EU

RAVATHERM™ XPS

Industry solutions

Ravago
BUILDING
SOLUTIONS

About Ravago Industry Solutions

Ravago Industry Solution is a branch of the Ravago group, a fast-growing multinational company with a culture based on family values. Founded in Belgium in 1961 the company is committed to ethical and sustainable business practices and forges strong relationships with its 7,000-strong workforce and 49,000 customers.

As part of the Ravago Building Solutions business unit we manufacture and distribute specialised industrial products and solutions across Europe, Turkey, and CIS markets.

Today we are relaunching our market-leading range of Extruded Polystyrene (XPS) foams for industrial applications and from 1st January 2020, STYROFOAM™ and XENERGY™ product names were rebranded into **RAVATHERM™ XPS**.

RAVATHERM™ XPS is the new name for our iconic blue and grey foam boards which have been used for many years in different industrial applications such as sandwich panels, verandas, caravans, motorhomes, doors, refrigerated trucks and other specialised technical applications.

With a strong heritage and European manufacturing operations stretching back 70 years the new **RAVATHERM™ XPS** foams offer engineers and technical designers the confidence and the assurance that the most demanding of design specifications can be met.

The comprehensive and practical knowledge of our team will continue to support our customers' success and help establish **RAVATHERM™ XPS** as the insulation material reference for industrial solutions.

RAVATHERM™ XPS New Name, Proven Quality

RAVATHERM™ XPS features at a glance:

- Energy efficiency and thermal insulation
- Long-term proven performance
- Easy to use
- High water and vapour resistance
- Chemical and corrosion resistance
- Versatile finish and design options
- High mechanical performance
- Lightweight
- Tailored to fit
- Excellent bonding properties
- Customer focus

Thank you STYROFOAM™ and XENERGY™!

Welcome RAVATHERM™ XPS

RAVATHERM™ XPS's

RAVATHERM™ XPS

At the core of composite components for more than 40 years

RAVATHERM™ XPS is the result of practical long-term experience and well-founded technical and technological know-how; important pre-requisite for the successful development of intelligent and innovative solutions for composite production.
A broad range of products for a wide variety of applications, like refrigerated vehicles, pipe section insulation, motor caravans besides others.

Our famous blue panels have proved being successful in extremely demanding applications and are highly appreciated by manufacturers of branded products worldwide – as well as by their customers.

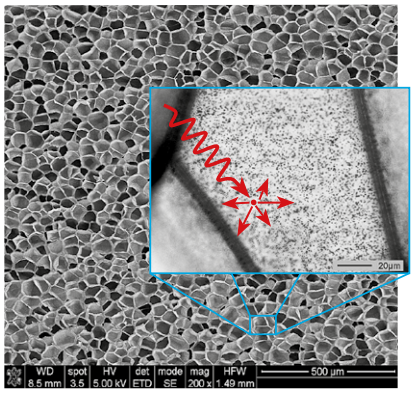
RAVATHERM™ XPS H LB GV
with grooved surface

RAVATHERM™ XPS X

Next generation thermal insulation boards from the inventor of XPS

It is this wealth of expertise and the ability to innovate that enabled Ravago Building Solutions to take a new step forward with the development of the high-class performance RAVATHERM™ XPS X.

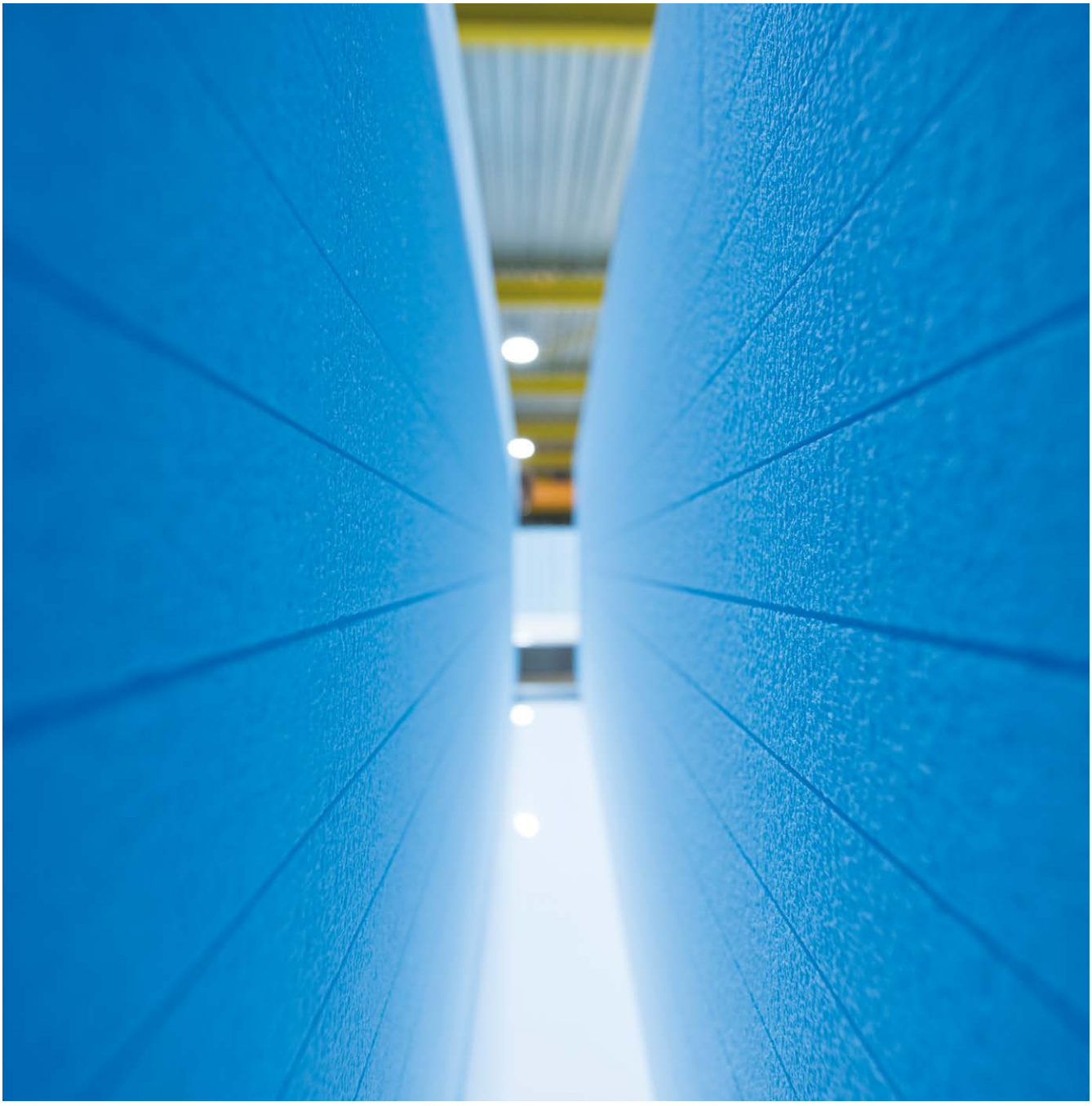
RAVATHERM™ XPS X insulation has been developed using a patent-granted technology: a manufacturing process which uses a zero-ODP blowing agent system and incorporated infra-red attenuator particles to scatter and reflect heat radiation within the foam board.



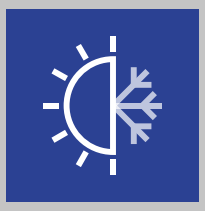
RAVATHERM™ XPS X Ultra incorporates infra-red attenuator particles into the cell walls to scatter and reflect heat radiation

RAVATHERM™ XPS X PLUS LB GV
with grooved surface

Key Concepts / Product properties



Ravatherm XPS Key Concepts:

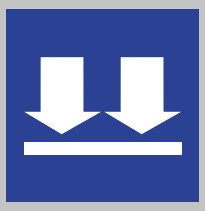


Energy efficiency
and thermal insulation

Lightweight

High water and vapour
resistance

Customer focus



High mechanical
performance

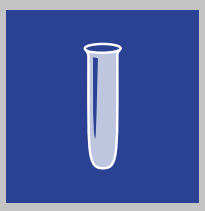
Easy to use

Excellent bonding
properties

Versatile finish
and design options

Long-term proven
performance

Tailored to fit

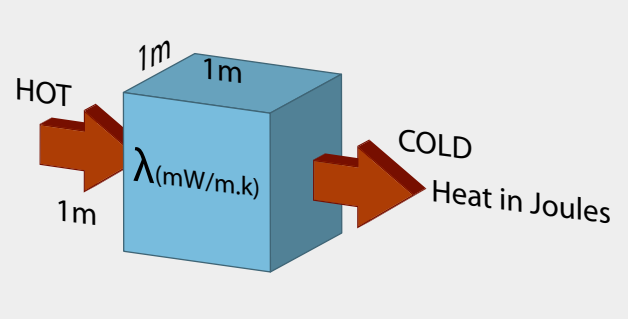


Chemical and corrosion
resistance

Energy efficiency and thermal insulation

Rising energy costs have made the public increasingly aware of and interested in energy efficient solutions in all areas of life.
Opting for RAVATHERM™ XPS and RAVATHERM™ XPS X as the core layer material for composite panels means opting for long-lasting effective thermal insulation, because it is impervious to moisture and has low thermal conductivity.

A measure of the thermal insulation value of a material is the thermal conductivity “λ”.
Heat conduction is the transport of heat from particle to particle under a temperature gradient.
The thermal conductivity is a measure for the heat conduction in a defined building material at a temperature difference of 1°K (equivalent 1°C).



Measuring thermal conductivity

The thermal resistance R (in m^2 K/W) of a layer of material is calculated by dividing the thickness of the layer, d, by the thermal conductivity, λ.
With a sandwich panel comprising three or more layers, the total thermal resistance is calculated from the total of the thermal resistance figures for the individual layers.

$$R = \frac{d_1}{\lambda_1} + \frac{d_2}{\lambda_2} + \frac{d_3}{\lambda_3} + \ldots + \frac{d_n}{\lambda_n}$$

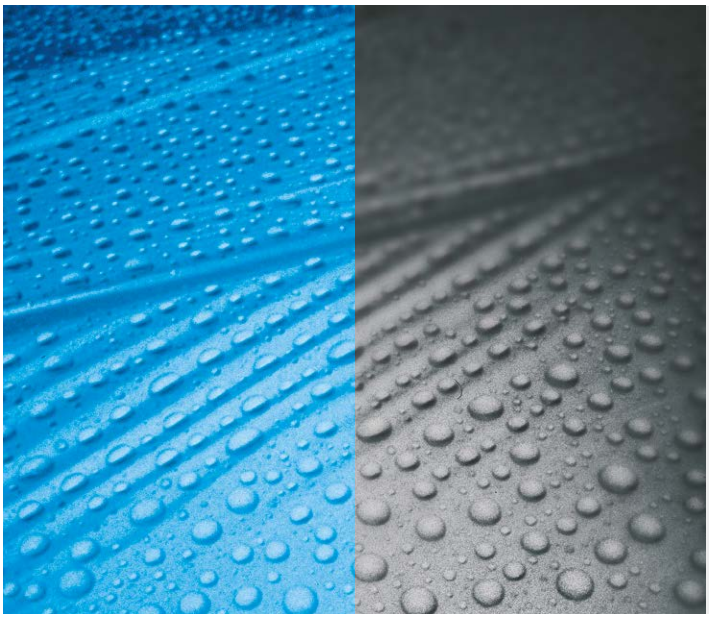
The thermal transmittance “U” (in W/m^2K) is the reciprocal value of R under consideration of the internal and external surface resistance, that depend on the final application of the element. The table with the surface resistance factor can be found in EN ISO 6946.
The following formula needs to be used when calculating the U-value of a sandwich element.

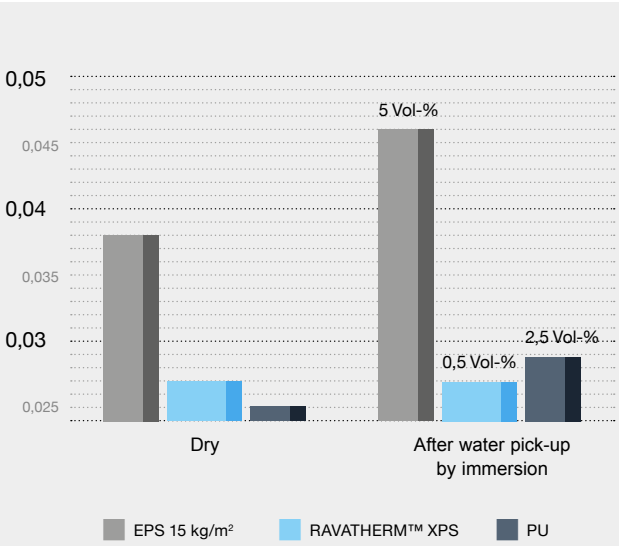
$$U = \frac{1}{R_{si} + R + R_{se}}$$

	Product	Thickness d (mm)	λ (W/mK)	R (m^2K/W)
LAYER 1	Alluminium	1	230	0,000
LAYER 2	OSB	2	0,13	0,015
LAYER 3	RAVATHERM™ XPS X PLUS RTM	51	0,029*	1,759
LAYER 4	Alluminium	1	230	0,000
TOTAL		55		1,774

* λ_D (declared lambda)

High water and vapour resistance





Resistance to water according to EN 12087

The moisture resistance of the core layer material can have a significant impact on the durability of the external structure of a composite panel, and can affect long term insulation performance.

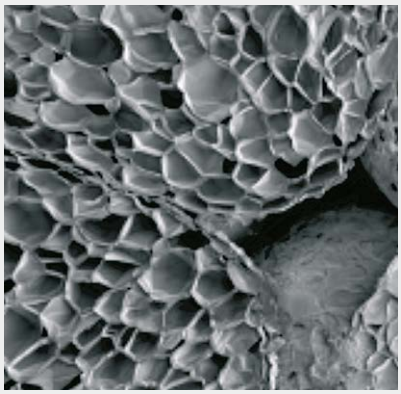
Moisture in core insulation materials has a negative effect on thermal insulation properties and can contribute to the development of mold.
Additionally, trapped moisture conducts heat 25 times better than air. In structures where gas-tight outer layers are not used, moisture can penetrate the core layer material by diffusion and condense. Damage to outer layers can also lead to moisture accumulating in insulation material.

As well as good thermal performance, RAVATHERM™ XPS also provides high water resistance, ensuring a consistently good thermal performance.

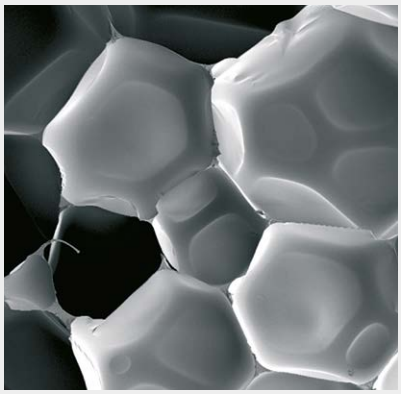
Thermal insulation materials are measured according to EN 12088 (water pick-up by immersion) to determine the water resistance. The samples are stored in a water bath for 28 days before measuring the water content. The above chart shows water pick-up values for XPS, EPS (15kg/m³) and PU, as known from publications. Besides water pick-up values the graph, on page 9, shows the change in thermal performance of materials due to water pick-up. RAVATHERM™ XPS and RAVATHERM™ XPS X products with their closed cell structure pick up very little amount of water.

As a result of that the thermal conductivity of RAVATHERM™ XPS and RAVATHERM™ XPS X doesn't change significantly after the water pick-up by immersion test compared to the thermal conductivity measured after storage under dry conditions.

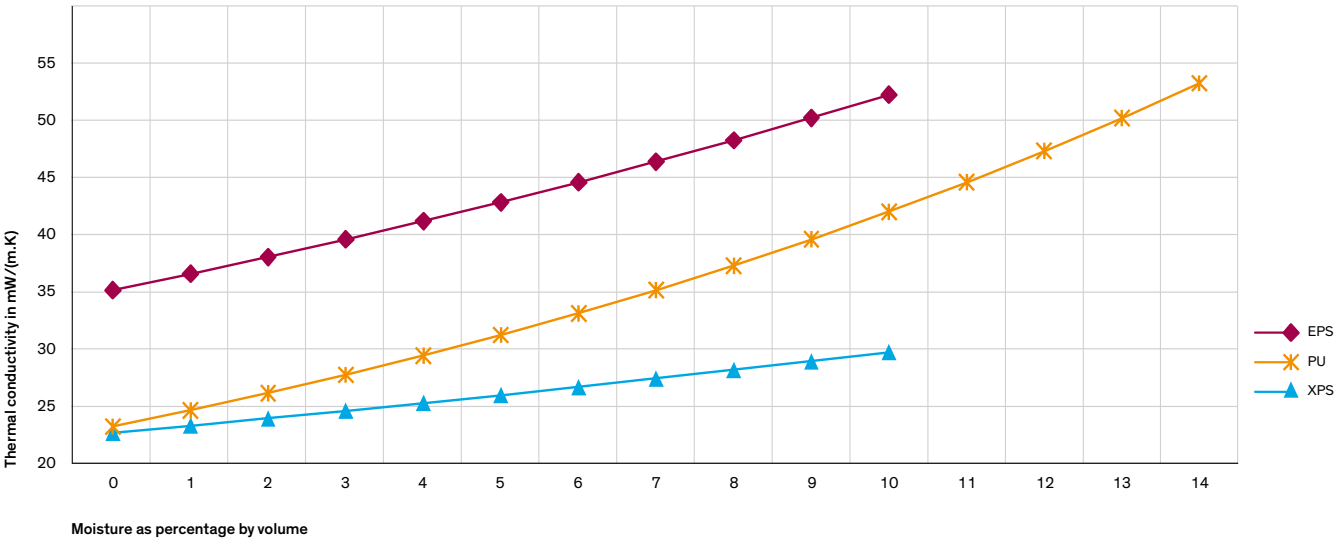
Cell structure of XPS



Cell structure of EPS



Cell structure of PU



Effect of moisture content on the thermal conductivity (λ) of foam core materials according to EN ISO 10456

High mechanical performance

A composite panel is a load-bearing, lightweight laminated structure, the performance of which can be analysed in the same way as that of a steel I beam.
Bending moments, induced by loading, are resisted by tensile and compressive forces in the facings, whilst the core material absorbs the shear forces (Fig. 01).

The performance and durability of a composite panel depend upon the proper harmonization of its constituent parts and the manufacturing process itself.
From decades of experience in a whole range of applications, Ravago Building Solutions has built up a vast store of know-how – both on production techno logies and on the various components of the composite panel.

The core material has to absorb the shear forces which occur due to the loading and bending of the composite panel (Fig. 01).

RAVATHERM™ extruded polystyrene foam boards for use in composite panels have planed surfaces and are produced to close dimensional tolerances

The specification of materials for sandwich panels involves consideration of performance parameters and results of relevant calculations.

The excellent mechanical properties of RAVATHERM™ XPS and RAVATHERM™ XPS X allow the use of the grey core in highly-stressed applications. RAVATHERM™ XPS and RAVATHERM™ XPS X are capable to withstand heavy cargo loads but also dynamic loads.

Where the expected loads are known, the deflection of a simply supported composite panel, consisting of two facings constantly glued to a foam core, can be calculated relatively precisely with the following equation (Fig. 02).

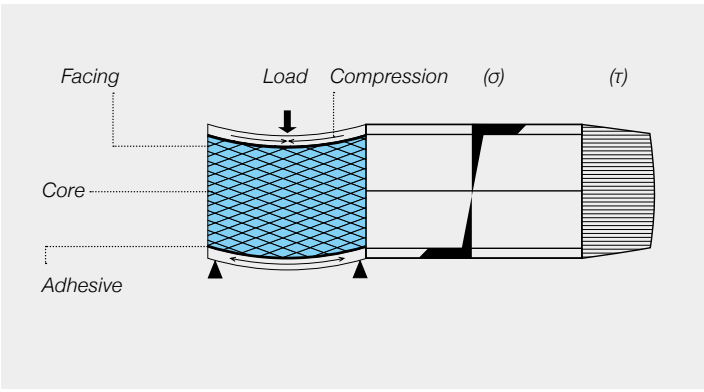


Fig. 01

Calculation part = facing

Calculation part: core

$$d = k_f \frac{P \bullet \ell^3}{E \bullet I} + k_c \frac{P \bullet \ell}{G \bullet A}$$

= flexural deflection + shear deflection for sandwich panels with thin facings

d = Deflection
P = Load
ℓ = Span
E = Elastic modulus
I = Moment of inertia
G = Shear modulus
A = Area
k = Specific coefficient

Fig. 02: Deflection calculation

RAVATHERM™ is ideally suited as a core material because:
- its high compressive strength prevents the facings from buckling
- it increases the composite panel's resistance
- to deflection
- its shear strength provides a very high shear modulus

The high shear modulus provided by RAVATHERM™ allows composite panels to be designed with long self-supporting spans, enhanced rigidity and low deflection.

Tensile forces affect the core material when, for example, heavy loads are attached to a roof or ceiling panel.
If the maximum permissible force is exceeded the panel may undergo plastic deformation (no longer return to its original shape) or even tear. All of those effects of forces are simulated in the Ravago Building Solutions laboratory in order to determine the loading limits of the foam core and also of finished and bonded sandwich panels.
In the context of mechanical performance, the temperature resistance of panel core needs to be taken into consideration.

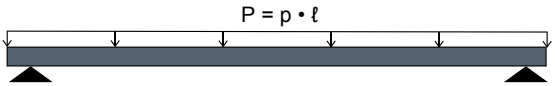
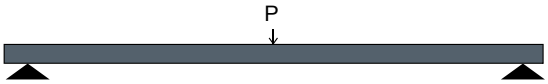
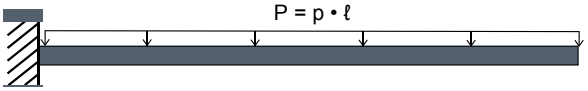
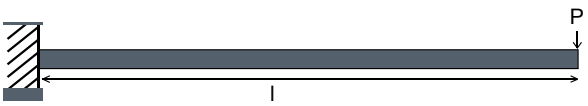
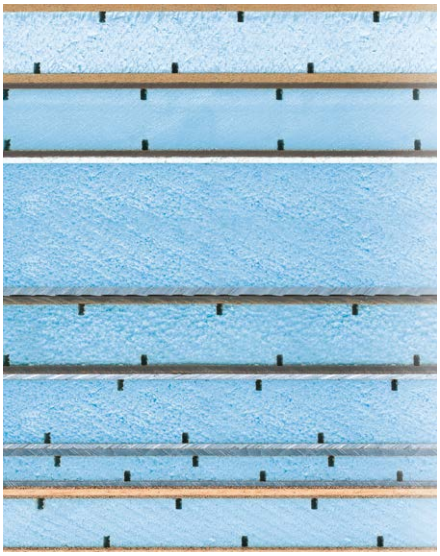
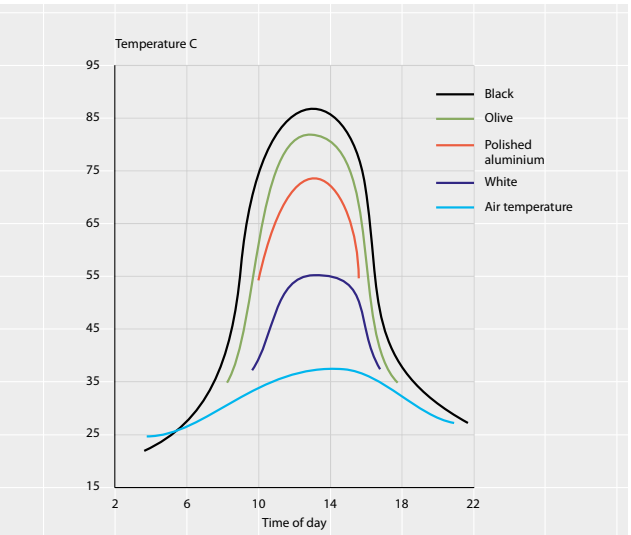
		k_f	k_c
Simply supported beam, uniformly distributed load		$\frac{5}{384}$	$\frac{1}{8}$
Simply supported beam, central point load		$\frac{1}{48}$	$\frac{1}{4}$
Simply supported beam, point loads at ℓ/4 span from the supports		$\frac{11}{768}$	$\frac{1}{8}$
Cantilever, uniformly distributed load		$\frac{1}{8}$	$\frac{1}{2}$
Cantilever, point load at free end		$\frac{1}{3}$	1

Fig. 03: Deflection calculation

Black colored facings exposed to direct sun light can achieve a surface temperature above +80°C. The maximum service temperature of RAVATHERM™ is +75°C.
The installation between two facings might allow an exposure to a higher temperature level than 75°C, but this must be proven case by case.





The data refer to a 100mm thick composite panel with RAVATHERM™ core and aluminium facings exposed horizontally in still air.

Fig. 04: Panel surface temperature with solar exposure

Excellent bonding properties

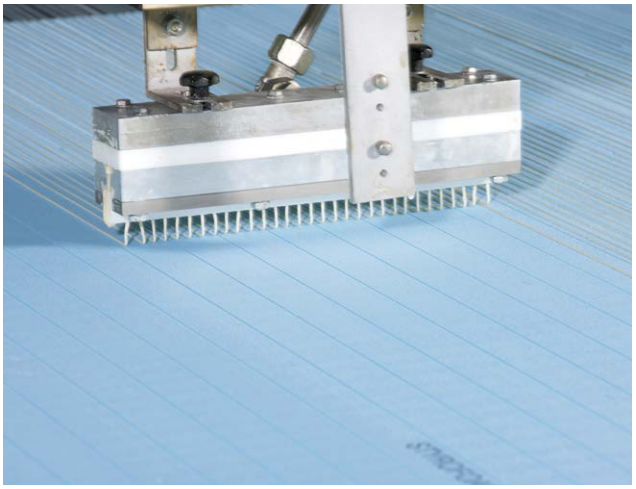
Solvent-free adhesives such as 1 and 2-component polyurethane adhesives must be used to adhere the panel facings to the core.

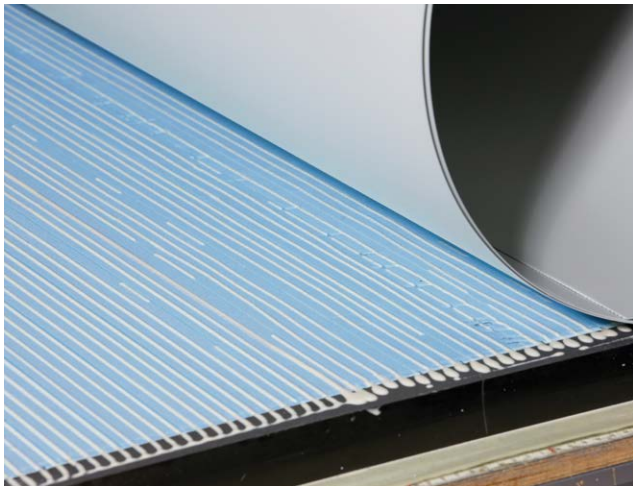
Reactive polyurethane, hot-melt, or epoxy adhesives are also used in specific cases and various press technologies are deployed, including vacuum and hydraulic presses and hip rollers.

The choice of adhesive and bonding technique is governed by the strength requirements of the panels to be produced, and their particular application.

A wide range of sheet materials can be used as facings for lamination to RAVATHERM™ core material (Fig. 5) including:

- Wood-based sheets
- Aluminium
- Steel
- PVC
- GRP
- Gypsum plasterboard
- Gypsum cellulose fibre
- Glass





Long-term proven performance

Fig. 07: Testing creep performance in Ravago's dedicated laboratory

Fig. 08: Shear test in Ravago's dedicated laboratory

Laboratory testing

Ravago Building Solutions undertakes rigorous quality management during and after the production of RAVATHERM™ in order to manufacture of consistently high quality products. Every two to three hours a sample of the production run is taken to check key properties such as dimensions, density, thermal conductivity and compressive strength, etc.

Data are captured in a database accessible to all plants. Selective product analyses are also conducted in the central Research and Development Department's laboratory in Rheinmünster.

This is where application-specific properties, including shear strength, tensile strength, lambda after 90 days and water pick-up are regularly checked.

Regular external inspections of our products are conducted by certified European testing and inspection organizations.

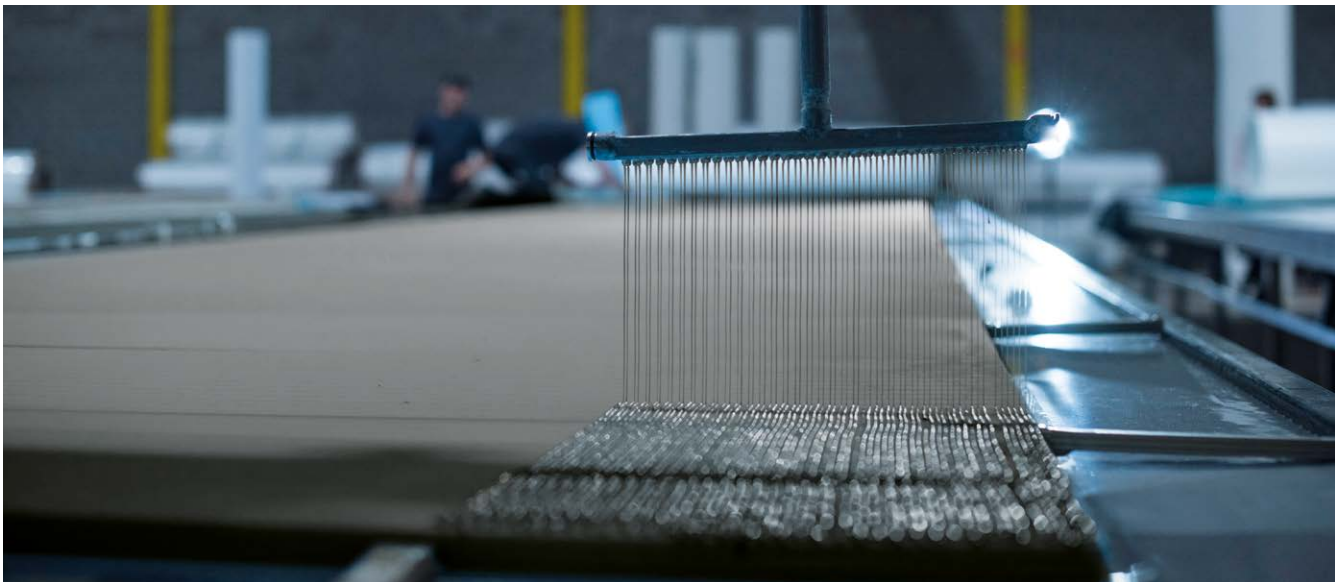
RAVATHERM™ products have an CE lable and comply with the harmonized European product standard DIN EN 13164. Declarations of conformity (DoCs) are available on demand, and quality systems are based on the ISO 9000 standard.

Ravago Building Solutions's extensive test programme includes small-scale dynamic fatigue testing, panel surface temperature measurements, testing the effects of solar exposure, testing large-scale panels to failure and a variety of customised mechanical testing.

The endurance properties of the products are evaluated, by performing creep tests.

The research and development department in Rheinmünster conducts product analyses, performs material research and develops new applications

Chemical and corrosion resistance



The Chemical resistance is the ability of a substance to endure itself from chemical attack for a specific period. Chemical and Corrosion resistance are very important parameters to consider in sandwich panel constructions and industrial applications in general.
The selection of the right, compatible, raw materials is necessary because using a wrong adhesive for example can affect the high mechanical properties of RAVATHERM™ XPS boards.

RAVATHERM™ XPS is well compatible with solvent-free adhesives such as 1 and 2-component polyurethane or Epoxy.

However, the XPS can be affected for example by solvents or styrene contained in an adhesive or a paint.

The reduced chemical resistance of the XPS boards could result in weakening the mechanical strength, causing blistering on the surface, swelling and inhomogeneous surface of the material, hence, the RAVATHERM™ XPS loses the functional ability required.

Here below we indicate a short list of compatible and non-compatible materials, but we recommend contacting our Technical Service in case of new development or doubts.

Chemical and Corrosion Resistance RAVATHERM™ XPS	
✓ Good	✗ Poor
Polyurethane adhesive	Solvent based adhesive
Epoxy adhesive	Diethyl Ether
Vinyl adhesive	Methyl Alcohol
Hot melt adhesive	Naphtha
Urea	Aqua Regia
Vaseline Petroleum Jelly	Acetone
Vinegar	Styrene
Propylene Glycol	Turpentine
Glycerine	Trichloroethane
Hydrogen peroxide	Toluene
Paraffin Oil	1,2,4-Trichlorobenzene
Olive Oil	Methil Ethyl ketone
Diethylene Glycol	Kerosene
Castor Oil U.S.P.	Gasoline
Wax	Chlorobenzene
Bitumen (Water emulsion)	Bitumen (Organic solvents emulsion)

Lightweight

High strength-to weight-ratio characteristic of RAVATHERM™ XPS foam is particularly important in sandwich panel constructions and various industrial applications. Thanks to RAVATHERM™ XPS, it is possible to build sandwich panels that are rigid enough while being lighter than traditionally built panels.

Sandwich panels produced with RAVATHERM™ XPS foam core have excellent tensile strength, enabling resistance to the stresses and vibrations which occur within floors, walls and ceilings of moving trailers and campers. This characteristic of the product provides the possibility of having longer spans without supports when used as verandas.

RAVATHERM™ XPS foam allows for production of light yet stiff structural panels combined with excellent insulation performance. This combination of properties offers low energy consumption and therefore low emissions when used in refrigerated trucks or campers.

Furthermore, sandwich panels built with RAVATHERM™ XPS core have a high resistance to moisture, which is released in recreational vehicles by daily activities such as showers, cooking or drying laundry.
Keeping moisture out is vital to preserve the long-term thermal & mechanical performance of the vehicles, key for you to peacefully enjoy it year after year.

Bigger span between supports enables more versatile and streamlined architectural designs.

Customer focus

Thanks to our decades of experience and our close working relationship with our customers, we have extensive knowledge of the technical processes involved in the production of composite panels.

Customers are frequently involved in work on specific solutions for composite production - for example, when it comes to stringent requirements related to surface finishes or the development of specific testing methods.

Based on decades of experience in the use of RAVATHERM™ as a core material and on modern simulation programs, Ravago Building Solutions's experts regularly assist customers with the structural design and development of their products.

Easy to use

The combination of light weight and homogeneous closed cells structure of the RAVATHERM™ XPS extruded polystyrene foam makes it easy to transport, manipulate and work with.

RAVATHERM™ XPS material can be cut, sanded, grooved, routed and milled without difficulties using industrial standard off-the-shelf techniques and machineries.

The dust and shavings resulting from the industrial process are 100% recyclable, neither hazardous nor classified.

Versatile finish and design options

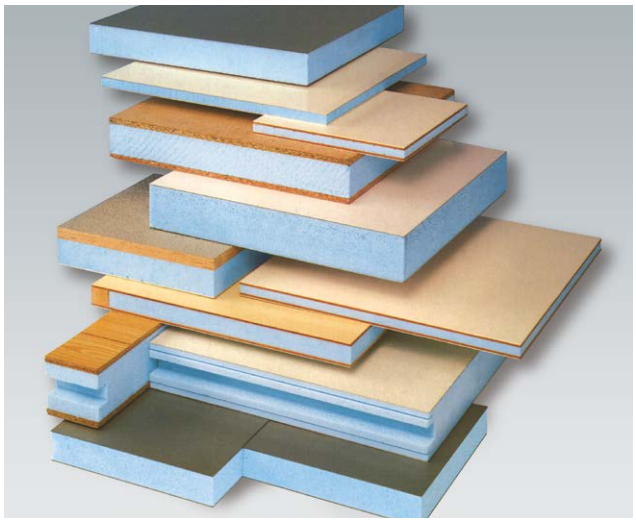
RAVATHERM™ XPS's wide range of technical offerings enables use in numerous and versatile applications as a structural core material or as a base foam block to fabricate wide range's of shapes.

Thanks to RAVATHERM™ XPS technical features including closed cell structure, structural rigidity of the boards, light weight, wide range of dimensions, surfaces and edge finishes, wide choice and long term sustainability of mechanical & thermal performances provides technical managers and designers with full freedom to engage in new developments.

Wide offering of surfaces & edge finishes of RAVATHERM™ XPS foam make it the ideal core material choice to laminate onto various facings such as wood, plastic sheets, metal, glass reinforced polymers as well as cement & plaster boards.

Designers' dreams are the sole limiting factor to imagine the future.

RAVATHERM™ XPS foam, the most versatile XPS structural insulation of the market.



Tailored to fit

RAVATHERM™ XPS and RAVATHERM™ XPS X extruded polystyrene foam panels are produced with a flat, dust-free surface and narrow tolerances. Hot-wire foam cutting equipment makes it possible to cut core layers of as little as 5 mm thick from RAVATHERM™ blocks.

Oscillating hot-wire cutting equipment can achieve a standard thickness tolerance of +/- 0.3 mm to +/- 0.5 mm (dependent on thickness), but there is also the option of manufacturing products as custom-made items with a thickness tolerance of +/-0.1 mm using a sander.

Ravago Building Solutions is capable of manufacturing tailor-made products - requests for specific dimensions or particular tolerances should be arranged with the responsible engineer.

Thickness tolerance	Production type
Standard ± 0.5 mm Close tolerance (CT) ± 0.3 mm	Online
(<15 mm) ± 0.5 mm (≥15 mm) ± 0.3 mm	Hot-wire cut (OF)
(≥10 mm) ± 0.3 mm	Quick sanded (QS)
(>10 mm) ± 0.1 mm (≤10 mm) ± 0.3 mm	Sanded (SA)

Fig. 05: Offline cutting RAVATHERM™ XPS

Fig. 06: Oscillating hot-wire cutting machine RAVATHERM™ XPS X

Technical data

RAVATHERM™ XPS

Technical Data

Properties		Unit	Standard	CE Code	RAVATHERM™ XPS IB
Density (typical value)		kg/m³	EN 1602	–	30
Thermal Conductivity Declared		W/m.K	EN 13164	λ_D	0.033 ≤60 mm 0.035 60.1 - 100 mm 0.035 > 100 mm
Thermal Conductivity for 60 days old foam - mean value at 10°C		W/m.K	EN 12667 EN 12939	λ-mean, 60d	–
Compressive stress or compressive strength @ 10% deformation[1]		kPa	EN 826	CS(10\Y)	250
Tensile Strength[1]		kPa	EN 1607	TR	400
Shear Strength		kPa	EN12090	SS	200
Moduli (typical)	E-Modulus[1]	MPa	EN 826	–	8 <80 mm 10 ≥80 mm
	Tensile Modulus[1]	MPa	EN 1607	–	–
	Shear Modulus[2]	MPa	EN 12090	–	–
Compressive Creep max after 50 years < 2% deformation under stress σ_c		kPa	EN 1606	CC(2/1.5/50)σ	–
Water vapour diffusion resistance factor μ (tabulated value)		–	EN 12086	MU	150
Long term water absorption by total immersion		%	EN 12087	WL(T)	1.5
Long term water absorption by partial immersion		%	EN 12087	WL(T)	–
Long term water absorption by diffusion		%	EN 12091	WD(V)	–
Freeze-thaw resistance		%	EN 12099	FTCD	–
Dimensional stability under specified temperature (70°C) and humidity conditions (90%rh)		%	EN 1604	DS(70,90)	<5
Deformation under specified compressive load (40kPa) and temperature (70°C) conditions		–	EN 1605	DLT(2)5	–
Coefficient of linear thermal expansion (typical value)		mm/(m.K)	–	–	0.07
Fire Performance		Euroclass	EN 13501-1	–	E
Temperature limits		°C	–	–	-50/+75
Tolerances	Thickness	mm	EN 823	T	-0.5/+0.5
	Width	mm	EN 822	–	0.0/+3
	Length	mm	EN 822	–	0.0/+10
Dimensions	Thickness	mm	EN 823	–	20 - 200
	Width	mm	EN 822	–	600
	Length	mm	EN 822	–	1250 - 2500
Edge Profile		–	–	–	Butt Edge
Surface finish		–	–	–	Planed

[1] 1 Measured in thickness direction

[2] Typical value for Shear Modulus, may vary with the inplane direction

1 N/mm² = 10³ kPa = 1MPa

RAVATHERM™ XPS LB (GV)	RAVATHERM™ XPS PLUS FB	RAVATHERM™ XPS SP
33	33	35
0.033 ≤80 mm 0.034 80.1 - 120 mm 0.035 > 120 mm	0.032	0.033 ≤80 mm 0.034 80.1 - 120 mm 0.035 > 120 mm
–	–	–
300	200	350
600	–	–
250	–	–
8 <30 mm 10 30 - 79 mm 15 ≥80 mm	–	20
24 >50 mm	–	–
7	–	–
–	–	140
150	50(declared)	150
1.5	–	0.7
–	0.3	–
–	–	3 <50 mm 2 50 - 80 mm 1 ≥80 mm
–	–	1
<5	<5	<5
–	<5	<5
0.07	0.07	0.07
E	E	E
-50/+75	-50/+75	-50/+75
-0.5/+0.5	-0.3/+0.3	-2/+2 <50 mm -2/+3 50 - 120 mm -2/+6 > 120 mm
0.0/+3 <700.0 mm 0.0/+5 >700.0 mm	0.0/+3	0.0/+3
0.0/+10	0.0/+10	0.0/+10
20 - 160	160 - 200	60 - 120
530 - 1210	600	600
2130 - 3600	1250 - 2500	2500
Butt Edge	Butt Edge	Butt Edge
Planed (GV) Planed and grooved	Planed	With Skin

RAVATHERM™ XPS X

Technical Data

Properties		Unit	Standard	CE Code	RAVATHERM™ XPS X PLUS LB (GV)
Density (typical value)		kg/m³	EN 1602	–	35
Thermal Conductivity Declared		W/m.K	EN 13164	λ_D	0.029 ≤100 mm 0.030 >100 mm
Thermal Conductivity for 60 days old foam - mean value at 10°C		W/m.K	EN 12667 EN 12939	λ-mean, 60d	0.027
Compressive stress or compressive strength @ 10% deformation[1]		kPa	EN 826	CS(10\Y)	300
Tensile Strength[1]		kPa	EN 1607	TR	600
Shear Strength		kPa	EN12090	SS	250
Moduli (typical)	E-Modulus[1]	MPa	EN 826	–	12 <30 mm 15 30 - 79 mm 20 ≥80 mm
	Tensile Modulus[1]	MPa	EN 1607	–	24
	Shear Modulus[2]	MPa	EN 12090	–	8
Compressive Creep max after 50 years < 2% deformation under stress σ_c		kPa	EN 1606	CC(2/1.5/50)σ	–
Water vapour diffusion resistance factor μ (tabulated value)		–	EN 12086	MU	150
Long term water absorption by total immersion		%	EN 12087	WL(T)	1.5
Long term water absorption by diffusion		%	EN 12091	WD(V)	–
Freeze-thaw resistance		%	EN 12099	FTCD	–
Dimensional stability under specified temperature (70°C) and humidity conditions (90%rh)		%	EN 1604	DS(70,90)	<5
Deformation under specified compressive load (40kPa) and temperature (70°C) conditions		–	EN 1605	DLT(2)5	–
Coefficient of linear thermal expansion (typical value)		mm/(m.K)	–	–	0.07
Fire Performance		Euroclass	EN 13501-1	–	E
Temperature limits		°C	–	–	-50/+75
Tolerances	Thickness	mm	EN 823	T	-0.5/+0.5
	Width	mm	EN 822	–	0.0/+3 <700.0 mm 0.0/+5 >700.0 mm
	Length	mm	EN 822	–	0.0/+10
Dimensions	Thickness	mm	EN 823	–	20 - 160
	Width	mm	EN 822	–	500 - 1210
	Length	mm	EN 822	–	1400 - 3600
Edge Profile		–	–	–	Butt Edge
Surface finish		–	–	–	Planed (GV) Planed and grooved

[1)] 1 Measured in thickness direction

[2)] Typical value for Shear Modulus, may vary with the inplane direction

1 N/mm² = 10³ kPa = 1MPa

RAVATHERM™ XPS X PLUS RTM (GV)	RAVATHERM™ XPS X PLUS HD300 (GV)	RAVATHERM™ XPS X ULTRA HD300 (GV)
40	45	45
0.029	0.029	0.028
0.027 ≤50 mm 0.025 >50 mm	0.027 ≤50 mm 0.025 >50 mm	0.025 ≤50 mm 0.023 >50 mm
400	700	700
900	1200	1200
400	500	500
17 <30 mm 22 30 - 80 mm 28 >80 mm	35 <80 mm 38 ≥80 mm	35 <80 mm 38 ≥80 mm
28	31	31
10	14	14
140	210	210
150	150	150
1.5	0.7	0.7
–	–	–
–	–	–
<5	<5	<5
<5	<5	<5
0.07	0.07	0.07
E	E	E
-50/+75	-50/+75	-50/+75
-0.5/+0.5	-0.5/+0.5	-0.5/+0.5
0.0/+3 <700.0 mm 0.0/+5 >700.0 mm	0.0/+3	0.0/+3
0.0/+10	0.0/+10	0.0/+10
25 - 120	40 - 114.5	87.5 - 114.5
529 - 1200	600	600
1200 - 3140	1200 - 2650	2504 - 2650
Butt Edge	Butt Edge	Butt Edge
Planed (GV) Planed and grooved	Planed (GV) Planed and grooved	Planed (GV) Planed and grooved


Max 3a

Main applications

Applications at a glance

RAVATHERM™ XPS IB						
RAVATHERM™ XPS LB						
RAVATHERM™ XPS PLUS FB						
RAVATHERM™ XPS SP						
RAVATHERM™ XPS X PLUS LB						
RAVATHERM™ XPS X PLUS RTM						
RAVATHERM™ XPS X PLUS HD300						
RAVATHERM™ XPS X ULTRA HD300						

Refrigerated Commercial Vehicles

Camper vans and caravans

Building panels

Pipeshell

Cold Store

Tile Backer Board

Refrigerated Commercial Vehicles

RAVATHERM™ XPS Key features

- Energy efficiency and thermal insulation
- High water and vapour resistance
- High mechanical performance
- Lightweight
- Easy to use
- Tailored to fit

The technical requirements for refrigerated truck bodies are defined by regulations and by economic considerations, which include the resale value of a vehicle.

To be cost efficient, refrigerated truck bodies must be insulated effectively and reliably whilst also being lightweight and built with highly durable materials to last for decades.
By choosing RAVATHERM™ as a core material it is possible to satisfy those requirements.

Panels with RAVATHERM™ core material have been used in the manufacture of floors, walls and roofs of refrigerated truck bodies for more than 25 years with proven success: RAVATHERM™ XPS X PLUS LB, XPS X PLUS RTM, XPS X PLUS HD300, XPS X ULTRA HD300 ideally suited to such applications.

Our specialists will be pleased to assist you in selecting the right RAVATHERM™ product and calculating the required thicknesses for any application.

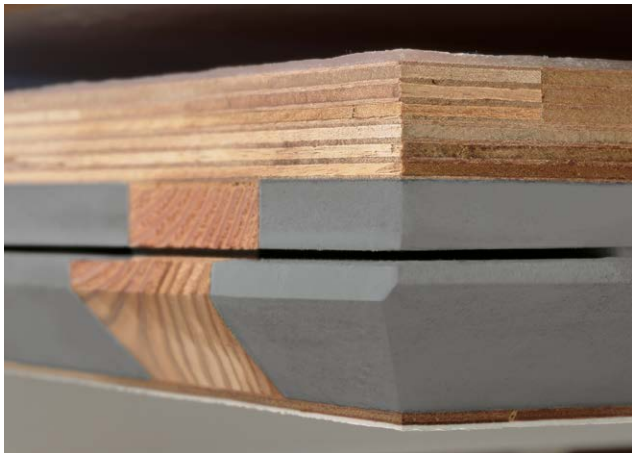


Fig. 09: Well insulated and able to support loads: refrigerated truck bodies using RAVATHERM™ XPS core panels.

Camper vans and caravans

RAVATHERM™ XPS Key features

- Energy efficiency and thermal insulation
- High water and vapour resistance
- High mechanical performance
- Lightweight
- Tailored to fit

Fig. 10: Robust body consisting of floor, wall and roof panels with RAVATHERM™ core

Another field of application, in which Ravago Building Solutions has decades of experience, is the use of RAVATHERM™ XPS as a core material in composite panels used to construct camper vans and caravans.
Leading manufacturers benefit from the very high strength-to-weight ratio of composite panels with RAVATHERM™ XPS in the production of their vehicles.

With camper vans and portable cabins, the long-term thermal performance of RAVATHERM™ XPS insulation plays a significant role.

RAVATHERM™ XPS composite panels provide a high level of rigidity to withstand the vibrations and stresses in the roofs of camper vans, caravans and portable cabins.

Because of the rigidity of RAVATHERM™ XPS composite panels it is possible to reduce the number and cross-section of wooden inserts used in floor panels whilst maintaining the required strength.

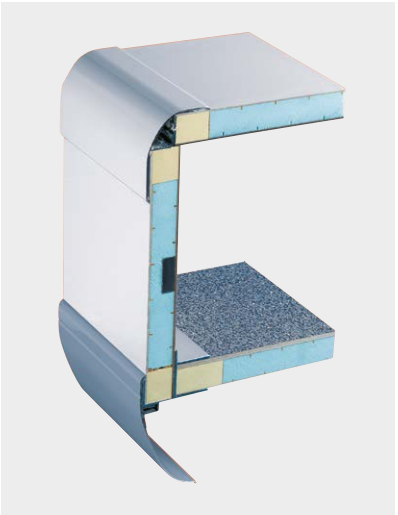


Fig. 11: Profile with GRP outer skin and RAVATHERM™ core material

Building panels

RAVATHERM™ XPS Key features

- Energy efficiency and thermal insulation
- High mechanical performance
- Excellent bonding properties
- Lightweight
- Tailored to fit

Lightweight composite panels provide the building industry with a flexible approach to construction, both in development of new structures and in renovation projects.

Such panels, which can be used for doors, windows, roof panels and verandas (cladding), can be encased in a wide variety of materials depending on design preferences. They also support rapid construction as well as opportunities to improve thermal efficiency of buildings, as long as appropriate materials are selected.

Key to the insulation and mechanical performance of such panels is the core material - RAVATHERM™ XPS from Ravago Building Solutions has been sold into all four key applications of composite panels for decades thanks to its well-established properties and performance.

The core material of a composite panel must provide good thermal performance, low water absorption, mechanical strength and an appropriate weight/strength ratio - such features are offered by RAVATHERM™ XPS, which is also easy to handle and gives a clean surface even after cutting.

The material is also well able to cope with tight thickness tolerances.

Pipeshell

RAVATHERM™ XPS Key features

- Energy efficiency and thermal insulation
- High water and vapour resistance
- Easy to use

Pipes designed to transport liquids or gases for industry or energy supply need to be well-insulated.
Efficient insulation of all relevant components supports maintenance of a constant temperature from generation through to use.
Using pre-fabricated insulated pipe shells helps to reduce labor costs on site.

RAVATHERM™ XPS pipe shells are mainly used to insulate pipes for air conditioning systems, cold water systems, chemical plants and the food industry.

RAVATHERM™ XPS pipe shells are an excellent choice for technical insulation that requires contact with soil.

Thanks to the moisture resistance and high compressive strength of RAVATHERM™ XPS, such pipes can remain permanently in contact with soil without losing functionality.

Cold Store

RAVATHERM™ XPS Key features

- Energy efficiency and thermal insulation
- High water and vapour resistance
- High mechanical performance
- Easy to use

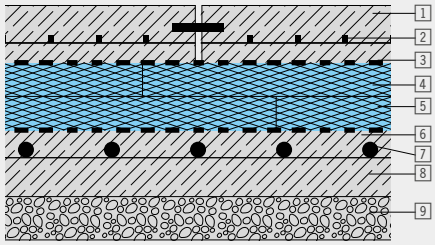
Cold store floor insulation material is one of the very first applications developed with XPS back in late 40ies.
As such, we have long proven records of perfect adequation between specific cold store application requirements and product long term thermal, as well as static & dynamic mechanical performances.

The replacement or repairs of cold store floor insulation is practically impossible in an operating room:proven reliability of RAVATHERM™ XPS is a load off your mind.

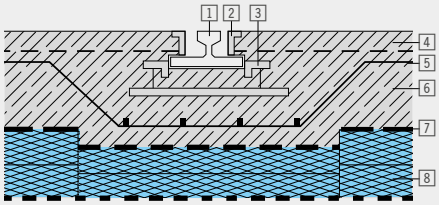
RAVATHERM™ XPS products' offering is declined as follow:
- RAVATHERM™ XPS SP and RAVATHERM™ XPS X SP for standard loads
- RAVATHERM™ XPS SP HC and RAVATHERM™ XPS X PLUS HD300 heavy duties.

Remarkable compression creep, long lasting thermal and mechanical performances position RAVATHERM™ XPS as material of reference for cold store floors since decades.

The closed cells structure of RAVATHERM™ XPS range, allows withstanding prolonged exposure to water, repeated freeze / thaw cycles and vapour pressure; thus making RAVATHERM™ XPS a perfect product for insulating cold room floors, where very important differences in temperatures and very high-water vapour pressure exist.

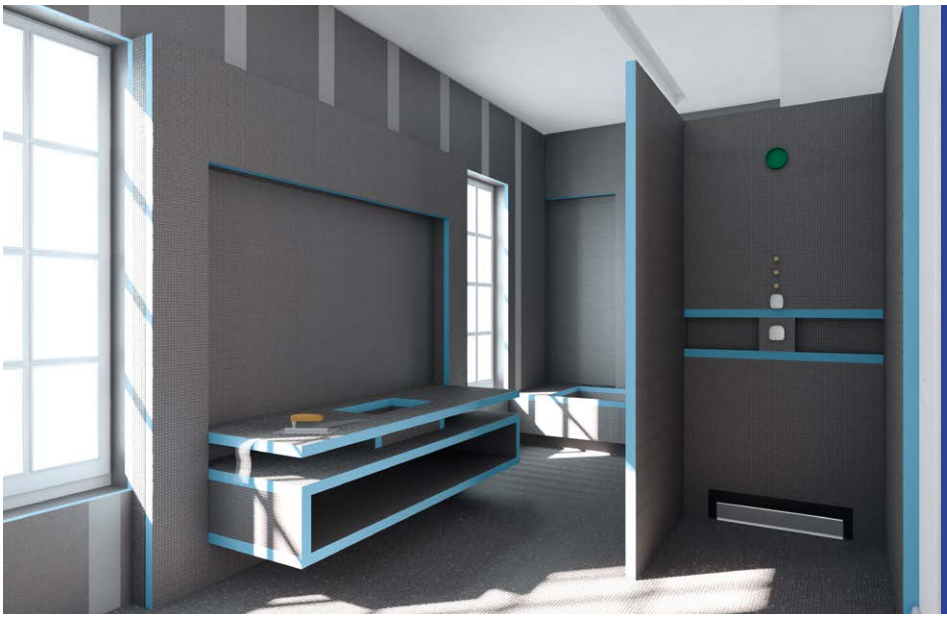


1 Coating concrete
2 Iron reinforcement
3 Separator layer
4 RAVATHERM™ XPS
5 Vapor barrier
6 Support concrete
7 Tooling
8 Lean concrete
9 Compact and stabilized ground



1 Ray
2 Linking and leveling plates
3 Steel profile
4 Scaffolding
5 Slip layer and anti infiltration
6 Reinforced concrete plate
7 Vapor barrier
8 RAVATHERM™ XPS

Tile Backer Board



RAVATHERM™ XPS Key features

- High water and vapour resistance
- Lightweight
- Easy to use
- Versatile finish and design options

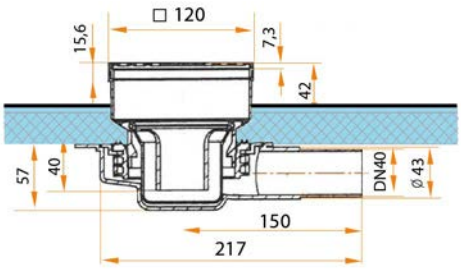
RAVATHERM™ XPS's wide range offering is the ideal core material for professional Tile Backer Boards.
The XPS foam core sandwich panels are coated on both sides with a substrate that supports good bonding with any kind of tile.

Tile Backer Boards based on RAVATHERM™ XPS panels can be fixed to a variety of surfaces, both even and smooth or uneven and rough. They are the ideal product for bathroom renovation, although they are now being used more and more also in new construction.
By using Tile Backer Boards, wet rooms and bathrooms can be quickly renovated and a large range of design solutions are possible.

RAVATHERM™ XPS's based tile backer boards create the perfect substrate to tile onto in wet rooms and bathrooms. It is vastly superior to plasterboard and plywood due to its waterproof qualities and resistance to rotting.

Tile Backer Boards allow you to build a totally waterproofed installation keeping your wet room clean and dry with ease. RAVATHERM™ XPS's extruded coated foam boards are lightweight, strong and have excellent insulating and rigidity properties as well as being easy to cut to whatever dimension customers require.

A full range of accessories for fixing Tile Backer Boards exist - screws, washers and adhesives - please refer to professional distributors for specific requirements.



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