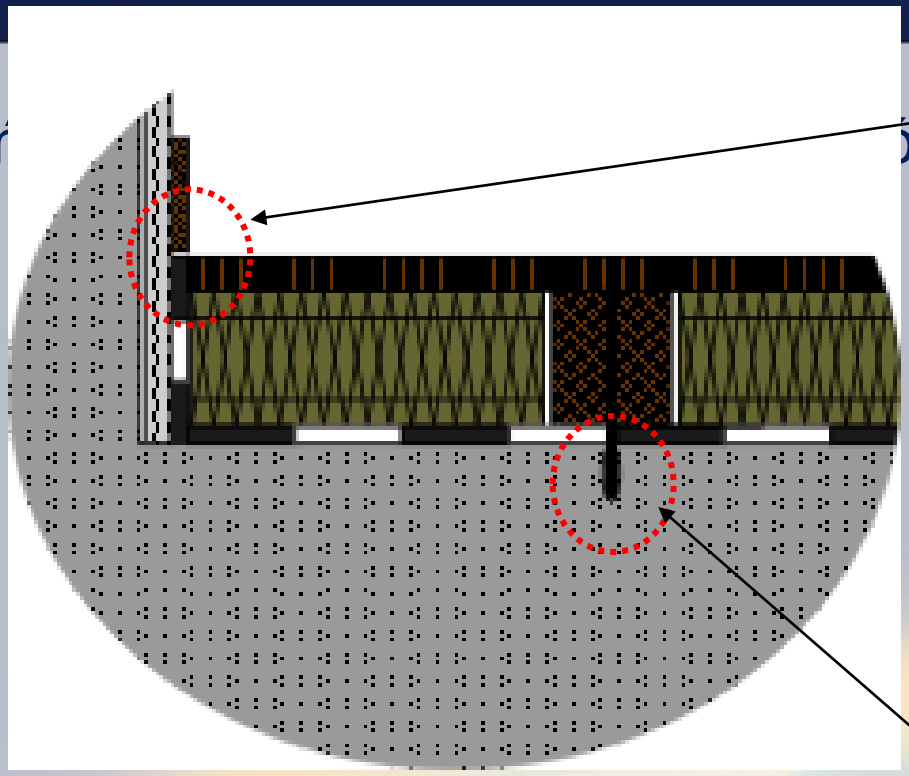
Με ή χωρίς ηχοαπορροφητικό Υλικό

Ln,w = 46dB

Ln,w = 52dB



Με η



Σοβατεπί: Η επαφή του με την τελική επιφάνεια του δαπέδου δημιουργεί ηχογέφυρα

Βίδες: Πρέπει να έχουν ειδικά ηχομονωτικά προστατευτικά για να μην δημιουργήσουν ηχογέφυρες

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ENERGYSHIELD.

Industrial Line

FIBRANgeo *T -R*

Stella Chadiarakou

Dr. Mechanical Engineer

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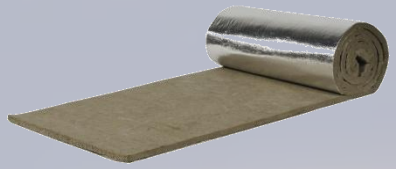
ENERGYSHIELD.

Type of Products

- Rolls
  - R-050-AL
  - R-560
  - R-080



- Rolls with wire net
  - R-560-KO
  - R-080-KO
  - R-001-KO
  - R-021-KO

- Boards
  - TB-560
  - TB-080
  - TB-001
  - TB-021

- Loose Wool
- Pipe Section
  - PS 80

- Special Items
  - SI

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ENERGYSHIELD.

Advantages of FIBRAN*geo* T

- Thermal insulation
- Maximum service temperature .
- Sound insulation .
- Fire Protection
- Breathability - Water Repellence – Non-hygroscopic
- Resistant to mechanical loads
- Natural, inorganic, odourless, chemically inert (practically neutral Ph)
- Lightweight, easy to handle, cut and install
- Resistant to vibrations
- Does not allow the development of micro-organisms, insects or rodents
- Recyclable
- Friendly to the environment and to the end user

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ENERGYSHIELD.

Application Area	FIBRANgeo T product type Products														
	Mattress on wire net				Boards						Block	Pipe Section	Roll		
	R-560-KO	R-080-KO	R-001-KO	R-021-KO	TB-050	TB-560	TB-080	TB-001	TB-021	TBP 50	TBP-080	PS	R-050-AL	R-560	R-080
Piping systems	✓	✓	✓									✓	✓		
Process pipelines	✓	✓	✓												
High temperature pipelines			✓	✓											
Smoke and exhaust pipes			✓	✓											
Circular ducts															
Rectangular ducts															
Fire insulation for Circular ducts															
Fire insulation for Rectangular ducts															
Sound Insulation for Circular ducts	✓	✓	✓		✓	✓				✓					
Sound Insulation for Rectangular ducts	✓	✓	✓		✓	✓				✓					
Tank walls/drums	✓				✓	✓							✓		
Tank roofs										✓					
Vessels															
Boiler			✓		✓	✓	✓	✓	✓	✓					
Furnaces			✓		✓	✓	✓	✓	✓	✓					
Industrial chimneys															
Valves, Bends, Flanges	✓	✓													
Columns	✓				✓	✓	✓						✓		

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ENERGYSHIELD.

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ENERGYSHIELD.

Application

- Pipe Section
  - High Temperature
  - HVAC
- Tanks
- Vessels – Boilers
- Storage Tanks
- Columns
- Cold Boxes
- Gas ducts

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ENERGYSHIELD.

Pipe Insulation

- Reduction of thermal losses
- Reduction of CO2
- Frost protection
- Stability of temperature
- Sound reduction
- Stability of condensation

Thermal Protection

Selection of materials

* ***Up to 300 C***
  - *pipe section* - ***FIBRANgeo PS***
  - *roll with AL* - ***FIBRANgeo R-050-AL***
* ***> 300 C***
  - *roll with wire net* - ***FIBRANgeo R-…-KO***

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ENERGYSHIELD.

Tanks – Storage Tanks

- Reduction of thermal losses
- Stability of temperature of the stored substance
- Frost protection
- Stability of condensation

Thermal Protection

Selection of materials

- Low thermal conductivity
- Water repellent
- Boards are recommended
- High compression strength in case of foot traffic
- Vapor Barrier in case of low temperatures

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ENERGYSHIELD.

Vessels - Boilers

- Reduction of thermal losses
- Frost protection
- Stability of the temperature of the stored substance
- Stability of the surface temperature

Thermal Protection

Selection of materials

Depend on …

- position of the vessel
- temperature of the stored substance
- dimension of the vessel
- application

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ENERGYSHIELD.

Gas Ducts

- Reduction of thermal losses
- Reduction of CO2
- Frost protection
- Stability of temperature
- Sound reduction
- Stability of condensation

Thermal Protection

Selection of materials

* ***Up to 300 C***
  - *pipe section*
  - *roll with AL*
* ***> 300 C***
  - *roll with wire net*

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ENERGYSHIELD.

Columns

- Reduction of thermal losses
- Frost protection
- Stability of the temperature of the stored substance
- Stability of the surface temperature
- Sound absorption

Thermal Protection

Selection of materials

Depend on …

- position of the vessel
- temperature of the stored substance
- dimension of the vessel
- application

Certification

CE

FIBRAN*geo* T products conform to the European Directive 89/106/EEC since 2004. In compliance with the above Construction Products Directive, all types of FIBRAN*geo* T stonewool products hold the CE marking and are in conformity with the European Norms ***EN 14303/2009 and EN 13162/2008*** which refer to mineral wool insulation products for industrial installations, building equipment and building applications. In accordance with the aforementioned European Standards, every insulation product acquires a designation code which declares its technical characteristics.


EC-CERTIFICATE OF CONFORMITY
0751-CPD-2-001.0-01

Factory made mineral wool (MW) products

FIBRAN S.A.
Insulating Materials Industry
6th km Thessaloniki - Oreokastro,
560 10 Thessaloniki / Greece

Terpni-Serres / Greece

0751 - Forschungsinstitut für Wärmeschutz e.V. München

EN 14303:2009+A1:2013
with the Annex B and C of EN 13172:2012
and Section 5 of EN ISO 13787:2003

Grafelfing, 27 June 2013

Certification Body

Dipl.-Ing. Roland Schminer

EUCEB

All **FIBRAN*geo*** stonewool insulation products also carry the certification mark EUCEB (European Certification Board for Mineral Wool Products). EUCEB is an independent organisation whose procedures ensure compliance of mineral wool insulation products with the Directive's 97/69/EC, Note Q, regarding their fibres biosolubility and their non-classification as 'carcinogenic' materials.

Moreover, according to EC Regulation 790/2009 (August 10, 2009) stonewool insulation products are no longer classified as products causing skin irritation (R38).


EUCEB - European Certification Board for Mineral Wool Products

CERTIFICATE N° 227
for the right to use the EUCEB Trademark

In accordance with the Constitution of the European Certification Board for Mineral Wool Products (EUCEB), the Management Board certifies that

FIBRAN S.A - Greece
Plant Terpni, Serres
Stone Wool FIBRAN*geo*

has successfully passed EUCEB's recognition procedure (Appendix N° 227) for obtaining the registered Trademark certifying conformity of fibres produced with the requirements of Note Q of the Regulation (EC) No 1272/2008 of the European Parliament and of the Council as currently in force.

EUCEB

Brussels, 12/03/2009

Mr. Adriaan de Reydellet
- President -

Dr. Ole Kamstrup
- Chairman of the Quality Board -

The validity of this certificate can be checked on the EUCEB web-site or at the EUCEB Secretariat.
www.euceb.org

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ENERGYSHIELD.

Designation Code

MW – EN 14303 – Ti – ST(+)i – CS(10)i – WS – MVi - AWi – AFri– CLi –Fi – pHi

- MW – Factory made mineral wool insulation material, manufactured from molten rock, slag or glass.
- EN 14303 – The European Standard number
- Ti – Thickness Tolerances. Classes for thickness tolerances from the nominal thickness (e.g. Class T2: - 5mm + 15mm, ClassT4: - 3mm + 5mm).
- ST(+)i – Maximum Service (operating) Temperature (˚C).
- CS(10)i – Minimum Compressive Stress at 10% thickness deformation (kPa).
- WS – Short Term Water Absorption (kg/m²). Partial immersion of the material in water for 24 hours. The water absorption should be less than 1 kg/m².
- MVi – Water Vapour Transmission. The maximum ratio 'factor μ' of water vapour diffusion resistance of the material to the resistance of an equal thickness of air.
- AWi -Weighted Sound Absorption Coefficient. The value of the sound absorption coefficient in the frequency of 500Hz, measured on the standard weighted sound absorption curve.
- AF_ri – Air flow resistivity (kPa s/m²). Measured as the air flow resistance of the material and should be greater than 5 kPa s/m².
- CLi / Fi/pHi – Trace quantities of water-soluble chloride, fluoride, silicate and sodium ions and the pH-value shall be determined in accordance with EN 13468. For chloride and fluoride, no test result shall exceed the declared value. For the pH-value, no test result shall deviate from the declared value by more than 1,0. Level soluble chlorides (mg/kg).

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ENERGYSHIELD.

Fire Classification (EN 13501-1)

- **Class A1** – *non combustible. Products are not cause or contribute in fire acceleration (ISO 1182, ISO1716, EN 13823)*
- **Class A2** – *products must not show any sustained flaming for more than 20sec in the non combustibility test. They are testing for fire contribution, smoke intensity, burning droplets (ISO 1182, ISO1716, EN 13823)*
- **Class B** – *products must not spread more than 150mm in 60sec, when evaluated by a small flame test. They are testing for fire contribution, smoke intensity, burning droplets (EN 13823, EN ISO 11925-2)*
- **Class C** – *product contribute to flashover after 10min (EN 13823, EN ISO 11925-2)*
- **Class D** – *product contribute to flashover after 2min (EN 13823, EN ISO 11925-2)*
- **Class E** – *product is stable for less than 2min (EN ISO 11925-2)*
- **Class F** – *not tested or flammable*

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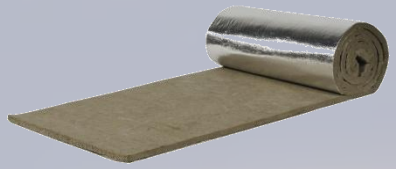
ENERGYSHIELD.

Type of Products

- Rolls
  - R-050-AL
  - R-560
  - R-080



- Rolls with wire net
  - R-560-KO
  - R-080-KO
  - R-001-KO
  - R-021-KO

- Boards
  - TB-560
  - TB-080
  - TB-001
  - TB-021

- Loose Wool
- Pipe Section
  - PS 80

- Special Items
  - SI

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ENERGYSHIELD.

FIBRANgeo R-050-AL

MW(Mineral Wool) - EN 14303 - T2-ST(+/100)600-WS1-MV1-AW1-CL10-F10-pH10,5

Technical Characteristics	Symbol EN-13162	Unit	Value	EN standard
Declared thermal conductivity at 10 ^{0}C	**λ_D**	**W/(mK)**	**0.035**	EN 13162 EN 12667 EN 12939
Nominal thickness	d_N	mm	30 - 80	EN 823
Maximum Service Temperature	-	^{o}C	600	EN 14706
Specific heat capacity	c	kJ/kg*K	0,84	-
Thickness tolerance	**T**	**Class**	**T2 (-5% , +15%)**	EN 14303
Short Term Water Absorption for 24 h	WS	kg/m^2	<1	EN 1609
Long Term Water Absorption for 28 days	WL(P)	kg/m^2	<3	EN 12087
Water vapour diffusion resistance factor μ	MU	-	1	EN 12086
Air flow resistivity, r	AF_r	kPa s/m^2	30 (without AL)	EN 29053
Weighted Sound Absorption Coefficient α_w (Board Thickness 50 mm)	AW	-	1 (without AL)	EN ISO 11654 EN ISO 354
Water vapour diffusion equivalent air layer thickness	MV	m	>100	EN ISO 10456
Trace quantities of water soluble chloride ions	CL	mg/kg	≤ 10	EN 13468
Trace quantities of water soluble fluoride ions	F	mg/kg	≤ 10	EN 13468
Level of the pH	pH	-	10,5 ± 1	EN 13468
Water leachable chloride, fluoride and PH-value	CL, F, PH	mg/kg	< 10 AS-quality for use over stainless steel. PH-value neutral to slightly alkaline	EN 13468 ASTM C795 ASTM C692 ASTM C871

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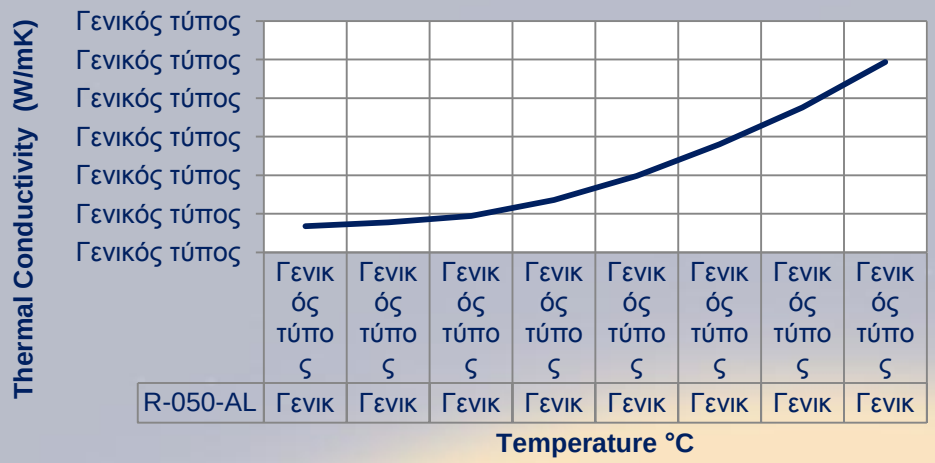
ENERGYSHIELD.

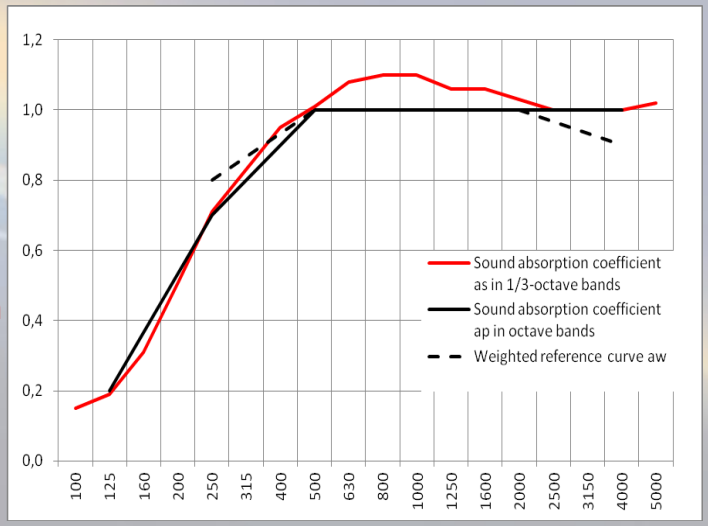
FIBRANgeo R-050-AL

MW(Mineral Wool) - EN 14303 - T2-ST(+/100)600-WS1-MV1-AW1-CL10-F10-pH10,5



Thermal Conductivity

Sound Absorption



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ENERGYSHIELD.

FIBRANgeo R-560

MW(Mineral Wool) - EN 14303 - T2-ST(+/250)650-WS1-MU1-AW1-AFr35-CL10-F10-pH10,5

Technical Characteristics	Symbol EN-13162	Unit	Value	EN standard
Declared thermal conductivity at 10 ^{0}C	**λ_D**	**W/(mK)**	**0.035**	EN 13162 EN 12667 EN 12939
Nominal thickness	d_N	mm	30 - 50	EN 823
Maximum Service Temperature	-	^{o}C	650	EN 14706
Fire Class			A1	EN 13501
Fire Class			A1	EN 13501
Specific heat capacity	c	kJ/kg*K	0,84	-
Thickness tolerance	**T**	**Class**	**T2 (-5% , +15%)**	EN 14303
Short Term Water Absorption for 24 h	WS	kg/m^2	<1	EN 1609
Long Term Water Absorption for 28 days	WL(P)	kg/m^2	<3	EN 12087
Water vapour diffusion resistance factor μ	MU	-	1	EN 12086
Air flow resistivity, r	AF_r	kPa s/m^2	35	EN 29053
Weighted Sound Absorption Coefficient α_w (Board Thickness 50 mm)	AW	-	1	EN ISO 11654 EN ISO 354
Water vapour diffusion resistance factor μ	MU		1	EN 12086
Trace quantities of water soluble chloride ions	CL	mg/kg	≤ 10	EN 13468
Trace quantities of water soluble fluoride ions	F	mg/kg	≤ 10	EN 13468
Level of the pH	pH	-	10,5 ± 1	EN 13468
Water leachable chloride, fluoride and PH-value	CL, F, PH	mg/kg	< 10 AS-quality for use over stainless steel. PH-value neutral to slightly alkaline	EN 13468 ASTM C795 ASTM C692 ASTM C871

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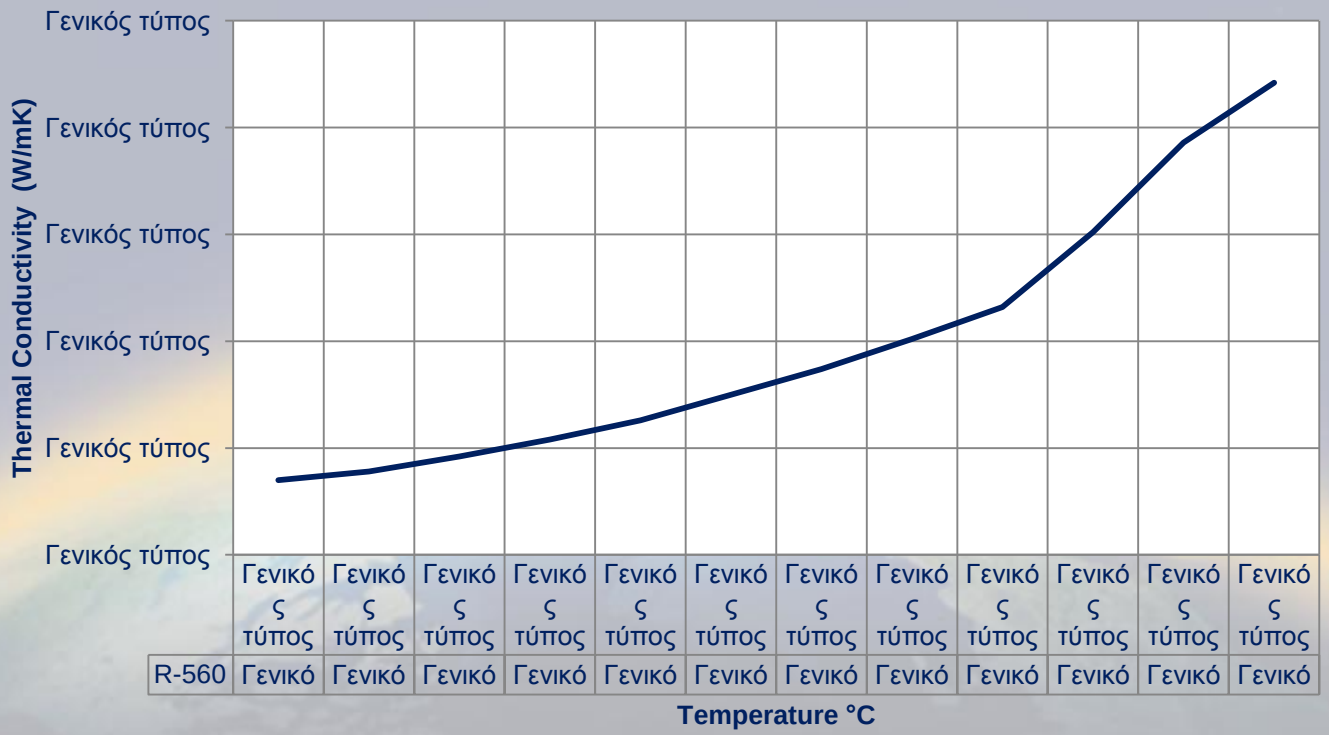
ENERGYSHIELD.

FIBRANgeo R-560

MW(Mineral Wool) - EN 14303 - T2-ST(+/250)650-WS1-MU1-AW1-AFr35-CL10-F10-pH10,5

Thermal Conductivity



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ENERGYSHIELD.

FIBRANgeo R-080

MW(Mineral Wool) - EN 14303 - T2-ST(+)650-WS1-MU1-AW1-AFr35-CL10-F10-pH10,5

Technical Characteristics	Symbol EN-13162	Unit	Value	EN standard
Declared thermal conductivity at 10 ^{0}C	**λ_D**	**W/(mK)**	**0.036**	EN 13162 EN 12667 EN 12939
Nominal thickness	d_N	mm	30 - 40	EN 823
Maximum Service Temperature	-	^{o}C	650	EN 14706
Fire Class			A1	EN 13501
Specific heat capacity	c	kJ/kg*K	0,84	-
Thickness tolerance	**T**	**Class**	**T2 (-5% , +15%)**	EN 14303
Short Term Water Absorption for 24 h	WS	kg/m^2	<1	EN 1609
Long Term Water Absorption for 28 days	WL(P)	kg/m^2	<3	EN 12087
Water vapour diffusion resistance factor μ	MU	-	1	EN 12086
Air flow resistivity, r	AF_r	kPa s/m^2	35	EN 29053
Weighted Sound Absorption Coefficient α_w (Board Thickness 50 mm)	AW	-	1	EN ISO 11654 EN ISO 354
Water vapour diffusion resistance factor μ	MU		1	EN 12086
Trace quantities of water soluble chloride ions	CL	mg/kg	≤ 10	EN 13468
Trace quantities of water soluble fluoride ions	F	mg/kg	≤ 10	EN 13468
Level of the pH	pH	-	10,5 ± 1	EN 13468
Water leachable chloride, fluoride and PH-value	CL, F, PH	mg/kg	< 10 AS-quality for use over stainless steel. PH-value neutral to slightly alkaline	EN 13468 ASTM C795 ASTM C692 ASTM C871

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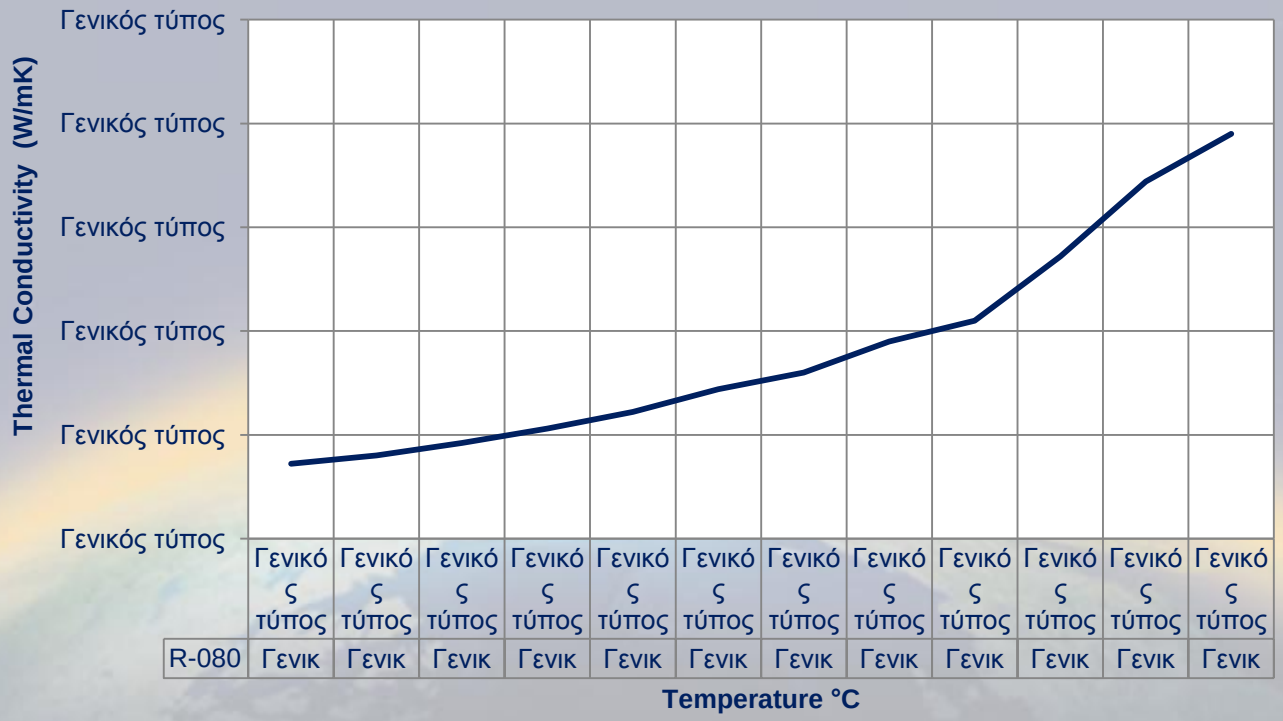
ENERGYSHIELD.

FIBRANgeo R-080

MW(Mineral Wool) - EN 14303 - T2-ST(+)650-WS1-MU1-AW1AFr35-CL10-F10-pH10,5

Thermal Conductivity



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ENERGYSHIELD.

FIBRANgeo R-560-KO

MW(Mineral Wool) - EN 14303 - T2-ST(+/250)650-WS1-MU1-AW1-AFr35-CL10-F10-pH10,5

Technical Characteristics	Symbol EN-13162	Unit	Value	EN standard
Declared thermal conductivity at 10 ^{0}C	**λ_D**	**W/(mK)**	**0.034**	EN 13162 EN 12667 EN 12939
Nominal thickness	d_N	mm	30 - 120	EN 823
Maximum Service Temperature	-	^{o}C	650	EN 14706
Fire Class			A1	EN 13501
Specific heat capacity	c	kJ/kg*K	0,84	-
Thickness tolerance	**T**	**Class**	**T2 (-5% , +15%)**	EN 14303
Short Term Water Absorption for 24 h	WS	kg/m^2	<1	EN 1609
Long Term Water Absorption for 28 days	WL(P)	kg/m^2	<3	EN 12087
Water vapour diffusion resistance factor μ	MU	-	1	EN 12086
Air flow resistivity, r	AF_r	kPa s/m^2	35	EN 29053
Weighted Sound Absorption Coefficient α_w (Board Thickness 50 mm)	AW	-	1	EN ISO 11654 EN ISO 354
Water vapour diffusion resistance factor μ	MU		1	EN 12086
Trace quantities of water soluble chloride ions	CL	mg/kg	≤ 10	EN 13468
Trace quantities of water soluble fluoride ions	F	mg/kg	≤ 10	EN 13468
Level of the pH	pH	-	10,5 ± 1	EN 13468
Water leachable chloride, fluoride and PH-value	CL, F, PH	mg/kg	< 10 AS-quality for use over stainless steel. PH-value neutral to slightly alkaline	EN 13468 ASTM C795 ASTM C692 ASTM C871

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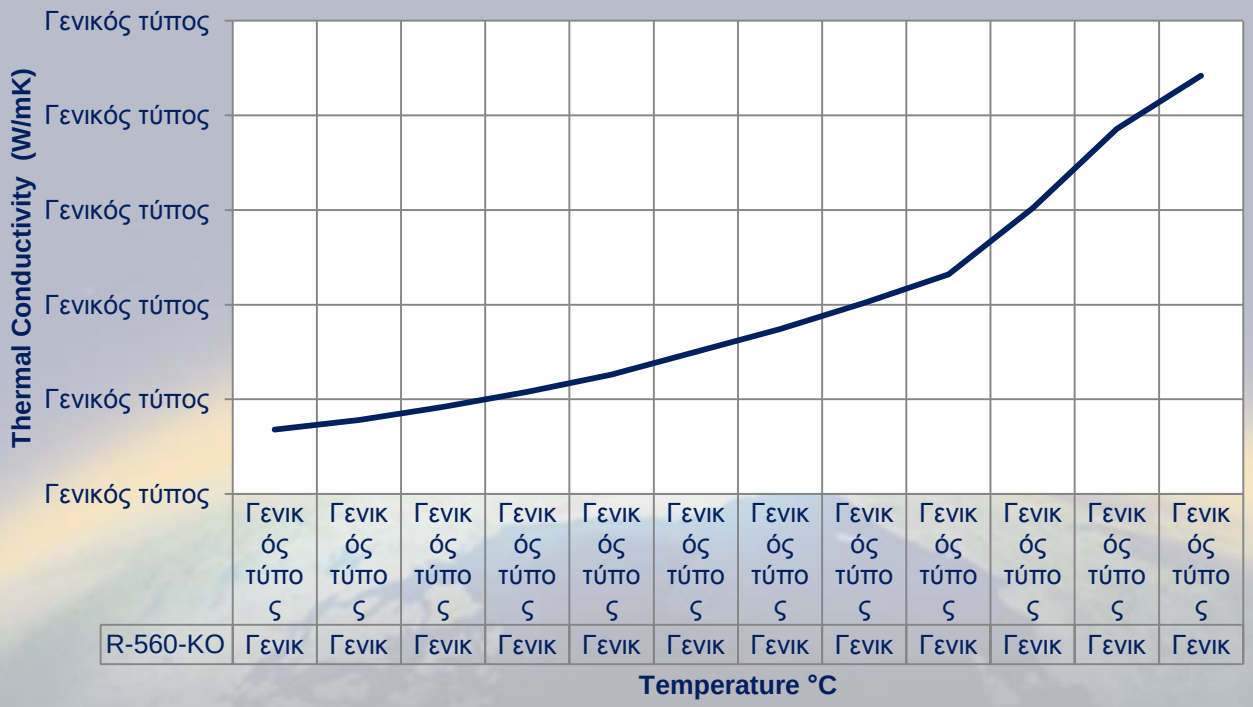
ENERGYSHIELD.

FIBRANgeo R-560-KO

MW(Mineral Wool) - EN 14303 - T2-ST(+/250)650-WS1-MV1-AW1-CL10-F10-pH10,5

Thermal Conductivity



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ENERGYSHIELD.

FIBRANgeo R-080-KO

MW(Mineral Wool) - EN 14303 - T2-ST(+)650-WS1-MU1-AW1-AFr55-CL10-F10-pH10,5

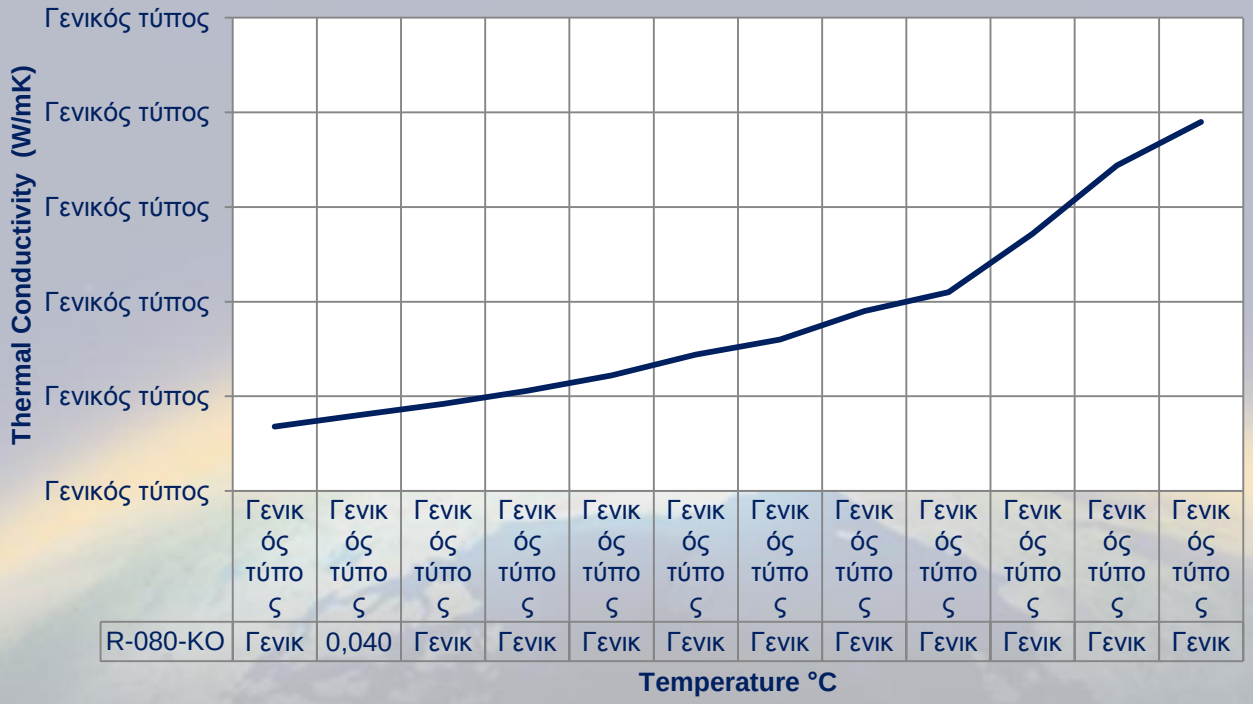
Technical Characteristics	Symbol EN-13162	Unit	Value	EN standard
Declared thermal conductivity at 10 ^{0}C	**λ_D**	**W/(mK)**	**0.034**	EN 13162 EN 12667 EN 12939
Nominal thickness	d_N	mm	30 - 120	EN 823
Maximum Service Temperature	-	^{o}C	650	EN 14706
Fire Class			A1	EN 13501
Specific heat capacity	c	kJ/kg*K	0,84	-
Thickness tolerance	**T**	**Class**	**T2 (-5% , +15%)**	EN 14303
Short Term Water Absorption for 24 h	WS	kg/m^2	<1	EN 1609
Long Term Water Absorption for 28 days	WL(P)	kg/m^2	<3	EN 12087
Water vapour diffusion resistance factor μ	MU	-	1	EN 12086
Air flow resistivity, r	AF_r	kPa s/m^2	55	EN 29053
Weighted Sound Absorption Coefficient α_w (Board Thickness 50 mm)	AW	-	1	EN ISO 11654 EN ISO 354
Water vapour diffusion resistance factor μ	MU		1	EN 12086
Trace quantities of water soluble chloride ions	CL	mg/kg	≤ 10	EN 13468
Trace quantities of water soluble fluoride ions	F	mg/kg	≤ 10	EN 13468
Level of the pH	pH	-	10,5 ± 1	EN 13468
Water leachable chloride, fluoride and PH-value	CL, F, PH	mg/kg	< 10 AS-quality for use over stainless steel. PH-value neutral to slightly alkaline	EN 13468 ASTM C795 ASTM C692 ASTM C871

ENERGYSHIELD.

FIBRANgeo R-080-KO

MW(Mineral Wool) - EN 14303 - T2-ST(+)650-WS1-MV1-AW1-CL10-F10-pH10,5

Thermal Conductivity



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ENERGYSHIELD.

FIBRANgeo R-001-KO

MW(Mineral Wool) - EN 14303 - T2-ST(+)650-WS1-MU1-AW1-AFr35-CL10-F10-pH10,5

Technical Characteristics	Symbol EN-13162	Unit	Value	EN standard
Declared thermal conductivity at 10 ^{0}C	**λ_D**	**W/(mK)**	**0.034**	EN 13162 EN 12667 EN 12939
Nominal thickness	d_N	mm	30 - 120	EN 823
Maximum Service Temperature	-	^{o}C	650	EN 14706
Fire Class			A1	EN 13501
Specific heat capacity	c	kJ/kg*K	0,84	-
Thickness tolerance	**T**	**Class**	**T2 (-5% , +15%)**	EN 14303
Short Term Water Absorption for 24 h	WS	kg/m^2	<1	EN 1609
Long Term Water Absorption for 28 days	WL(P)	kg/m^2	<3	EN 12087
Water vapour diffusion resistance factor μ	MU	-	1	EN 12086
Air flow resistivity, r	AF_r	kPa s/m^2	35	EN 29053
Weighted Sound Absorption Coefficient α_w (Board Thickness 50 mm)	AW	-	1	EN ISO 11654 EN ISO 354
Water vapour diffusion resistance factor μ	MU		1	EN 12086
Trace quantities of water soluble chloride ions	CL	mg/kg	≤ 10	EN 13468
Trace quantities of water soluble fluoride ions	F	mg/kg	≤ 10	EN 13468
Level of the pH	pH	-	10,5 ± 1	EN 13468
Water leachable chloride, fluoride and PH-value	CL, F, PH	mg/kg	< 10 AS-quality for use over stainless steel. PH-value neutral to slightly alkaline	EN 13468 ASTM C795 ASTM C692 ASTM C871

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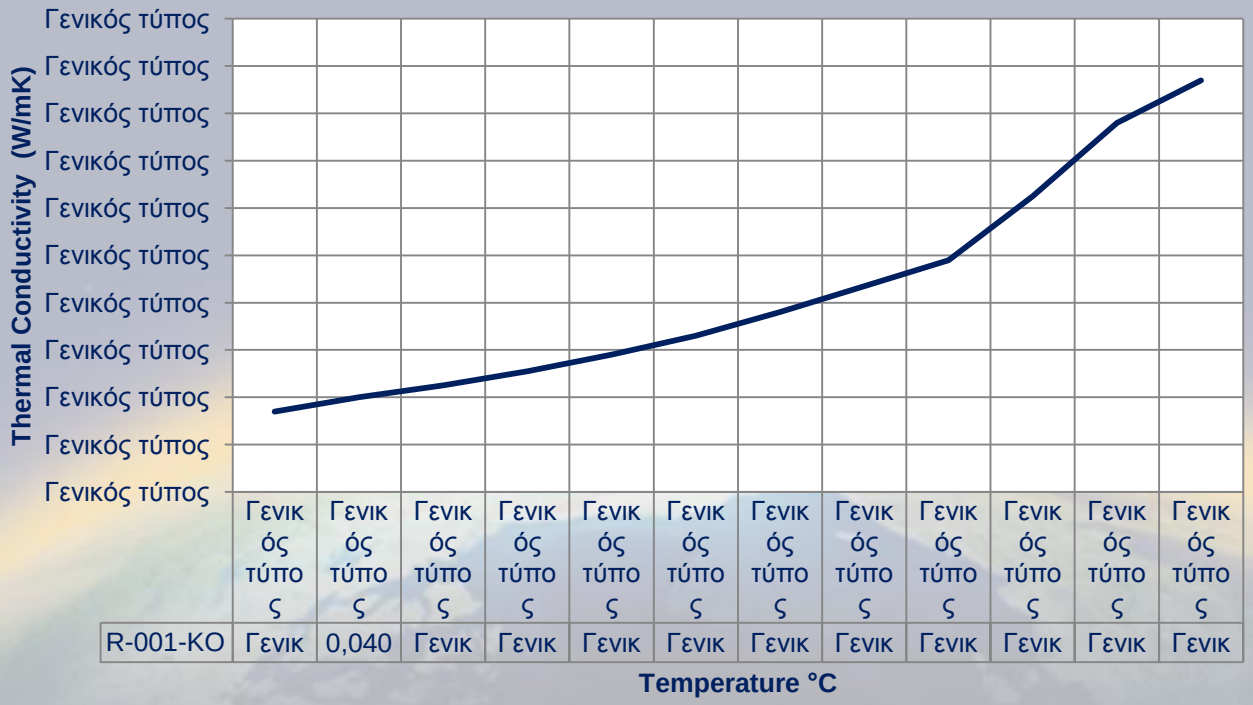
ENERGYSHIELD.

FIBRANgeo R-001-KO

MW(Mineral Wool) - EN 14303 - T2-ST(+)650-WS1-MV1-AW1-CL10-F10-pH10,5

Thermal Conductivity



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ENERGYSHIELD.

FIBRANgeo R-021-KO

MW(Mineral Wool) - EN 14303 - T2-ST(+/250)650-WS1-MU1-AW1-AFr35-CL10-F10-pH10,5

Technical Characteristics	Symbol EN-13162	Unit	Value	EN standard
Declared thermal conductivity at 10 ^{0}C	**λ_D**	**W/(mK)**	**0.034**	EN 13162 EN 12667 EN 12939
Nominal thickness	d_N	mm	30 - 120	EN 823
Maximum Service Temperature	-	^{o}C	650	EN 14706
Fire Class			A1	EN 13501
Specific heat capacity	c	kJ/kg*K	0,84	-
Thickness tolerance	**T**	**Class**	**T2** **(-5% , +15%)**	EN 14303
Short Term Water Absorption for 24 h	WS	kg/m^2	<1	EN 1609
Long Term Water Absorption for 28 days	WL(P)	kg/m^2	<3	EN 12087
Water vapour diffusion resistance factor μ	MU	-	1	EN 12086
Air flow resistivity, r	AF_r	kPa s/m^2	35	EN 29053
Weighted Sound Absorption Coefficient α_w (Board Thickness 50 mm)	AW	-	1	EN ISO 11654 EN ISO 354
Water vapour diffusion resistance factor μ	MU		1	EN 12086
Trace quantities of water soluble chloride ions	CL	mg/kg	≤ 10	EN 13468
Trace quantities of water soluble fluoride ions	F	mg/kg	≤ 10	EN 13468
Level of the pH	pH	-	10,5 ± 1	EN 13468
Water leachable chloride, fluoride and PH-value	CL, F, PH	mg/kg	< 10 AS-quality for use over stainless steel. PH-value neutral to slightly alkaline	EN 13468 ASTM C795 ASTM C692 ASTM C871

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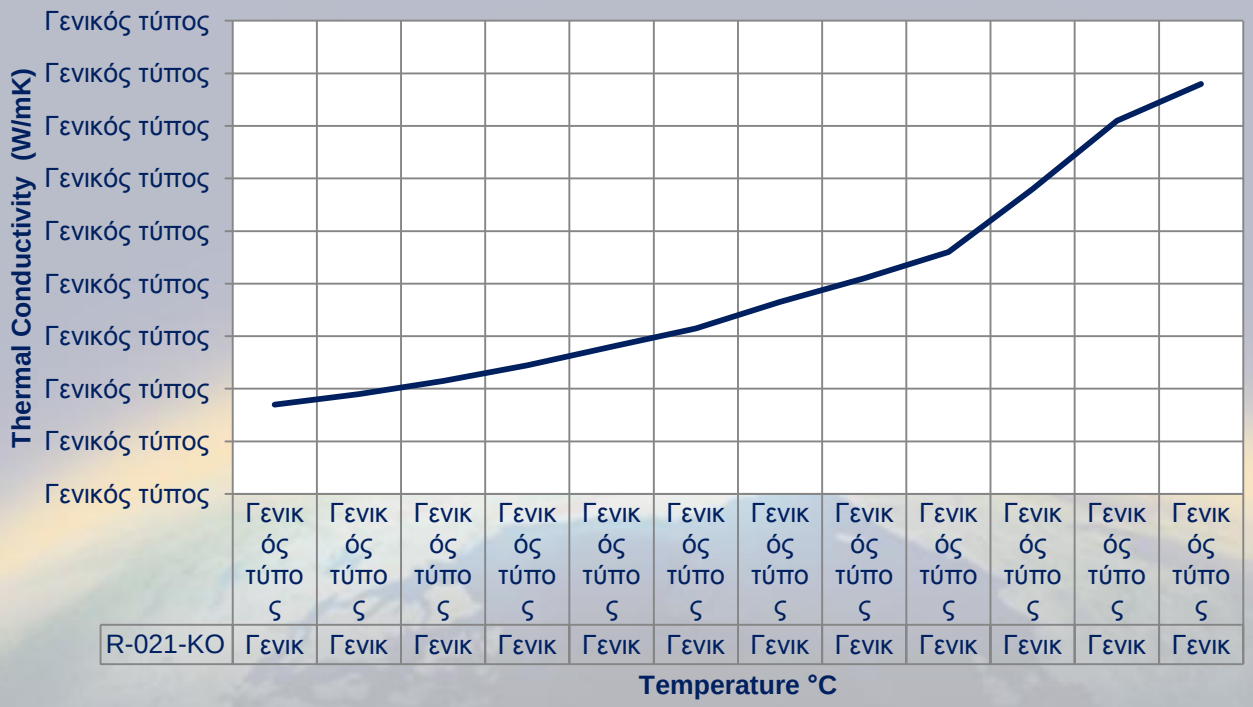
ENERGYSHIELD.

FIBRANgeo R-021-KO

MW(Mineral Wool) - EN 14303- T2-ST(+)650-WS1-MV1-AW1-CL10-F10-pH10,5

Thermal Conductivity



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ENERGYSHIELD.

FIBRANgeo TB-560

MW(Mineral Wool) - EN 14303 - T2-ST(+/250)650-WS1-MU1-AW1-AFr35-CL10-F10-pH10,5

Technical Characteristics	Symbol EN-13162	Unit	Value	EN standard
Declared thermal conductivity at 10 ^{0}C	**λ_D**	**W/(mK)**	**0.033**	EN 13162 EN 12667 EN 12939
Nominal thickness	d_N	mm	30 - 160	EN 823
Maximum Service Temperature	-	^{o}C	650	EN 14706
Fire Class			A1	EN 13501
Fire Class			A1	EN 13501
Specific heat capacity	c	kJ/kg*K	0,84	-
Thickness tolerance	**T**	**Class**	**T2 (-5% , +15%)**	EN 14303
Short Term Water Absorption for 24 h	WS	kg/m^2	<1	EN 1609
Long Term Water Absorption for 28 days	WL(P)	kg/m^2	<3	EN 12087
Water vapour diffusion resistance factor μ	MU	-	1	EN 12086
Air flow resistivity, r	AF_r	kPa s/m^2	35	EN 29053
Weighted Sound Absorption Coefficient α_w (Board Thickness 50 mm)	AW	-	1	EN ISO 11654 EN ISO 354
Water vapour diffusion resistance factor μ	MU		1	EN 12086
Trace quantities of water soluble chloride ions	CL	mg/kg	≤ 10	EN 13468
Trace quantities of water soluble fluoride ions	F	mg/kg	≤ 10	EN 13468
Level of the pH	pH	-	10,5 ± 1	EN 13468
Water leachable chloride, fluoride and PH-value	CL, F, PH	mg/kg	< 10 AS-quality for use over stainless steel. PH-value neutral to slightly alkaline	EN 13468 ASTM C795 ASTM C692 ASTM C871

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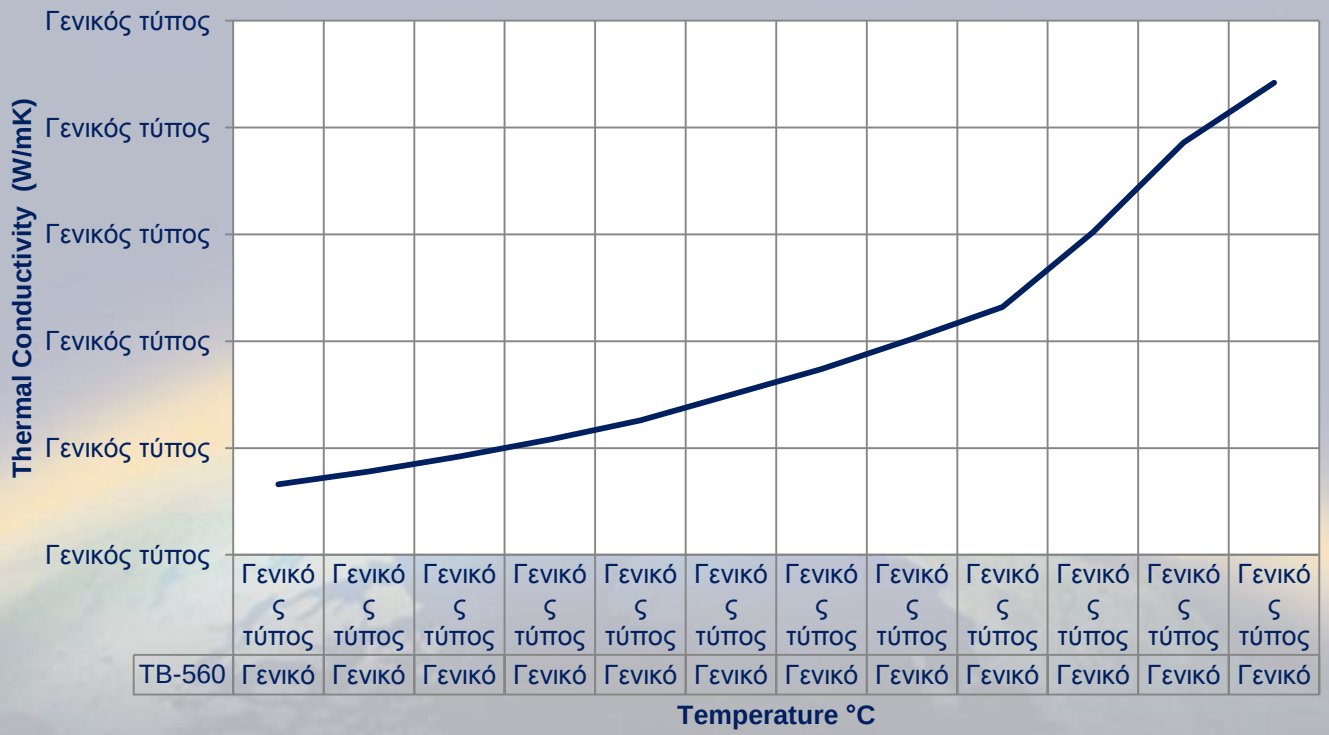
ENERGYSHIELD.

FIBRANgeo TB-560

MW(Mineral Wool) - EN 14303 - T2-ST(+/250)650-WS1-MU1-AW1-AFr35-CL10-F10-pH10,5

Thermal Conductivity



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ENERGYSHIELD.

FIBRANgeo TB-080

MW(Mineral Wool) - EN 14303 - T2-ST(+)650-WS1-MU1-AW1-AFr55-CL10-F10-pH10,5

Technical Characteristics	Symbol EN-13162	Unit	Value	EN standard
Declared thermal conductivity at 10 ^{0}C	**λ_D**	**W/(mK)**	**0.034**	EN 13162 EN 12667 EN 12939
Nominal thickness	d_N	mm	30 - 120	EN 823
Maximum Service Temperature	-	^{o}C	650	EN 14706
Fire Class			A1	EN 13501
Specific heat capacity	c	kJ/kg*K	0,84	-
Thickness tolerance	**T**	**Class**	**T2 (-5% , +15%)**	EN 14303
Short Term Water Absorption for 24 h	WS	kg/m^2	<1	EN 1609
Long Term Water Absorption for 28 days	WL(P)	kg/m^2	<3	EN 12087
Water vapour diffusion resistance factor μ	MU	-	1	EN 12086
Air flow resistivity, r	AF_r	kPa s/m^2	55	EN 29053
Weighted Sound Absorption Coefficient α_w (Board Thickness 50 mm)	AW	-	1	EN ISO 11654 EN ISO 354
Water vapour diffusion resistance factor μ	MU		1	EN 12086
Trace quantities of water soluble chloride ions	CL	mg/kg	≤ 10	EN 13468
Trace quantities of water soluble fluoride ions	F	mg/kg	≤ 10	EN 13468
Level of the pH	pH	-	10,5 ± 1	EN 13468
Water leachable chloride, fluoride and PH-value	CL, F, PH	mg/kg	< 10 AS-quality for use over stainless steel. PH-value neutral to slightly alkaline	EN 13468 ASTM C795 ASTM C692 ASTM C871

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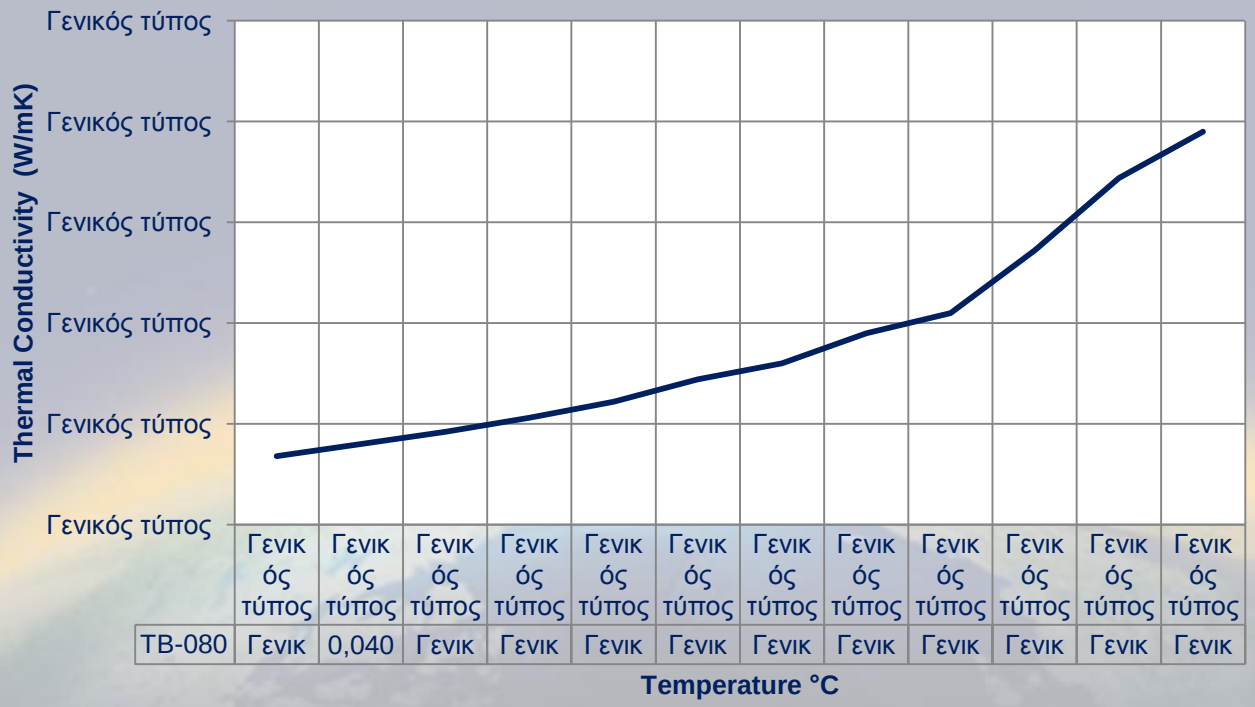
ENERGYSHIELD.

FIBRANgeo TB-080

MW(Mineral Wool) - EN 14303 - T2-ST(+)650-WS1-MV1-AW1-CL10-F10-pH10,5

Thermal Conductivity



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ENERGYSHIELD.

FIBRANgeo TB-001

MW(Mineral Wool) - EN 14303 - T2-ST(+)650-WS1-MU1-AW1-AFr35-CL10-F10-pH10,5

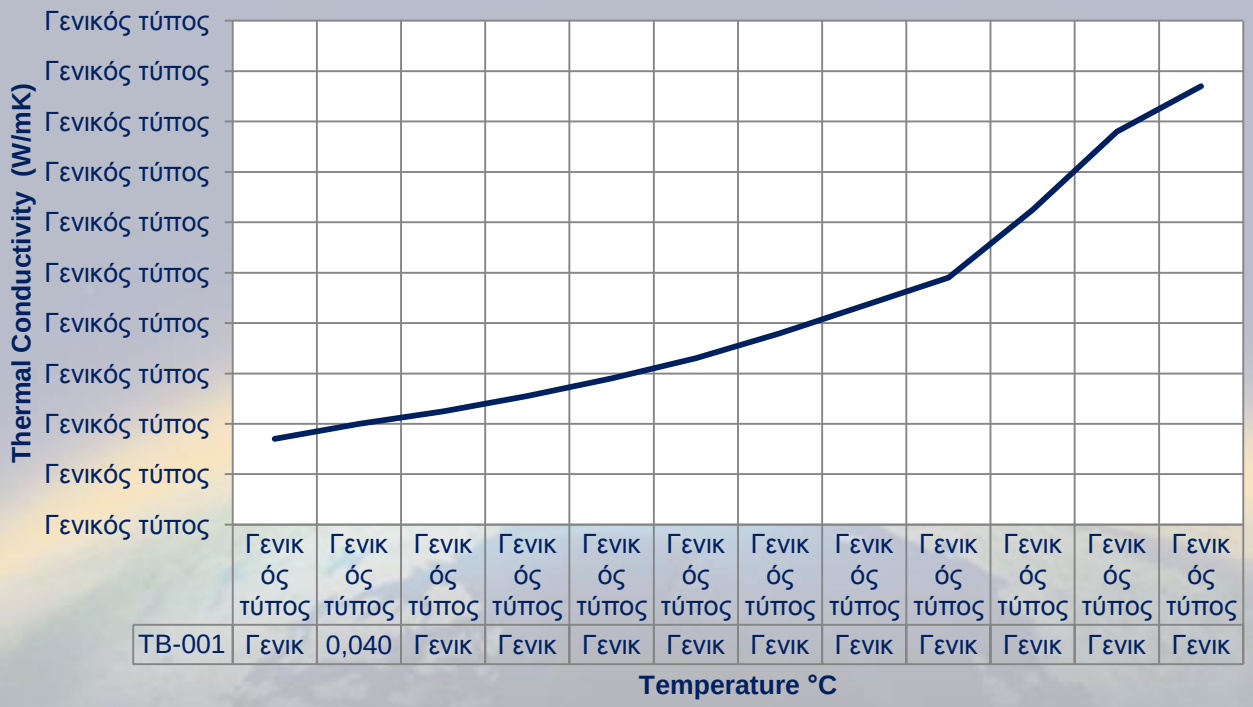
Technical Characteristics	Symbol EN-13162	Unit	Value	EN standard
Declared thermal conductivity at 10 ^{0}C	**λ_D**	**W/(mK)**	**0.034**	EN 13162 EN 12667 EN 12939
Nominal thickness	d_N	mm	30 - 120	EN 823
Maximum Service Temperature	-	^{o}C	650	EN 14706
Fire Class			A1	EN 13501
Specific heat capacity	c	kJ/kg*K	0,84	-
Thickness tolerance	**T**	**Class**	**T2 (-5% , +15%)**	EN 14303
Short Term Water Absorption for 24 h	WS	kg/m^2	<1	EN 1609
Long Term Water Absorption for 28 days	WL(P)	kg/m^2	<3	EN 12087
Water vapour diffusion resistance factor μ	MU	-	1	EN 12086
Air flow resistivity, r	AF_r	kPa s/m^2	35	EN 29053
Weighted Sound Absorption Coefficient α_w (Board Thickness 50 mm)	AW	-	1	EN ISO 11654 EN ISO 354
Water vapour diffusion resistance factor μ	MU		1	EN 12086
Trace quantities of water soluble chloride ions	CL	mg/kg	≤ 10	EN 13468
Trace quantities of water soluble fluoride ions	F	mg/kg	≤ 10	EN 13468
Level of the pH	pH	-	10,5 ± 1	EN 13468
Water leachable chloride, fluoride and PH-value	CL, F, PH	mg/kg	< 10 AS-quality for use over stainless steel. PH-value neutral to slightly alkaline	EN 13468 ASTM C795 ASTM C692 ASTM C871

ENERGYSHIELD.

FIBRANgeo TB-001

MW(Mineral Wool) - EN 14303 - T2-ST(+)650-WS1-MV1-AW1-CL10-F10-pH10,5

Thermal Conductivity



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ENERGYSHIELD.

FIBRANgeo TB-021

MW(Mineral Wool) - EN 14303 - T2-ST(+/250)650-WS1-MU1-AW1-AFr35-CL10-F10-pH10,5

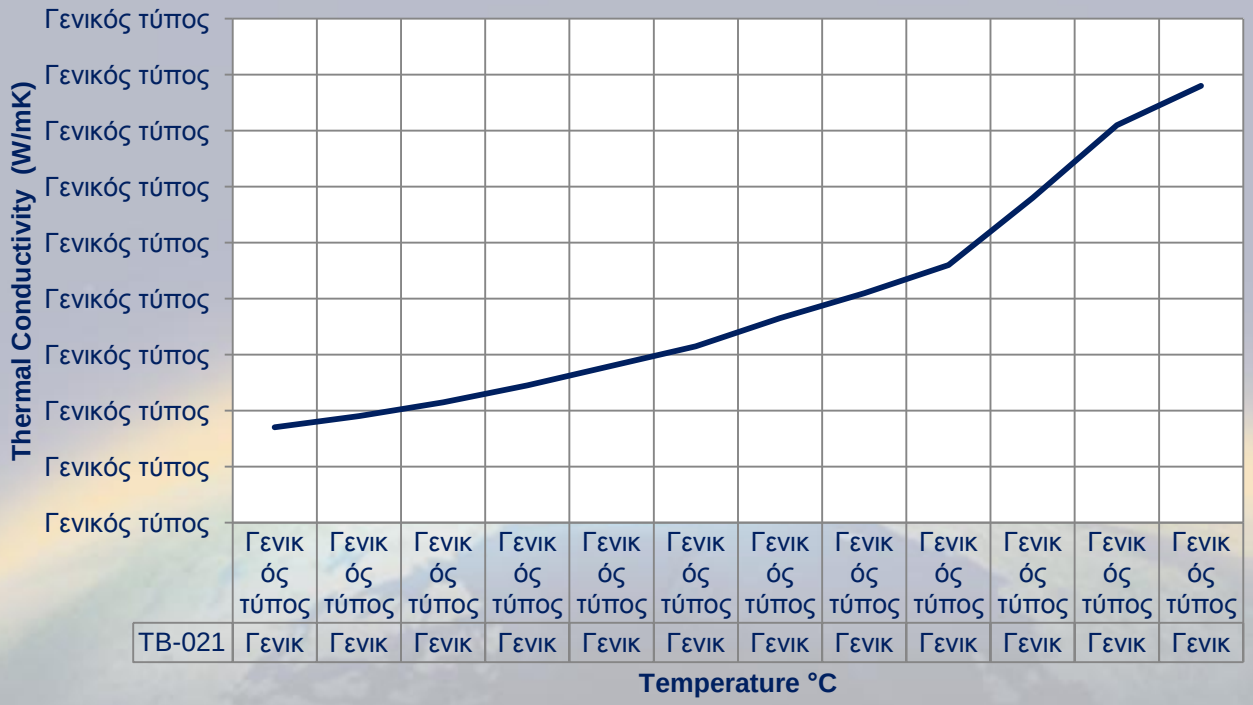
Technical Characteristics	Symbol EN-13162	Unit	Value	EN standard
Declared thermal conductivity at 10 ^{0}C	**λ_D**	**W/(mK)**	**0.034**	EN 13162 EN 12667 EN 12939
Nominal thickness	d_N	mm	30 - 120	EN 823
Maximum Service Temperature	-	^{o}C	650	EN 14706
Fire Class			A1	EN 13501
Specific heat capacity	c	kJ/kg*K	0,84	-
Thickness tolerance	**T**	**Class**	**T2 (-5% , +15%)**	EN 14303
Short Term Water Absorption for 24 h	WS	kg/m^2	<1	EN 1609
Long Term Water Absorption for 28 days	WL(P)	kg/m^2	<3	EN 12087
Water vapour diffusion resistance factor μ	MU	-	1	EN 12086
Air flow resistivity, r	AF_r	kPa s/m^2	35	EN 29053
Weighted Sound Absorption Coefficient α_w (Board Thickness 50 mm)	AW	-	1	EN ISO 11654 EN ISO 354
Water vapour diffusion resistance factor μ	MU		1	EN 12086
Trace quantities of water soluble chloride ions	CL	mg/kg	≤ 10	EN 13468
Trace quantities of water soluble fluoride ions	F	mg/kg	≤ 10	EN 13468
Level of the pH	pH	-	10,5 ± 1	EN 13468
Water leachable chloride, fluoride and PH-value	CL, F, PH	mg/kg	< 10 AS-quality for use over stainless steel. PH-value neutral to slightly alkaline	EN 13468 ASTM C795 ASTM C692 ASTM C871

ENERGYSHIELD.

FIBRANgeo TB-021

MW(Mineral Wool) - EN 14303- T2-ST(+)650-WS1-MV1-AW1-CL10-F10-pH10,5

Thermal Conductivity



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ENERGYSHIELD.

FIBRANgeo TBP 50

MW(Mineral Wool) - EN 14303- T4-ST(+)650-CS(10)50-PL(5)600-WS1-MU1-AW0,95-AFr60-CL10-F10-pH10,5

Technical Characteristics	Symbol EN-13162	Unit	Value	EN standard
Declared thermal conductivity at 10 °C	**λ_D**	**W/(mK)**	**0,038**	EN 13162 EN 12667 EN 12939
Nominal thickness	d_N	mm	30 - 160	EN 823
Fire classification	-	Class	A1 (Non-combustible)	EN 13501-1
Melting temperature	-	°C	>1000	DIN 4102-17
Specific heat capacity	c	kJ/kg*K	0,84	-
Thickness tolerance	**T**	**Class**	**T4 (-3, +5%)**	EN 13162
Tensile strength perpendicular to faces	TR	kPa	15	EN 1607
Compressive Stress at 10% thickness deformation	**CS(10)**	**kPa**	**50**	EN 826
Shear Strength	SS	kPa	20	EN 12090
Point Load (applied on a small area of 50 cm²) at 5 mm thickness deformation	**PL(5)**	**N**	**600**	EN 12430
Compressibility The difference between the unloaded thickness and the loaded thickness, (Cp = dL - dB)*	**CP**	**mm**	**2**	EN 13162 EN 12431
Design Load	-	kN/m²	15	EN 13162
Dynamic Stiffness , s' (Board Thickness 50 mm)	SD	MN/m³	32	EN 29052-1
Short Term Water Absorption for 24 h	WS	kg/m²	<1	EN 1609
Long Term Water Absorption for 28 days	WL(P)	kg/m²	<3	EN 12087
Water vapour diffusion resistance factor μ	MU	-	1	EN 12086
Air flow resistivity, r	AF_r	kPa s/m²	60	EN 29053
Weighted Sound Absorption Coefficient α_w (Board Thickness 50 mm)	AW	-	0,95 (Class A)	EN ISO 11654 EN ISO 354

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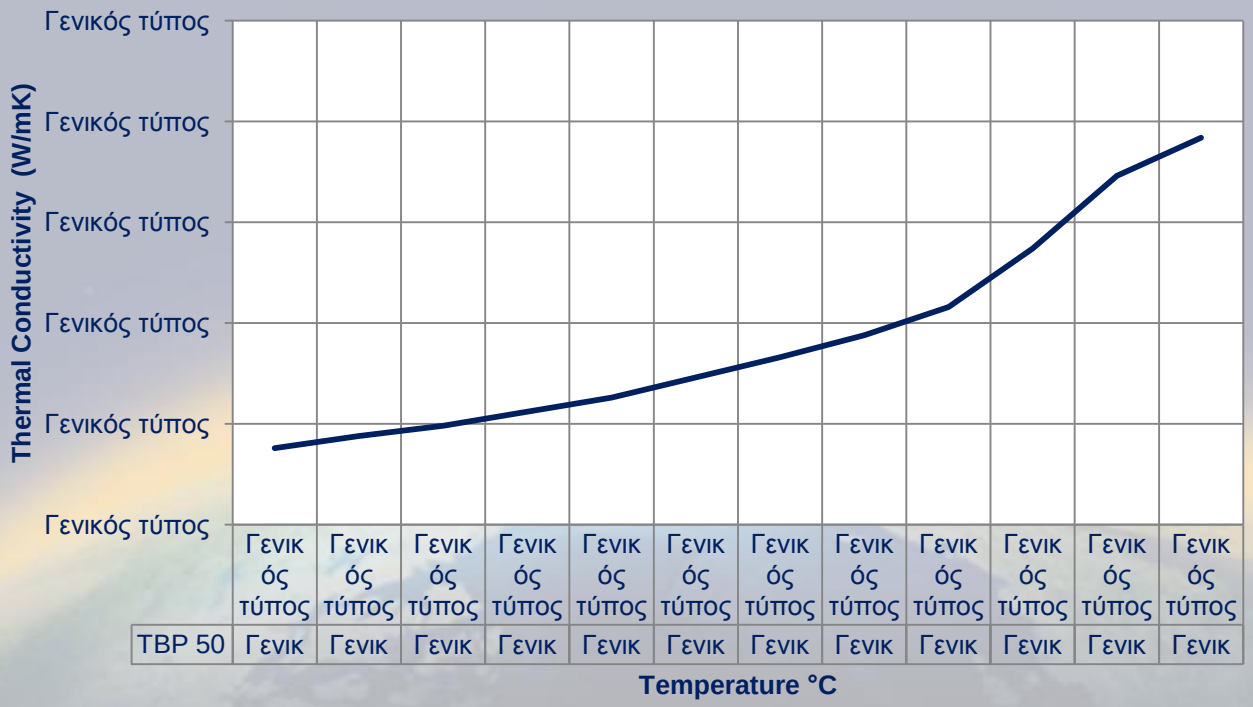
ENERGYSHIELD.

FIBRANgeo TBP 50

MW(Mineral Wool) - EN 14303- T4-ST(+)650-CS(10)50-PL(5)600-WS1-MU1-AW0,95-AFr60-CL10-F10-pH10,5

Thermal Conductivity



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ENERGYSHIELD.

FIBRANgeo TBP-080

MW(Mineral Wool) - EN 14303- T4-ST(+)650-WS1-MU1-AW0,95-AFr60-CL10-F10-pH10,5

Technical Characteristics	Symbol EN-13162	Unit	Value	EN standard
Declared thermal conductivity at 10 ^{0}C	**λ_D**	**W/(mK)**	**0,039**	EN 13162 EN 12667 EN 12939
Nominal thickness	d_N	mm	200-300-400	EN 823
Fire classification	-	Class	A1 (Non-combustible)	EN 13501-1
Specific heat capacity	c	kJ/kg*K	0,84	-
Thickness tolerance	**T**	**Class**	**T4 (-3, +5%)**	EN 13162
Short Term Water Absorption for 24 h	WS	kg/m^2	<1	EN 1609
Long Term Water Absorption for 28 days	WL(P)	kg/m^2	<3	EN 12087
Water vapour diffusion resistance factor μ	MU	-	1	EN 12086
Air flow resistivity, r	AF_r	kPa s/m^2	60	EN 29053
Weighted Sound Absorption Coefficient α_w (Board Thickness 50 mm)	AW	-	0,95 (Class A)	EN ISO 11654 EN ISO 354

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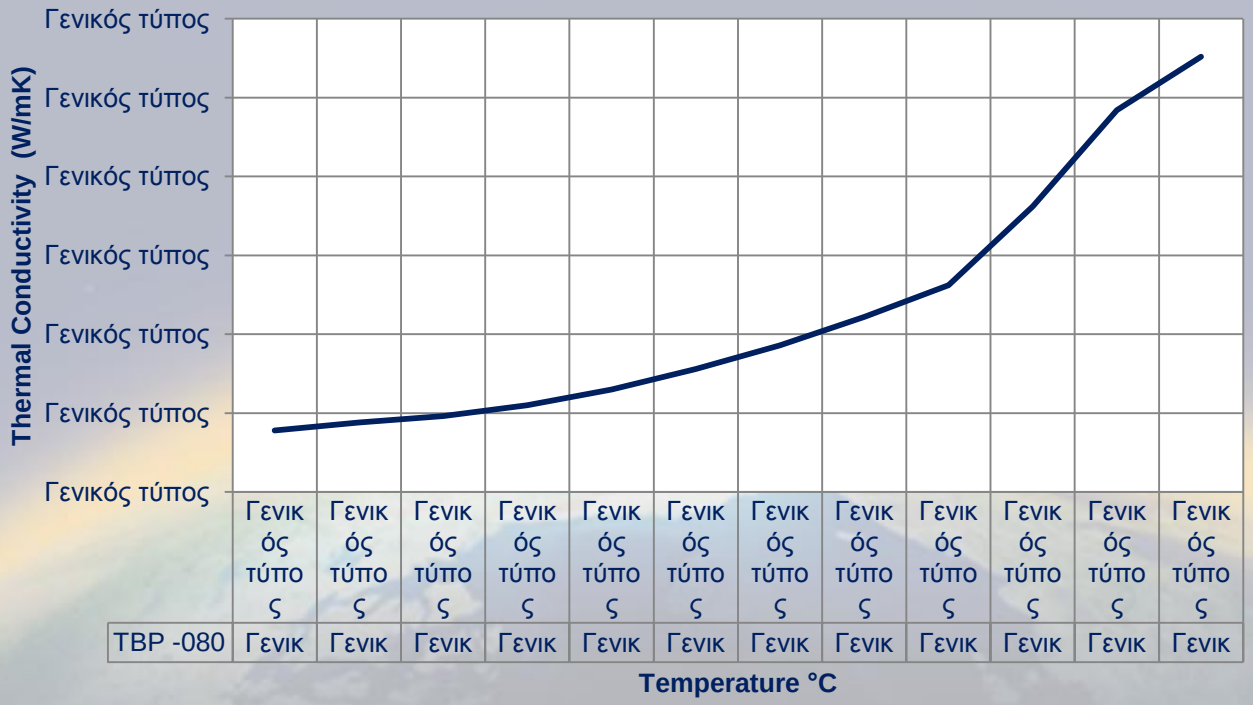
ENERGYSHIELD.

FIBRANgeo TBP-080

MW(Mineral Wool) - EN 14303- T4-ST(+)650-CS(10)50-PL(5)600-WS1-MU1-AW0,95-AFr60-CL10-F10-pH10,5

Thermal Conductivity



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FIBRANgeo TBP-080

MW(Mineral Wool) - EN 14303- T4-ST(+)650-WS1-MU1-AW0,95-AFr60-CL10-F10-pH10,5

Technical Characteristics	Symbol EN-13162	Unit	Value	EN standard
Declared thermal conductivity at 10 ^{0}C	**λ_D**	**W/(mK)**	**0,039**	EN 13162 EN 12667 EN 12939
Nominal thickness	d_N	mm	200-300-400	EN 823
Fire classification	-	Class	A1 (Non-combustible)	EN 13501-1
Specific heat capacity	c	kJ/kg*K	0,84	-
Thickness tolerance	**T**	**Class**	**T4 (-3, +5%)**	EN 13162
Short Term Water Absorption for 24 h	WS	kg/m^2	<1	EN 1609
Long Term Water Absorption for 28 days	WL(P)	kg/m^2	<3	EN 12087
Water vapour diffusion resistance factor μ	MU	-	1	EN 12086
Air flow resistivity, r	AF_r	kPa s/m^2	60	EN 29053
Weighted Sound Absorption Coefficient α_w (Board Thickness 50 mm)	AW	-	0,95 (Class A)	EN ISO 11654 EN ISO 354

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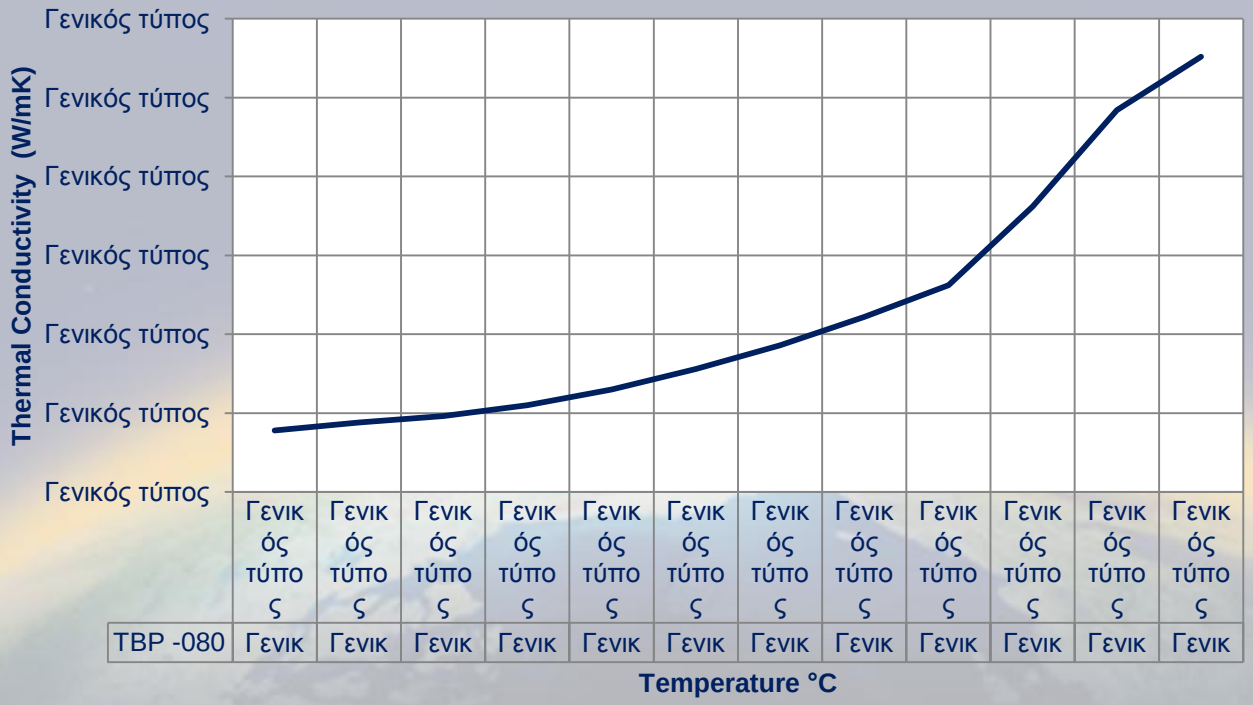
FIBRANgeo TBP-080

MW(Mineral Wool) - EN 14303- T4-ST(+)650-CS(10)50-PL(5)600-WS1-MU1-AW0,95-AFr60-CL10-F10-pH10,5

Thermal Conductivity



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FIBRANgeo PS

MW(Mineral Wool) - EN 14303- T8-ST(+)650-WS1-MU1-AW0,95-AFr60-CL10-F10-pH10,5

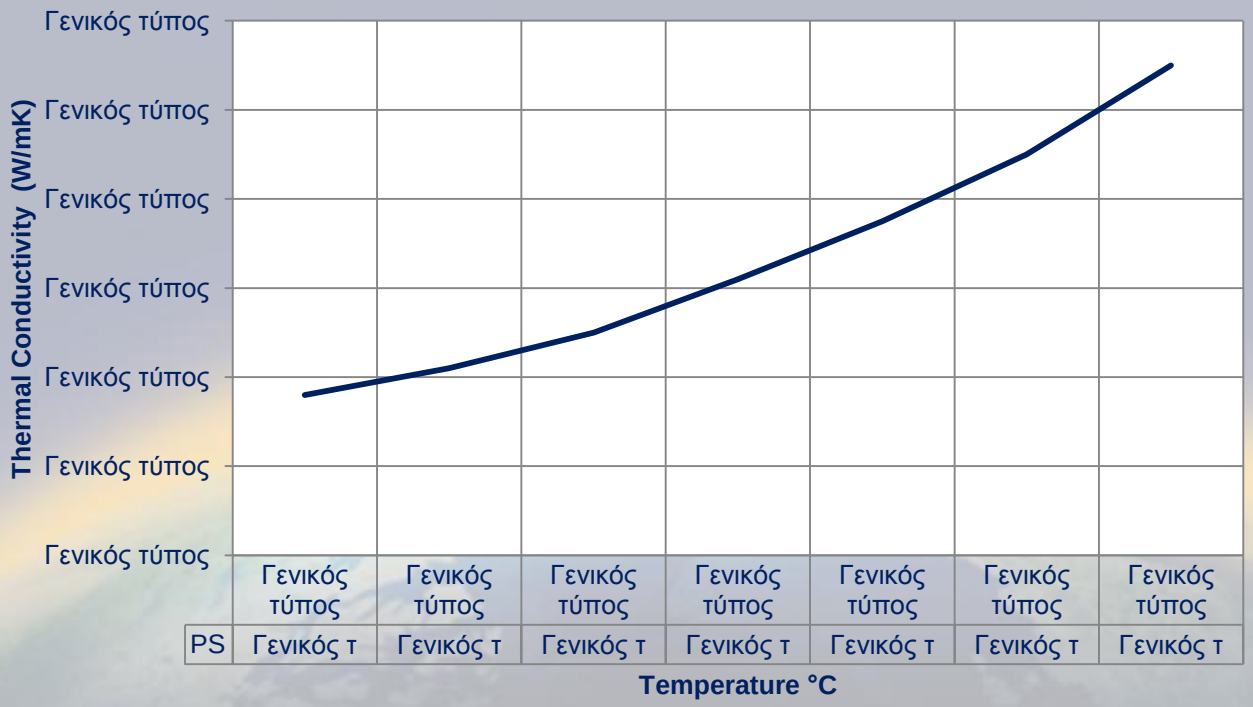
Technical Characteristics	Symbol EN-13162	Unit	Value	EN standard
Declared thermal conductivity at 10 ^{0}C	**λ_D**	**W/(mK)**	**0,036**	EN 13162 EN 12667 EN 12939
Nominal thickness	d_N	mm	25-160	EN 823
Fire classification	-	Class	A1 (Non-combustible)	EN 13501-1
Specific heat capacity	c	kJ/kg*K	0,84	-
Thickness tolerance	**T**	**Class**	**T8 (-5, +5%)**	EN 13162
Short Term Water Absorption for 24 h	WS	kg/m^2	<1	EN 1609
Water vapour diffusion resistance factor μ	MU	-	1	EN 12086
Air flow resistivity, r	AF_r	kPa s/m^2	60	EN 29053
Weighted Sound Absorption Coefficient α_w (Board Thickness 50 mm)	AW	-	0,95 (Class A)	EN ISO 11654 EN ISO 354

ENERGYSHIELD.

FIBRANgeo PS

MW(Mineral Wool) - EN 14303- T8-ST(+)650-WS1-MU1-AW0,95-AFr60-CL10-F10-pH10,5

Thermal Conductivity



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