

RAVATHERMTM

XPS

INDUSTRIAL FLOOR

GUIDE



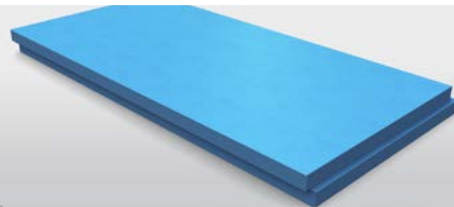
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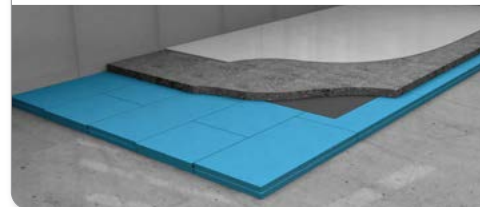
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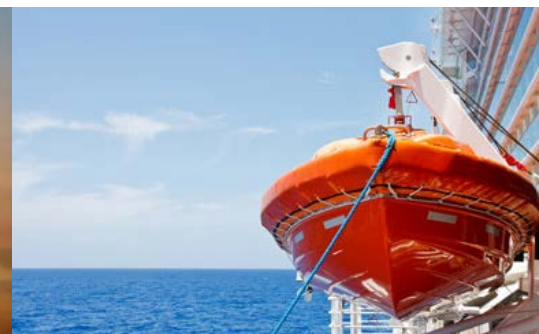
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ABOUT RAVAGO BUILDING SOLUTIONS

Ravago Building Solutions is the building materials manufacturer and distribution division of the Ravago group. Besides the building material distribution activities which have been present in Ravago's life almost since the beginning, manufacturing quality building materials has become increasingly important over the last 10 years. With 15 factories and a sales service, Ravago Building Solutions provides high-level service to its partners in 18 European countries.

Since 2014 we have been manufacturing our products under the RAVATHERM XPS brand at our extruded polystyrene foam manufacturing plant in Balatonfűzfő, which has a history of more than 30 years. From February 2016, RAVATHERM XPS products with high thicknesses of 120-320 mm have been manufactured using revolutionary technology.

Closed cell polystyrene foam is produced using a strict quality assurance system to ensure long service life and reliability. At the end of the extrusion process, a homogeneous closed cell material structure is produced, the thermal insulation properties and durability of which lasts until the end of the life of the building. Ravago Building Solutions is committed to environmental protection, RAVATHERM XPS products are manufactured and marketed in accordance with ISO 14001 environmental management and ISO 50001 energy management systems.

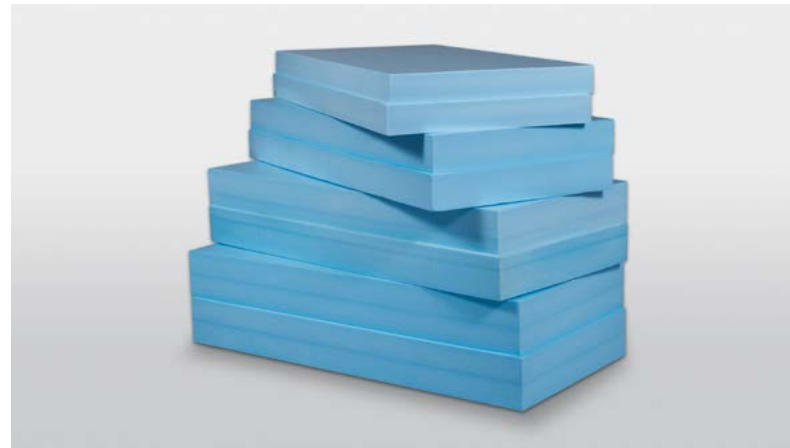
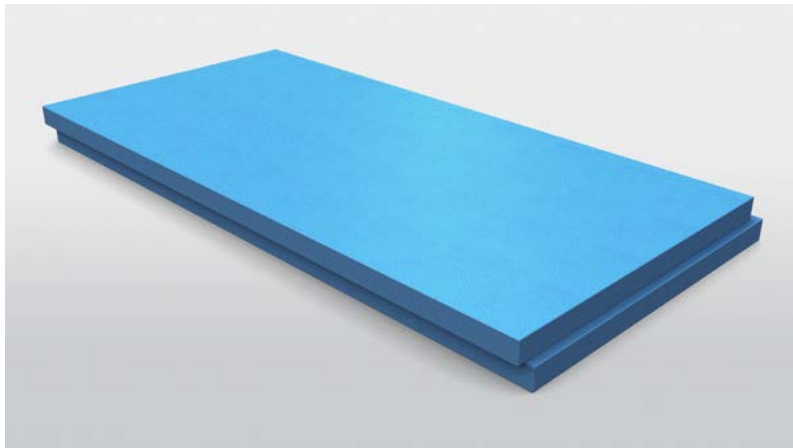


INTRODUCING RAVATHERM XPS PRODUCTS

RAVATHERM XPS thermal insulation is a closed cell polystyrene foam manufactured using the latest extrusion technology. Made exclusively with quality materials, the "blue foam" significantly reduces the heat loss of our buildings. The special material structure guarantees efficient thermal insulation properties. Due to the closed crystalline cell structure, RAVATHERM XPS is non-sensitive to moisture, resistant to freezing, anti-corrosive and can bear heavy loads.

We offer a wide range of products in different thicknesses, surfaces and compressive strengths to fit the demands of the functional requirements of different buildings. Products from the RAVATHERM XPS extruded polystyrene foam thermal insulation range are suitable for roofs, flat roofs, terraces, floors, base slabs, underground building structures, thermal bridges and plinth walls. Our products have high compressive strength thus, they are step-resistant.

Ravago Building Solutions Hungary Ltd. provides professional help, advice and information to help you achieve your goals and find the solutions that best suit you. In addition to our professional commitment, we place great emphasis on the protection of our environment. Our products play an active role in reducing CO² emissions globally, through significant energy savings. RAVATHERM XPS products are manufactured according to the ISO 14001 environmental management system and the ISO 50001 power management system.



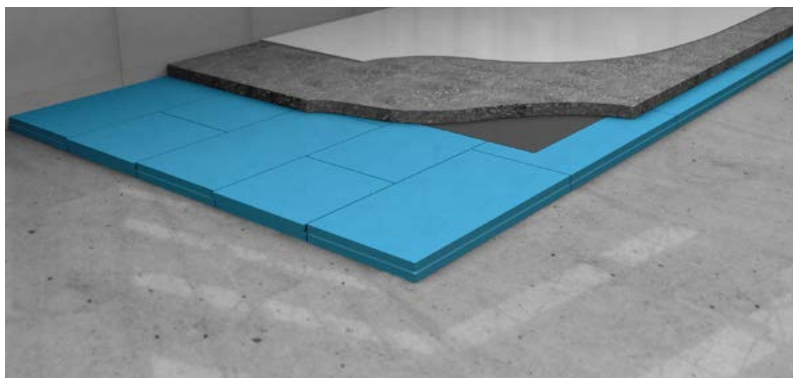
MORE ABOUT THERMAL INSULATION OF INDUSTRIAL FLOORS

The proper design of the thermal envelope of buildings has high priority in the design process, so is the case with industrial buildings. Thermal insulation of industrial buildings not only covers the flat roof and the wall structure, but the insulation of the huge floor structure is also essential for optimal internal temperature and minimizing heat loss. Insulating only the edge of the under the floor structure is advised only for large halls with a minimum of 500 m² floor area, because of the heat storage effect of the ground beneath the building. In order to avoid greater heat loss, it is worth insulating the industrial floor beneath the whole area. Furthermore, it is important to take into account the function of the hall, the resulting heat load and the type of work being done in the building- physical work, e.g. workshop, or sedentary work, e.g. sewing manufacture. Ensuring the necessary comfort greatly affects the amount of thermal insulation required for the industrial floor.

The industrial floor slab and the thermal insulation below it are under constant, intense stress, due to the following:

- loads caused by vehicles, forklifts, high shelves, stands, machinery, industrial equipment
- static load (loads transferred from connecting building structures)
- dynamic load (start, brake, vibration)
- mechanical stress during construction.

Extruded polystyrene foam has a high elasticity, which means that the insulation can be adjusted to some extent to the unevenness of the floor. The chance of breakage of the thermal insulation boards during floor construction is actually zero. The insulation boards installed under the floor slabs are part of the load bearing structure. During the design phase of the heavy-duty floor structure, which is exposed to vehicle traffic and heavy loads, the design values of the compressive strength and elasticity modulus of RAVATHERM XPS insulating boards must be taken into account.



THERMAL INSULATION SELECTION CRITERIA

Energy aspects

According to the latest building energy standards, low-energy logistics and industrial buildings do not have to comply with the CNE, i.e. near zero energy-intensive requirements and, in the case of floor structures on the ground, the Regulation allows for the insulation of floor structures in a band of only 1,5 m. However, the thermal transmittance for floor structures must be below $U=0,3 \text{ W/m}^2\text{K}$ and, taking into account all energy aspects, it is recommended to use XPS thermal insulation under the whole floor structure - its entire extent. With this solution we can reduce the risk of frost, also heat loss can be significantly reduced in the case of heated warehouse industrial hall.

Compressive strength aspects

The compressive strength declared in the technical documentation shows the compressive strength value of the product when placed under short-term loads in laboratory tests. For plastic insulation boards (XPS, EPS etc.), this short-term (nominal) compressive strength value cannot be used for load-bearing structural calculations, only for the strength of each product and comparison categorisation. During the calculation of the load-bearing capacity of the floor structure (including the thermal insulation layer), the long-term compressive strength value shall be used.

Compressive creep (long-term compressive strength)

In the technical documentation of the products, the long-term compressive strength of the XPS is also included. This is determined in accordance with EN1606 standard, which states an application period of 50 years and a maximum of 2% compression. **This means that if RAVATHERM XPS boards are permanently under pressure, the compression of the extruded polystyrene foam boards is not expected to exceed 2% of their thickness after 50 years.** For increased security reasons, the long-term compressive strength value should be used for floor slabs exposed to intense vehicle traffic. The load-bearing reinforced concrete slab over the thermal insulation layers must be designed by support structure designer. design of the steel requirements for floorboards as a structure.



THERMAL INSULATION SELECTION CRITERIA

Building function

The amount of the thermal insulation to be installed depends largely on the function of the industrial building. The level of technological heat production in the building (e.g. heavy industrial work or storage) can make a huge difference, because in the case of larger heat-generating machines, a separate energy plan is required!

Durability

From a durability point of view, it is also important that the right thermal insulation material is installed, as the industrial floor needs thermal insulation that has a high compressive strength value and has good long-term thermal insulation properties. In an industrial building, subsequent repairs of the floor structure are not permitted during its operation, since it is impractical and uneconomical.

Economical

RAVATHERM XPS is easy to install, which allows much faster work. Due to its long-term high thermal insulation properties, the operation of the building is more efficient, thus significant energy savings can be achieved. When applied under the entire reinforced concrete slab, the energy efficiency can be increased even further.

Environmentally-friendly

RAVATHERM XPS products play an active role in reducing global carbon-dioxide emissions through significant energy savings. RAVATHERM XPS products are manufactured and marketed in accordance with ISO 14001 environmental management and ISO 50001 energy management systems, which regulate the energy used and the biological footprint during the manufacture of the material at the lowest possible optimal level.



XPS PRODUCTS FOR INDUSTRIAL FLOOR INSULATION

RAVATHERM XPS 300 SL

extruded polystyrene foam

Field of application: Flat roofs, terraces, roof gardens, thermal insulation of floors, industrial floors, basement insulation.

Thickness:	30-320 mm
Compressive strength (CS):	300 KPa
Compressive creep (CC):	130 KPa
Thermal conductivity:	$\lambda = 0,033-0,035 \text{ W/mK}$
Reaction to fire:	E
Capillary water absorption:	0
Frost resistance:	FTCD 1
Water absorption by immersion:	VL(T) 0,7
Water absorption by diffusion:	$\leq 40 \text{ mm VD(V) 3}$
	50-60 mm VD(V) 2
	$\geq 100 \text{ mm VD(V) 1}$

EN product code (EN 13164:2012+A1:2015):

30-40 mm:
T1 - CS(10\Y)300 - CC(2/1,5/50)130 - DS(70,90) - DLT(2)5 - WD(V)3 - WL(T)0,7 - FTCD1
50-60 mm:
T1 - CS(10\Y)300 - CC(2/1,5/50)130 - DS(70,90) - DLT(2)5 - WD(V)2 - WL(T)0,7 - FTCD1
80-280 mm:
T1 - CS(10\Y)300 - CC(2/1,5/50)130 - DS(70,90) - DLT(2)5 - WD(V)1 - WL(T)0,7 - FTCD1

Declaration of performance

Technical Datasheet

RAVATHERM XPS 500 SL

extruded polystyrene foam

Field of application: Heavy-duty floors, industrial floors, thermal insulation of parking roofs.

Thickness:	40-200 mm
Compressive strength (CS):	500 KPa
Compressive creep (CC):	180 KPa
Thermal conductivity:	$\lambda = 0,034-0,035 \text{ W/mK}$
Reaction to fire:	E
Capillary water absorption:	0
Frost resistance:	FTCD 1
Water absorption by immersion:	VL(T) 0,7
Water absorption by diffusion:	$\leq 40 \text{ mm VD(V) 3}$
	50-60 mm VD(V) 2
	$\geq 100 \text{ mm VD(V) 1}$

EN product code (EN 13164:2012+A1:2015):

40 mm:
T1 - CS(10\Y)300 - CC(2/1,5/50)130 - DS(70,90) - DLT(2)5 - WD(V)3 - WL(T)0,7 - FTCD1
50-60 mm:
T1 - CS(10\Y)300 - CC(2/1,5/50)130 - DS(70,90) - DLT(2)5 - WD(V)2 - WL(T)0,7 - FTCD1
80-200 mm:
T1 - CS(10\Y)300 - CC(2/1,5/50)130 - DS(70,90) - DLT(2)5 - WD(V)1 - WL(T)0,7 - FTCD1

Declaration of performance

Technical Datasheet

RAVATHERM XPS 700 SL

extruded polystyrene foam

Field of application: Heavy-duty floors, industrial floors, insulation of reinforced concrete base-slab.

Thickness:	40-160 mm
Compressive strength (CS):	700 KPa
Compressive creep (CC):	250 KPa
Thermal conductivity:	$\lambda = 0,034-0,035 \text{ W/mK}$
Reaction to fire:	E
Capillary water absorption:	0
Frost resistance:	FTCD 1
Water absorption by immersion:	VL(T) 0,7
Water absorption by diffusion:	$\leq 40 \text{ mm VD(V) 3}$
	50-60 mm VD(V) 2
	$\geq 100 \text{ mm VD(V) 1}$

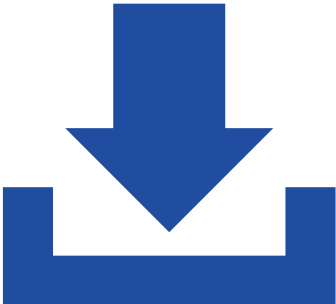
EN product code (EN 13164:2012+A1:2015):

40 mm:
T1 - CS(10\Y)300 - CC(2/1,5/50)130 - DS(70,90) - DLT(2)5 - WD(V)3 - WL(T)0,7 - FTCD1
50-60 mm:
T1 - CS(10\Y)300 - CC(2/1,5/50)130 - DS(70,90) - DLT(2)5 - WD(V)2 - WL(T)0,7 - FTCD1
80-160 mm:
T1 - CS(10\Y)300 - CC(2/1,5/50)130 - DS(70,90) - DLT(2)5 - WD(V)1 - WL(T)0,7 - FTCD1

Declaration of performance

Technical Datasheet

DOWNLOADABLE MATERIALS



Declaration of Performance

RAVATHERM XPS 300 SL
RAVATHERM XPS 500 SL
RAVATHERM XPS 700 SL

Technical data sheet

RAVATHERM XPS 300 SL
RAVATHERM XPS 500 SL
RAVATHERM XPS 700 SL

Brochure



Price list



ISO 14001 certification



VOC exemption declaration



Halocarbon exemption
declaration



LEED, BREEAM data request,
ISO certification of supplier
partners



SPECIAL FLOOR STRUCTURES

Cold store

Effective thermal insulation is top priority for cold store floor structures, not only to save energy, but also to continuously maintain the desired internal temperature. Due to the thickness of the thermal insulation, in some cases exceeding 200mm, it is particularly appropriate to use high compressive-strength thermal insulation material. RAVATHERM XPS 500/700 SL boards with high thermal insulation properties and high compressive strength allow for cost-effective load bearing reinforced concrete floor construction. The thickness of the thermal insulation layer internal cooling temperature depends on the maximum permissible heat flow for the economical operation of refrigeration equipment. The thermal transmittance of the building structure can be determined by the maximum permissible heat flow, as well as the thickness of the required thermal insulation. In the case of freezer warehouses, under the insulated floor structure, a ground heating system may be necessary to avoid the freezing of frost-sensitive soil layers.

General layer order:

1. Reinforced concrete floor slab
2. PE membrane
3. RAVATHERM XPS 500/700 SL
4. Waterproofing membrane
5. Heated concrete slab
6. Gravel bed

PRODUCT
INFORMATION



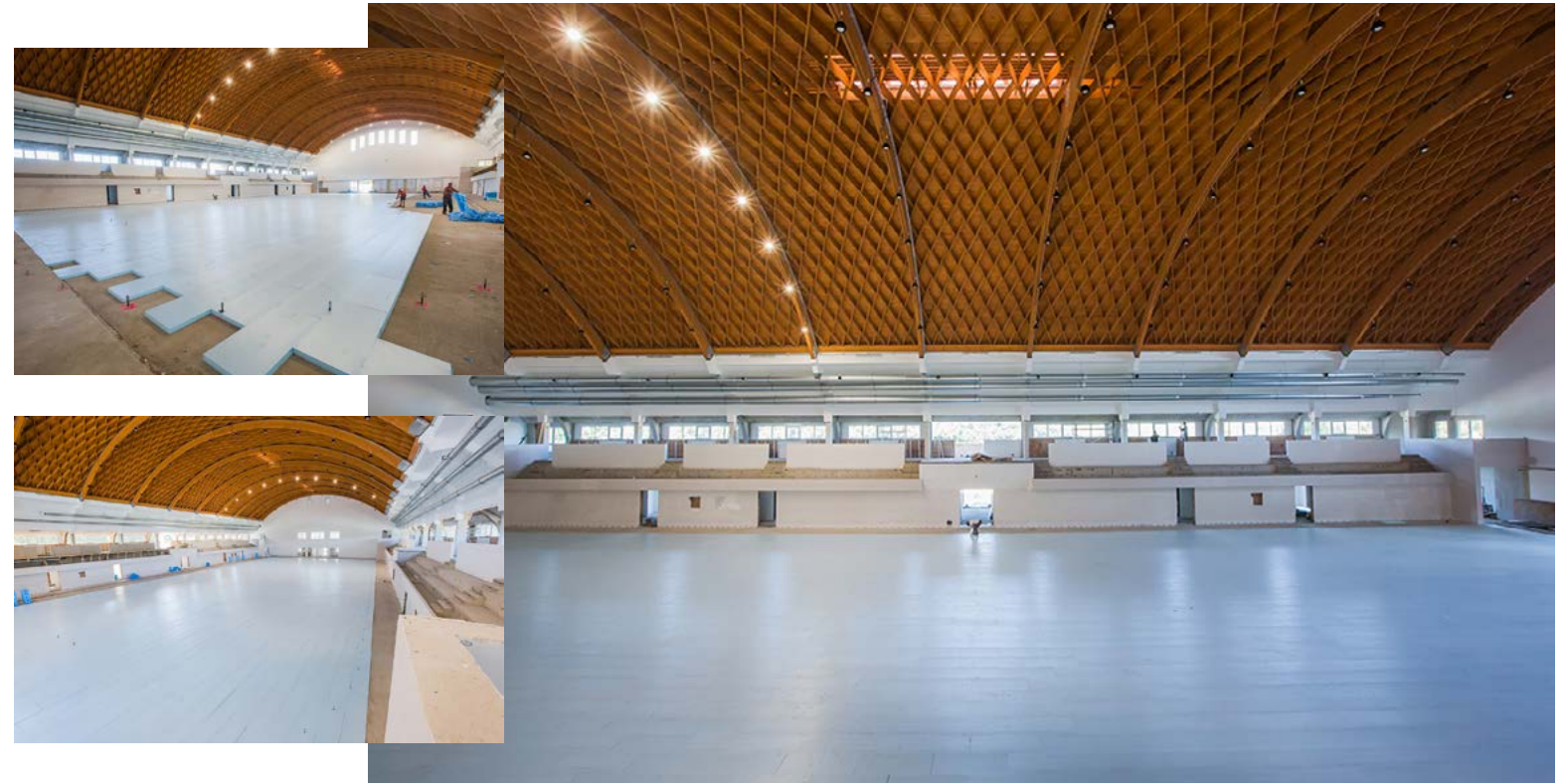
SPECIAL FLOOR STRUCTURES

Ice-rink

Modern indoor ice rinks are usually equipped with two pipe systems: one for cooling and one for heating. Cooling pipes play a role in the creating and maintenance of the ice. These also reduce the temperature of the ground below, thereby reducing the economical running of the building. If the soil does not melt when the ice rink is not in use, there is a risk that lower layers of the soil will remain frozen. If the operating season lasts more than six months, heating pipes shall be placed under the floor structure to prevent persistently frozen soil layers. A well insulated structure can melt more quickly, allowing the floor to be used for multiple purposes. Using RAVATHERM XPS thermal insulation reduces the need for earthworks, furthermore, due to its extremely high compressive strength, it is able to bear the huge loads such as the ice resurfacing machine or other machines without deformation.

General layer order:

1. Ice surface
2. Reinforced refrigerated concrete layer
3. Reinforced concrete floor slab
4. RAVATHERM XPS 500/700 SL
5. Bedding sand + heating pipes
6. Waterproofing layer
7. Blind concrete
8. Compressed gravel bedding



SPECIAL FLOOR STRUCTURES

Sports fields

RAVATHERM XPS thermal insulation can be used for indoor and outdoor sports fields. The compressive strength of the material used depends on the type and function of the field. The lower layers of outdoor sports and football pitches are similar to roads with lighter traffic. RAVATHERM XPS 500 SL or RAVATHERM XPS 700 SL is recommended for use under the whole area of the field, plus 0.5-1 m beyond the edges. The boards must be laid with a 5 mm gap to allow water drainage. The drainage channel around the field is made of 250-350 mm high-quality gravel or crushed stone. The floor structure of an indoor sports field can be formed as laminate floor surface with double wooden sleepers, or as flexible rubber surface poured onto a concrete layer, depending on the demand for point-flexible or surface-flexible sports floors. For the base of indoor sports floors, a general industrial floor structure can be used.

Layer order recommendation indoor sports field

1. Playing surface
(laminated floor, PVC or rubber surface)
2. Concrete layer
3. Reinforced concrete slab
4. 2 layers of PE barrier
5. RAVATHERM XPS thermal insulation
6. Compressed crushed stone bed
7. Compressed subsoil

Layer order recommendation outdoor artificial grass football field

1. Artificial grass
2. Impact-sink layer
3. Asphalt
4. Bedding sand
5. RAVATHERM XPS thermal insulation
6. Drainage layer
7. Soil



PRODUCT
INFORMATION



CONSTRUCTION ADVICE

Material handling

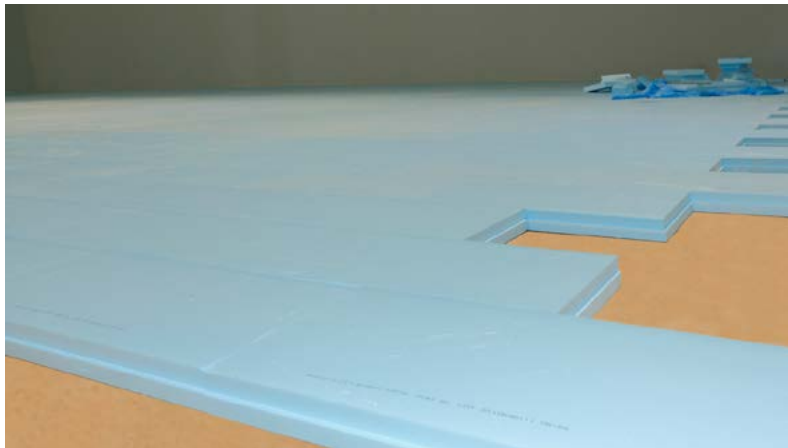
Thermal insulation boards can be laid easily and quickly under any weather conditions. To cut the boards to size, a handsaw or electric saw (but not a chainsaw!), or a hot wire cutting knife should be used. The cut surfaces can be precisely aligned next to each other. RAVATHERM XPS boards are resistant to pressure or other impacts which may occur during transport to the place of construction and therefore the risk of damage to the boards is also reduced.

Laying the boards

RAVATHERM XPS insulating boards must be laid directly onto the compressed gravel bed or a thin concrete layer with a smooth surface. When placed on a gravel bed, 2 cm of sand must be laid on top of the gravel to ensure smooth placement. The boards are low-weight, so they can be laid easily, quickly and tightly, without any adhesive. Between the thermal insulation and reinforced concrete slab, the use two layers of PE barrier membrane is recommended.

Iron works

Due to its high strength, thermal insulation boards reinforcing steel works are not damaged by reinforcing steel works during installation, however, it is advisable to install or use a separation layer or plank cover on previously insulated surfaces. If the insulation boards are installed above the waterproofing layer, they also play the role of a mechanical protective layer at the time of construction, which is advantageous during ironworks.



IMPORTANT INFORMATION

Load-bearing structure calculations

In order to determine the load-bearing capacity of the floor structure, including the thermal insulation layer, **the long-term compression strength value must be used.** The amount of steel required for a reinforced concrete floor slab, must be designed with the assistance of a structural engineer!

Important

- The application temperature of RAVATHERM XPS products is maximum +75°C. At higher temperatures, the boards melt, and suffer permanent deformation.
- RAVATHERM XPS products contain an ecologically safe anti-combustion additive. Although the boards can catch fire, due to the additive they are self-extinguishing under normal temperatures. The valid fire safety regulations must be taken into account at times during application.
- RAVATHERM XPS products are resistant to solvent-free and plasticiser-free materials that are commonly used in building construction. (Solvent-free bitumen components, aqueous wood protection materials, lime, cement, masonry plaster mortars, etc.)
- Certain organic substances, dye additives, solvents (acetone, ethyl acetate, petroleum, petrol, etc.) damage the insulation boards, and can cause softening, shrinkage, and material damage.
- During installation, solvent-free adhesive must be used, making sure to follow the manufacturer's instructions for polystyrene foam. XPS products must not be exposed to direct, intense sunlight.



SHIPPING AND ORDER INFORMATION

Our company strives to maintain direct and close contact with the major players in the building construction industry. In our opinion, the secret of a mutually beneficial partnership is fast and precise service and technical support which offers effective problem solving.

We are looking forward to receiving your requests and also initiate contacts through colleagues in different fields.

We can accept requests from our construction partners for the delivery of our products through orders sent by our contracted trading partners. For larger volume orders of several hundred cubic metres, we are happy to offer you a direct offer, but for smaller volumes we recommend contacting our trading partner nearest to the project, as they can help you quickly and flexibly based on the stock of the shorter claimed delivery times.

When requesting a quote, please provide the following information:

- **project name, exact address**
- **precise description of the necessary products, type and place of application, quantity,**
- **expected delivery schedule (week of first and last delivery per product)**

Our sales and technical consultants can process and answer your request in a short time.



SHIPPING AND ORDER INFORMATION

Expected delivery times may vary by product, delivery address and the quantities required, so please also check in advance at the following contact details. Based on the data above, we prepare a specific offer for a specific project, considering the expected delivery schedule, or, in the case of deliveries already ordered, our colleagues directly contact the person entitled to receive it as specified in advance.

Should you have any questions about orders, shipping to projects, please contact us at:

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