ROCKWOOL®

TECHNICAL INSULATION

SeaRox® marine and offshore manual

Giving you technical guidance to achieving the best fire-safe, acoustic and thermal stone wool solution possible

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This is SeaRox®

Marine insulation faces a number of unique challenges compared to onshore applications.

Delivering the best-possible insulation solution therefore takes knowledge and experience – as well as a full range of quality marine insulation products.

Extreme conditions within marine and offshore...

The marine and offshore is among the most difficult of operating environments. The marine industry is an environment highly exposed to water and humidity; it must tolerate high temperature; and it forms a critical part of fire safety. It also plays and important role in acoustic health and safety, as well as thermal performance. And if all that's not enough, it must be installed in the space-constrained environment onboard a ship.

... require expert solutions

The design of marine insulation systems must take all of these factors into account. Not an easy task. There is no single insulation product that can do everything in every marine application. But there is SeaRox marine and offshore insulation: Our full range of insulation solutions for the shipbuilding industry. SeaRox products are offered to the same standard specifications wherever you are in the world – from the UK to China – ensuring you can easily determine the right material for the job.

Our experts are also always on hand to advise when it comes to the selection of the most appropriate insulation solutions. From documentation to delivery and aftersales service, we don't just sell products; we supply solutions. It's a total service approach that our customers can rely on for professionalism, innovation and trust.

With a focus on sustainability

Economic and environmental pressures have become an increasingly prominent item on the agenda of shipowners, shipbuilders, naval architects, and marine engineers. This includes efforts to control energy consumption, which has the dual benefit of reducing both operating costs and carbon emissions. Our latest insulation high-performance lightweight stone wool solutions are designed to meet this challenge and drive incremental improvements in energy efficiency.

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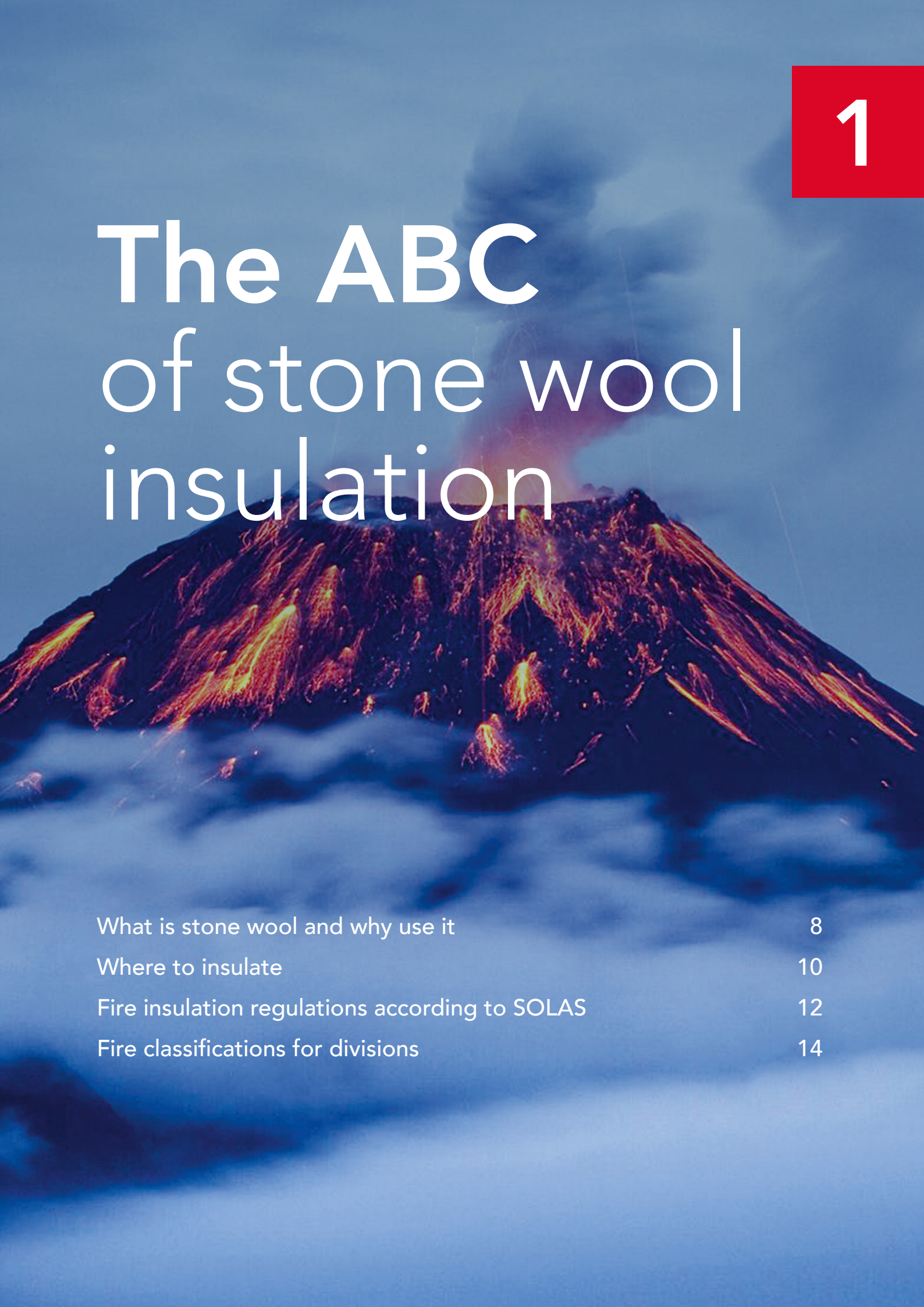


1

The ABC of stone wool insulation

What is stone wool and why use it

As with all ROCKWOOL products, SeaRox® combines the strenght of stone – that is volcanic rock: a material nature produces in abundant quantities. Based on the natural power of this stone, we have identified several inherent strengths that reflect the versatile properties of stone wool.

Fire-resilience

ROCKWOOL stone wool fibres can withstand more than 1000°C without melting.

Acoustic capabilities

The acoustic properties of our products secure excellent noise reduction and better indoor comfort.

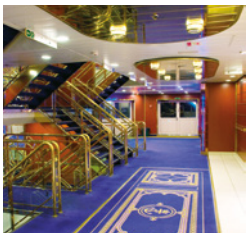
Thermal properties

Saves energy by maintaining optimum indoor temperature and climate.

Water repellency

When engineered to repel water, stone wool repels water and have low water absorption; reduces the risk of weight increase, reduced thermal insulation performance and other negative effects of water accumulation in the insulation over time.

Where to insulate
Multiple application areas



Stairways

The stairways are part of the emergency escape routes on a vessel. The number of vertical fire zones the stairway passes determines the fire insulation class.

Corridors

Corridors are part of the emergency escape routes on a vessel. The number of horisontal fire zones the corridor passes determines the fire insulation class.

Control room

In the case of fire, the control room must be able to stay in operation for as long as possible, as this is the last place where all the technical equipment can be controlled. The sound level also needs to be low, as the crew will spend a lot of time here. Fire protection and acoustic insulation of the control room is therefore very important.

Public area

The public area requires various kinds of insulation, depending on the situation.

Engine room

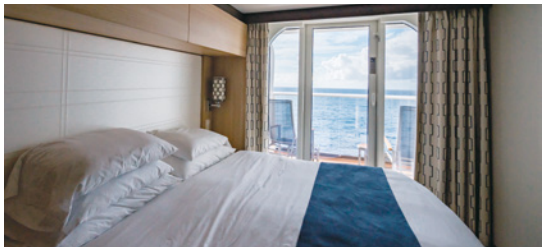
The engine room contains a lot of fire risks so fire protection is essential. The engine room is also a source of a lot of often disturbing noise. It is also an area containing pipes, tanks, containers and other equipment where technical insulation is required.

Bridge

On the bridge it is important to secure a high level of fire protection and sound reduction.

Storage and tank rooms

In the boiler room, storage rooms and tank rooms it is often important to insulate hot surfaces, boilers and pipes.



Cabins

On board a ship it is essential to have the right insulation between the cabins. It is crucial to ensure the required fire protection and it is more and more important to have a high level of sound and thermal (comfort) insulation.

Offshore

Conditions on offshore applications are more or less the same as on a ship. Furthermore you have the risk of hydrocarbon fire and you need to protect people and material from this type of fire exposure.

Galley

In the galley you always have a risk of fire, as you can have a mixture of heat and flammable materials. In this case it is also necessary to be aware of the facings, as there may be oil vapour in the air.

Disco

The discothèque, cinema and bar areas on board cruise ships are big sources of noise. Such areas need to be properly sound insulated.

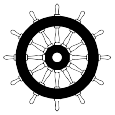
Fire insulation regulations according to SOLAS

The requirements for materials and constructions to meet specified standards of safety are normally prescribed by international or national laws related to shipping and offshore installations.

In addition to these regulations, classification societies such as DNV and LR (Lloyd's Register) may have additional requirements.

Approvals and certification

- Suppliers of materials and constructions to the marine and offshore industry must prove that their products meet at least the statutory requirements.
- The Marine Equipment Directive "MED directive 2014/90/EU" replaced the MED directive 96/98/EC and all previous approvals from the maritime authorities within EEA countries. All products supplied to marine vessels carrying EEA flag are subject to the MED directive.
- MED-certificates are issued by notified bodies accredited by an EEA country. Approved products bear the mark of conformity. All ROCKWOOL SeaRox material are supplied in accordance with the MED directive and marked accordingly.
- Classification societies issue type approval certificates stating the permission to use specific materials and constructions together with any relevant restrictions.



- For UK flagged vessels United Kingdom Maritime & Coastguard Agency (MCA) has implemented the UK Conformity Assessment Scheme for certification of marine equipment. This has resulted in a new regulation for all UK flagged vessels, called the Marine Equipment Regulation (MER). The new rules were implemented 1. January 2023 and our SeaRox offerings are certified accordingly.

- If there are special circumstances or requirements for special details, it may be required to obtain statements from other authorities.
- Via an agreement between EU and USA, MED and USCG (US Coast Guard) certificates are mutually recognised.

Approval requirements

- To satisfy the national authorities and classification societies, materials and constructions must be proven to comply with the national and international requirements. Tests have to be done at internationally recognised test laboratories.
- The tests have to be performed so that the materials or products are exposed to a fire generated under controlled conditions that simulate as closely as possible a worst case scenario.

Test requirements

- There are several national and international requirements regarding the use of materials on ships and offshore installations. These classifications are required to prove combustibility characteristics and include ignition properties, heat release and development of toxic gases and smoke.
- To prove that materials meet the required fire technical classification, tests are carried out at recognised test institutions according to standardised test methods.

Material test methods

Testing of material's fire resistance is done according to the latest FTP code for non-combustibility and where a facing is applied for low flame spread.

It is important to note that materials which meet the requirements for non-combustibility do not have to be tested for other fire technical properties.

All our A- and H-constructions are tested according to the FTP code. The FTP code also describes the thickness of the test specimen. The decision about the thickness of the structural part is the responsibility of the ship designer and will ultimately be approved by the responsible class society.

Construction test methods

Tests of a construction's fire resistance (decks, bulkheads, structural steel, penetrations etc.) are carried out in a standardised test furnace, where the construction specimen is exposed to a fire according to a standardised time/temperature curve.

IMO 2010 FTP code

Fire test procedures within the marine sector, IMO 2010 FTP Code came into effect on 1 July 2012. The test procedures have been revised in order to maintain the highest practical level of safety including the harmonisation of certified test institutes to the same level. Most of the ROCKWOOL A-class solutions have now been tested and certified to part 3 of the new IMO 2010 FTP code.

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SOLAS, Chapter II-2, Regulation 5.3.1:

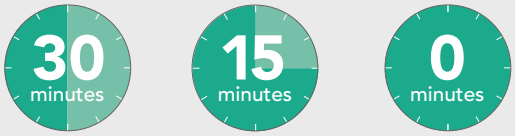
Use of non-combustible materials

"Insulating materials shall be non-combustible, except in cargo spaces, mail rooms, baggage rooms and refrigerated compartments of service spaces. Vapour barriers and adhesives used in conjunction with insulation, as well as the insulation of pipe fittings for cold service systems, need not be of non-combustible materials, but they shall be kept to the minimum quantity practicable and their exposed surfaces shall have low flame-spread characteristics."

Fire classifications for divisions

Class B fire divisions

- Class B fire divisions must be of non-combustible materials and must prevent the propagation of flames for at least 30 minutes during a standard fire test.
- The divisions must be insulated so that the average temperature on the unexposed side of the division does not exceed 140°C above the initial temperature.
- Furthermore, the temperature at any single point on the unexposed side must not exceed 225°C above the initial temperature within the time limits.



Class B-30 **Class B-15** **Class B-0**

Class A fire divisions

- Class A fire divisions must be of non-combustible materials and insulation materials must be fire tested at a recognised institution. They must be sufficiently braced and must prevent the propagation of flames and smoke for a minimum of one hour during a standard fire test.
- The divisions must be insulated so that the average temperature on the unexposed side of the division does not exceed 140°C above the initial temperature.
- Furthermore, the temperature at any single point on the unexposed side must not exceed 180°C above the initial temperature within the time limits.
- For aluminium constructions, in addition to the normal A-class fire requirements, the temperature of the core aluminium structure is not allowed to increase by more than 200°C during a 1 hour fire testing as per the IMO 2010 FTP code, this apply for A-0, A-15, A-30 and A-60.

Class A-60 **Class A-30**

Class A-15 **Class A-0**

Fire classes defined according to IMO 2010 FTP Code

Notified body

ROCKWOOL Technical Insulation is certified according to the MED directive. As notified body, we have chosen DNV, which also guarantees our quality by running audits. Further reference is made to the ROCKWOOL MED-D certificates.

2

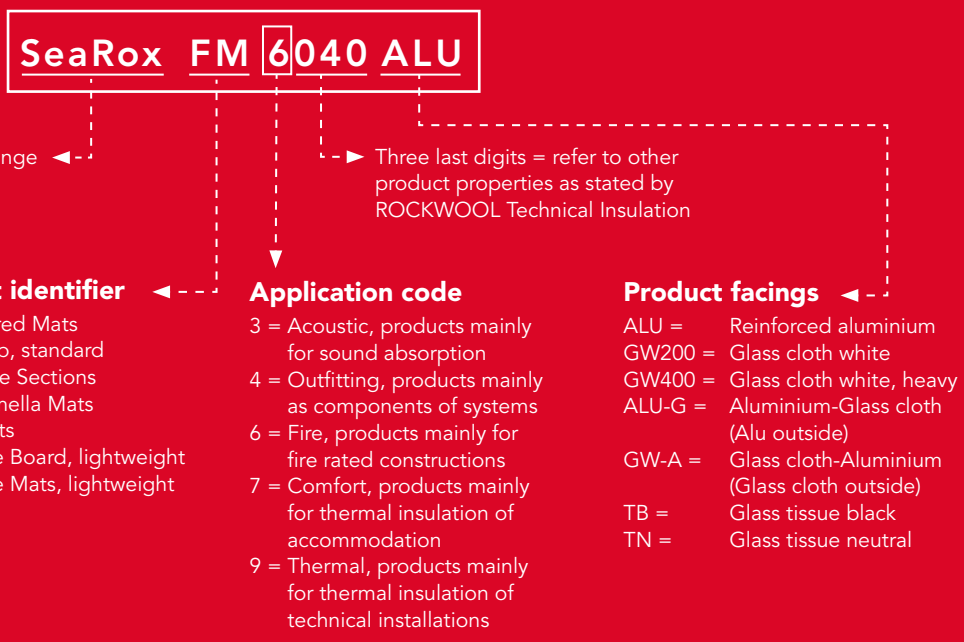
Our products

Understanding the SeaRox® product name

All SeaRox product names are structured in a uniform and clear way to ensure they are easy to understand for all our customers across the globe.

This is how the product names are structured

Example:



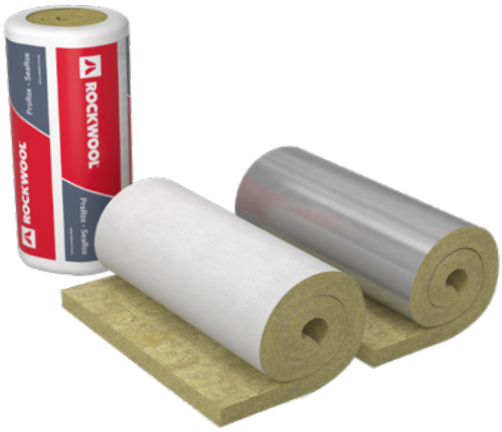
Product guide and selector

We have developed a special range of marine products that meet the requirements of IMO's regulations. There is a ROCKWOOL SeaRox® product with the required approval for virtually every construction.

The tables below give a general idea of product applications in different constructions.

Product selector	SeaRox FB 6020	SeaRox FB 6040	SeaRox FB 6050	Searox FM 6020	Searox FM 6030	Searox FM 6040	Searox FM 6050	SeaRox SL 620	SeaRox SL 640	SeaRox WM 620	SeaRox WM 640	SeaRox MA 7000	SeaRox SL 720	SeaRox MA 720	SeaRox SL 740	SeaRox MA 740	SeaRox SL 320	SeaRox SL 340	SeaRox SL 436	SeaRox SL 440	SeaRox SL 480	SeaRox LM 900 ALU	ProRox WM 950	ProRox PS 930 ALU	ProRox PS 960
Bulkhead and deck																									
Fire (A-class divisions) - lightweight	■	■	■	■	■	■	■																		
Fire (A-class divisions) - standard								■	■	■	■														
Thermal (comfort insulation) - lightweight												■													
Thermal (comfort insulation) - standard													■	■	■	■									
Sound reduction (absorption)																	■	■							
Outfitting																									
Floating floor and panels																			■	■	■				
Technical installations																									
Thermal (pipes) < 250°C						■										■						■		■	■
Thermal (pipes) > 250°C						■																	■		■
Thermal (tanks) < 250°C						■		■							■	■						■			
Thermal (equipment) > 250°C						■		■															■		
Thermal, air ducts															■	■						■			
Fire (A-60 pipelines)						■				■															■
Fire (air ducts)						■		■		■															
Sound reduction (pipes)																							■		■

COMFORT, THERMAL INSULATION



Product	Application	Optional facings						
		ALU	GW200	GW400	ALU-G	GW-A	TN	TB
Comfort, thermal insulation	Products mainly for thermal insulation of accommodations							
SeaRox MA 7000 ALU	Lightweight stone wool mat for thermal insulation. Delivered as standard with reinforced aluminium foil (ALU) on one side as a highly compressed, compact roll.	X			X	X		
SeaRox SL 720	Low weight and semi-rigid slab for thermal insulation.	X	X		X	X		
SeaRox MA 720 ALU	Low weight and highly compressed mat used for thermal insulation. Delivered as standard with reinforced aluminium foil (ALU) on one side.	X			X	X		
SeaRox SL 740	Low weight and semi-rigid slab for thermal insulation.	X	X	X	X	X		
SeaRox MA 740 ALU	Semi-rigid highly compressed mat used for thermal insulation. Delivered as standard with reinforced aluminium (ALU) on one side.	X			X	X		

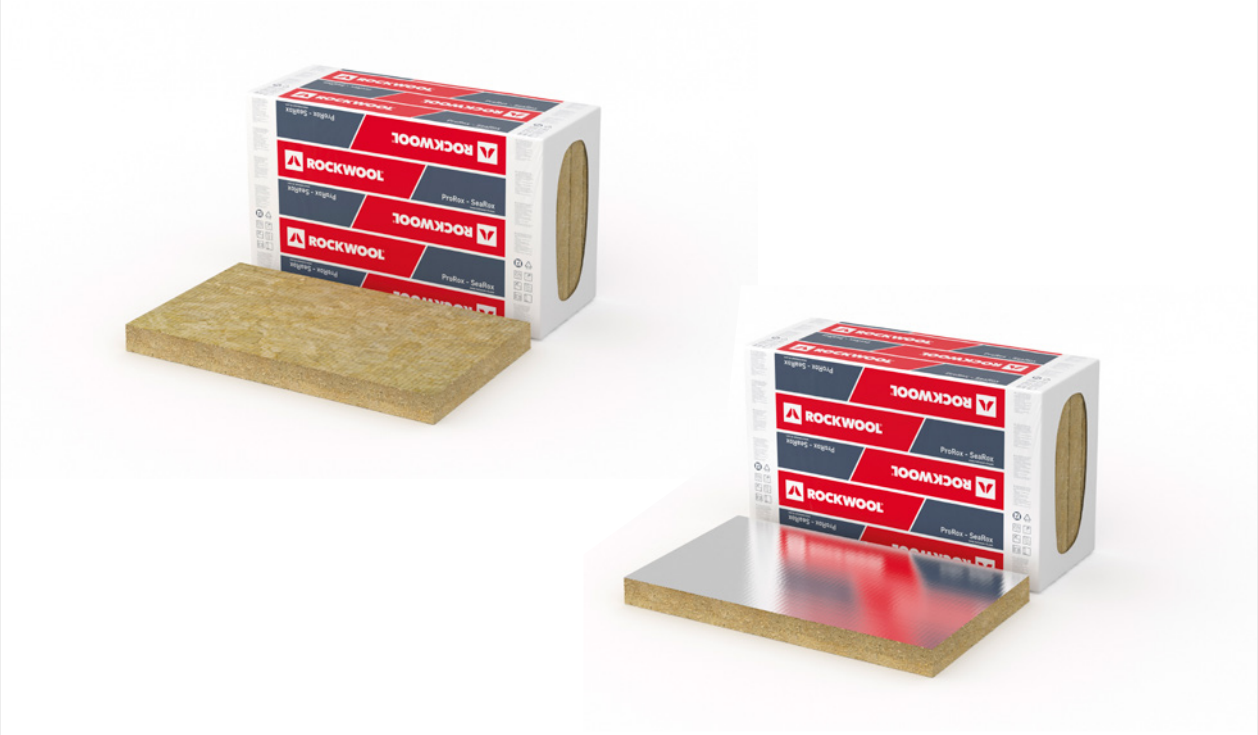
Local variations in products and facings might occur.

SOUND REDUCTION

Product	Application	Optional facings						
		ALU	GW200	GW400	ALU-G	GW-A	TN	TB
Sound reduction	Products mainly for sound absorption							
SeaRox SL 320	Semi-rigid slab primarily used for sound absorption.	X					X	
SeaRox SL 340	Semi-rigid slab primarily used for sound absorption.	X					X	X
SeaRox Acoustic foil	Thin, strong and durable film for mainly engine rooms to maintain the high noise absorption properties of the ROCKWOOL insulation.							

Local variations in products and facings might occur.

OUTFITTING



Product	Application	Optional facings						
		ALU	GW200	GW400	ALU-G	GW-A	TN	TB
Outfitting	Products mainly used as components of systems							
SeaRox SL 436	Rigid slab for insulation of floating floors. Approved for A-60 floating floors.	X						
SeaRox SL 440	Strong and rigid slab for floating floors or to be cut into lamellas and used for panels. Approved for A-60 floating floors.						X	
SeaRox SL 480	Strong, high density and rigid slab for floating floors or to be cut into lamellas and used for panels. Approved for A-60 floating floors.						X	

Local variations in products and facings might occur.

FIRESAFE INSULATION LIGHTWEIGHT

Product	Application	Optional facings						
		ALU	GW200	GW400	ALU-G	GW-A	TN	TB
Fire-safe insulation	Products mainly for fire rated applications							
SeaRox FB 6020	Lightweight stone wool slab for A-class divisions.	X	X	X	X	X		
SeaRox FB 6040	Lightweight stone wool slab for A-class divisions.	X	X	X	X	X		
SeaRox FB 6050	Lightweight stone wool slab for A-class divisions.	X	X	X	X	X		
SeaRox FM 6020	Lightweight stone wool mat for A-class divisions. Delivered as standard with reinforced aluminium foil (ALU) on one side.	X	X		X	X		
SeaRox FM 6030	Lightweight stone wool mat for A-class divisions. Delivered as standard with reinforced aluminium foil (ALU) on one side.	X						
SeaRox FM 6040	Lightweight stone wool mat for A-class divisions. Delivered as standard with reinforced aluminium foil (ALU) on one side.	X	X		X	X		
SeaRox FM 6050	Lightweight stone wool mat for A-class divisions. Delivered as standard with reinforced aluminium foil (ALU) on one side.	X	X		X	X		

Local variations in products and facings might occur.

FIRESAFE INSULATION

Product	Application	Optional facings						
		ALU	GW200	GW400	ALU-G	GW-A	TN	TB
Fire-safe insulation (continued)	Products mainly for fire rated applications							
SeaRox SL 620	Rigid slab for fire insulation in A-class constructions.	X	X	X	X	X		
SeaRox SL 640	Rigid slab for fire insulation in A-class constructions.	X	X		X	X		
SeaRox WM 620	Flexible mat, one side faced with wire netting. Used for A-class constructions and penetrations.	X						
SeaRox WM 640	Flexible mat, one side faced with wire netting. Used for A-class constructions and penetrations.	X						

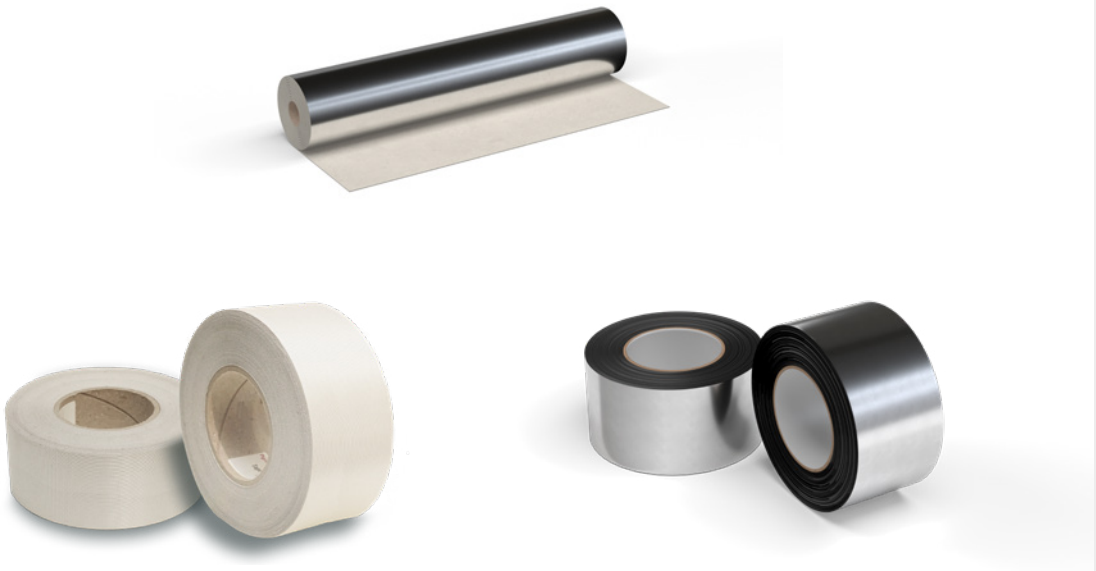
Local variations in products and facings might occur.

TECHNICAL INSULATION

Product	Application	Optional facings						
		ALU	GW200	GW400	ALU-G	GW-A	TN	TB
Technical insulation	Products for thermal insulation of technical installations							
SeaRox LM 900 ALU	Lamellas placed edgewise on reinforced aluminium (roll). For insulation of pipes, tanks and ventilation ducts.	X						
ProRox WM 950	Flexible mat, one side faced with wire netting. Used for insulation of technical installations mainly pipes.	X						
ProRox PS 930 ALU	Pipe section for thermal insulation of marine piping.	X						
ProRox PS 960	Mandrel wound pipe section with WR-Tech (Water Repellency Technology). Rigid pipe section for steam and process pipes.	X						

Local variations in products and facings might occur.

TAPES AND FACINGS



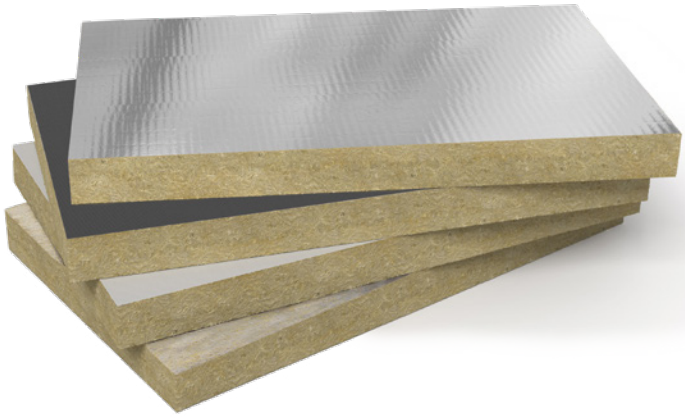
Product	Application
Tapes and facings	
SeaRox Tape ALU (SeaRox ALU Tape 337)	Self adhesive aluminium tape. The tape is used for sealing joints between SeaRox ALU or ALU-G faced stone wool products.
SeaRox Tape GW-A (SeaRox Glass cloth Tape 120)	Composite self-adhesive glass cloth tape on a aluminium foil backing. The tape is used to seal joints between SeaRox GW200 and GW-A faced stone wool products.
SeaRox Tape ALU-G	Strong, composite self-adhesive alu tape on a glass cloth foil backing.The tape is used to seal joints between SeaRox ALU and ALU-G faced stone wool products.
SeaRox Glass Cloth GW200	White glass cloth (approx. 210 g/m^2)supplied in rolls to be loosely applied on top of stone wool products as a separate layer as the final surface.
SeaRox Glass Cloth ALU-G / GW-A	Composite glasscloth and aluminium foil (approx. 275 g/m^2) supplied in rolls to be loosely applied on top of stone wool products as a separate layer with aluminium or glass cloth as the final surface.

Local variations in products and facings might occur.

SeaRox® facings

Improve the performance and safety of your SeaRox insulation with specialist pre-applied facings.

We offer a great selection of pre-applied facings for our stone wool insulation products for the marine and offshore industry.



But why use facings?

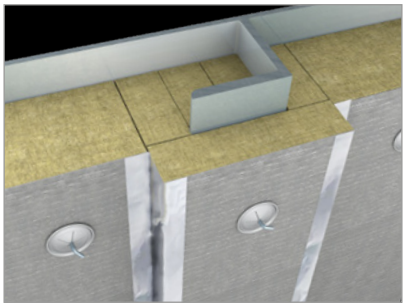
- Reduce weight and save cost by replacing plates/cladding in areas with limited traffic and limited risk for mechanical impact.
- Create a water vapour barrier.
- Improve the appearance of your marine and offshore installations.
- Encapsulate dust.
- Protect your insulation from mechanical impacts, abrasions and oil spillages or vapour.
- Choose from reinforced or laminated aluminium foil, glass cloth, or glass tissue facings.

Facings

Reinforced aluminium foil (ALU)*)

Glass fibre scrim reinforced aluminium foil, total weight, approx. 85 g/m².

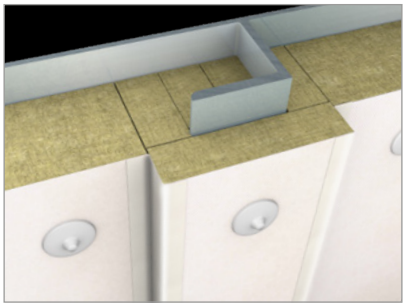
This surface is mainly used as a vapour barrier or to encapsulate dust. Used for a service temperature at maximum 80°C.



Glass cloth white (GW200)

White woven glass cloth, approx. 210 g/m².

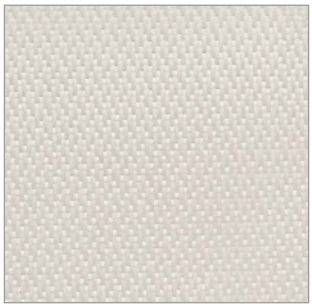
This facing functions as a surface, removing the need for additional metal cladding. The glass cloth creates an attractive impact-resistant surface that encapsulates dust.

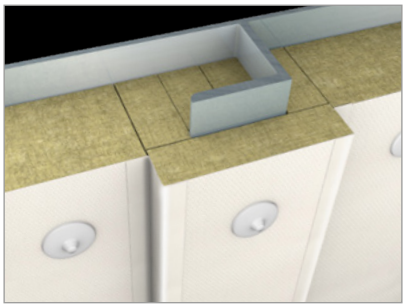


Glass cloth white (GW400)

Heavy, white woven glass cloth, approx. 450 g/m².

The facing functions as a surface, precluding the need for extra metal cladding. The glass cloth creates an attractive impact-resistant surface that encapsulates dust.

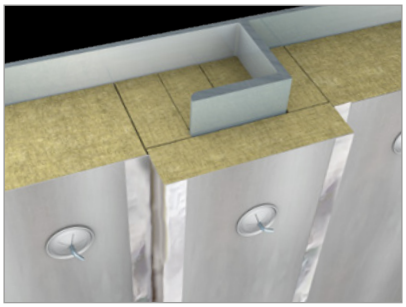




Aluminium foil laminated with glass cloth on the underside (ALU-G)*)

Aluminium foil laminated with white glass cloth on the underside, approx. 275 g/m².

This facing has a smooth and shiny surface, it is heavy-duty and easy to clean. The laminated aluminium foil serves as a water vapour barrier.

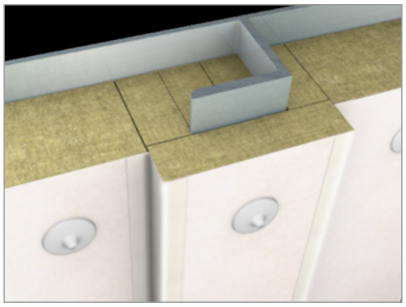


*) *All joints, pin penetration points and any damages in the foil must be sealed.*

White glass cloth laminated with aluminium foil (GW-A)*)

White glass cloth laminated with aluminium foil on the underside, approx. 275 g/m².

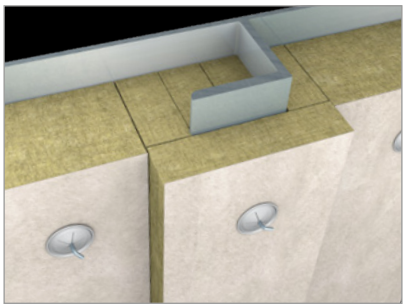
This facing creates a strong, impact-resistant, dust free surface. The facing combines the water vapour barrier properties of aluminium foil with mechanical resistance and attractive appearance of the glass cloth.



Glass tissue neutral (TN)

Glass tissue neutral (TN) is a white/neutral glass tissue in approx. 60 g/m².

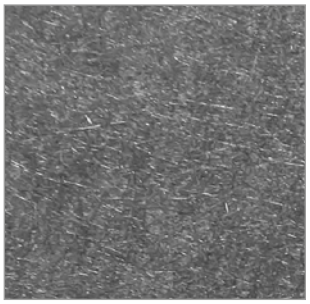
This glass tissue provides dust encapsulation, while the neutral/transparent look creates brightness.

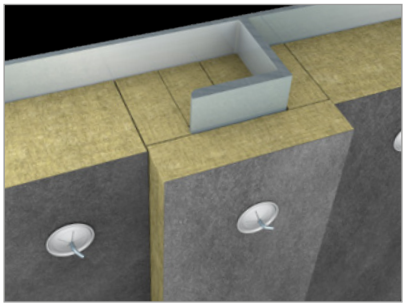


Glass tissue black (TB)

Glass tissue black (TB) is a black glass tissue in approx. 60 g/m².

This glass tissue provides dust encapsulation and a low-key background. The black tissue is often used in ventilation shafts or behind a perforated plate.



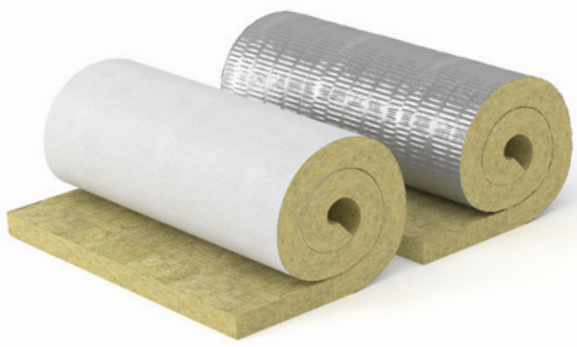


Facing properties

FACING	Description	Colour	Facing weight	Vapour barrier	Mechanical properties	Fire classification	Available products	Features
ALU	Glass fibre scrim reinforced aluminium foil	Bright aluminium	Approx. 85 g/m²	Yes (sensitive to punching through)*)	Low	Low flame spread according to IMO 2010 FTP Code	■ Slabs ■ Mats ■ Wired Mats ■ Pipe Sections	■ Reduced water vapour ingress ■ Oil and oil vapour protection ■ Encapsulate dust
GW200	White woven glass cloth	White	Approx. 210 g/m²	No	Medium	Low flame spread according to IMO 2010 FTP Code	■ Slabs ■ Mats	■ Mechanical protection ■ Encapsulate dust and provide a nice appearance
GW400	White woven glass cloth	White	Approx. 450 g/m²	No	High	Low flame spread according to IMO 2010 FTP Code	■ Slabs	■ High mechanical protection ■ Encapsulate dust and provide a nice appearance
ALU-G	Aluminium foil laminated with glass cloth beneath	Bright aluminium	Approx. 275 g/m²	Yes *)	High	Low flame spread according to IMO 2010 FTP Code	■ Slabs ■ Mats	■ Heavy-duty, shiny surface for gentle cleaning with water ■ Reduced water vapour ingress ■ Oil and oil vapour protection ■ Encapsulate dust
GW-A	White glass cloth laminated with aluminium foil beneath	White	Approx. 275 g/m²	Yes *)	High	Low flame spread according to IMO 2010 FTP Code	■ Slabs ■ Mats	■ Mechanical protection ■ Reduced water vapour ingress ■ Oil and oil vapour protection ■ Encapsulate dust and provide a nice appearance
TN	White/neutral glass tissue	White/ Neutral	Approx. 60 g/m²	No	Low	Low flame spread according to IMO 2010 FTP Code	■ Slabs	■ Encapsulate dust, light appearance
TB	Black glass tissue	Black	Approx. 60 g/m²	No	Low	Low flame spread according to IMO 2010 FTP Code	■ Slabs	■ Encapsulate dust, dimmed appearance

*) *All joints, pin penetration points and any damages in the foil must be sealed.*

For more information about our SeaRox facings or to check their availability in your region, please contact your local ROCKWOOL Technical Insulation sales representative.



How to order
Calculation of materials

This quick guide will help you estimate the stone wool products and accessories needed for your project. For more precise calculations, always refer back to your detailed project drawings.

Insulation

Based on a plate of X m^2:
The number of slabs for stiffeners can roughly be estimated at X times 0.7.

Example:

100 m^2 of plate needs to be insulated.
Calculation of material for stiffener:
100 m^2 x 0.7 = 70 m^2

Based on a total amount of insulation for plate + stiffeners:

- The plate equals 60%
- The stiffeners equal 40%

Pins and washers

The number of pins and washers can roughly be estimated as follows:
Plate in m^2 times min. 12.
Stiffener in m^2 times min. 10.

Example

100 m^2 insulation of plate requires
100 m^2 x 12 pins/m^2 = 1200 pins

100 m^2 insulation of stiffeners requires
100 m^2 x 10 pins/m^2 = 1000 pins

Alternatively, the number of pins and washers can roughly be estimated as follows:
the total area of plate in m^2 times min. 18.

Example

A total quantity of 100 m^2 plate needs to be insulated; also taking the insulation of stiffeners into consideration.
Estimated need of pins and washers:
100 m^2 x 18 pins/m^2 = 1800 pins

Tape

The amount of tape for joints can roughly be estimated by multiplying the insulated area in m^2 by 4 stated in running metres.

Example

Tape for 100 m^2 of insulation;

100 m^2 x 4 m/m^2 = 400 metres

Waste

As guidance, the following amount of waste has to be included:

- Insulation area < 100 m^2 10% waste
- Insulation area > 100 m^2 5% waste

The customer is always responsible for the finale calculations.

How to order
Making sure to choose the right products

To find the correct product it is necessary to know the application:

- Fire insulation
- Sound reduction
- Thermal, comfort insulation
- Insulation of technical installations
- Floating floor insulation
- Panels
- Combinations, such as fire and sound reduction

When the application is known, the requirements for product characteristics need to be evaluated:

- Fire properties
- Sound properties
- Thickness
- Thermal conductivity
- Mechanical strength
- Water repellency

All ROCKWOOL SeaRox products have good fire properties, but when using the products on ships or offshore rigs, it is necessary to choose the right product with the required fire rating.

To secure the highest safety level onboard, also remember to check whether the product and construction are tested according to the latest standard fire test procedure, IMO 2010 FTP Code.

In some applications the weight could be of importance. In such cases, the lighter products can be chosen, but it is not always the lightest solution that gives the best result. All our main products and constructions have been tested for acoustic properties and it is recommended to check the actual values to find the optimal solution for the specific situation.

For marine and offshore applications, choosing the product with the best water repellency properties is also recommended. All ROCKWOOL SeaRox products have low water absorption as standard, which ensures the best product performance.

Evaluating the various solutions with regard to the working and installation method is also recommended.

Depending on the experience, the labour cost and the prioritisation it might be relevant to include parameters, such as:

- Ease of handling
- Amount of cutting
- Speed of installation
- Labour intensity

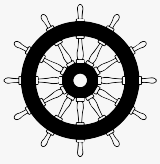
ROCKWOOL Technical Insulation has a large number of certificates for the different products and applications from classification companies based on fire tests made at IMO-approved fire institutes.

When choosing a product, it is necessary to choose a product that is accepted by the classification company that ultimately has to approve the application/newbuild. Some customers prefer to work with constructions based on slabs, securing easy handling of small size and fixed products, others prefer to work with constructions based on mats for improved workability and faster installation. For some customers, it is important to have the best and safest solutions, typically based on a two-layer solution while other customers may focus on the easy and fast installation of a one-layer system.

Finally, it is important to focus on the right documentation such as:

- Type approvals
- Type certificates

ROCKWOOL SeaRox products will always carry the wheel mark, confirming that the materials are MED type approved for installation on vessels registered in an EEA country or the USA (with mutual recognition with USCG).



0575/year

It is important to make sure that the products and constructions have the right approval needed in the specific project, such as construction approval, non-combustible approval and low flame spread approval. Remember to check whether the certificate is valid when the insulation plan is approved by the classification societies and for A-class constructions, and that the certificate is valid at the time of installation.

How to install

Insulation material can be installed in various ways, and it is up to the insulation contractor to choose the best method for each application. For fire-rated constructions, the installation must adhere to the approved ROCKWOOL construction data sheets, installation instructions, and official drawings according to the fire test. These drawings can be found on our website: rti.rockwool.com.

Below is a general description of how the insulation work can be carried out:

Preparation

Welding of pins to plate and stiffeners (bulkhead/deck)

First, the pins must be welded to the plate and stiffener. The distance between pins should not exceed 300 mm. For fire rated constructions, the position of pins must correspond to the official drawings.

Painting of plate and stiffeners

To avoid corrosion, the plate can then be coated with anti-corrosion paint.

Cutting

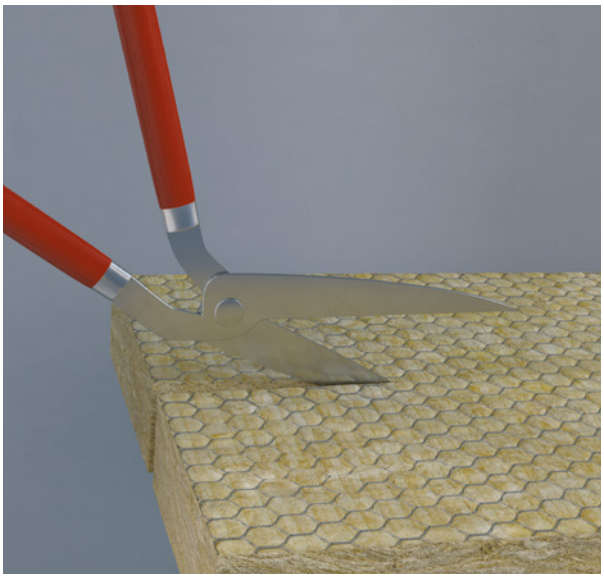
Use an electrical saw to cut large quantities of SeaRox® products

An electric saw is recommended when cutting large quantities of SeaRox insulation. This will ensure a good angular surface that is easy to tighten against adjacent slabs. 2-5 mm oversize is recommended. The pieces of insulation should be at least 150 x 150 mm.

Use a knife to cut the insulation

SeaRox insulation can easily be cut with a sharp knife. When the slabs are cut 2-5 mm oversize (depending on density), the optimal tension and tightness can be obtained when fitting the wool. The pieces of insulation should be at least 150 x 150 mm.

Using scissors to cut wired mats



Wired mats should be cut with large shears. The pieces of insulation should be at least 150 x 150 mm and 2-5 mm oversize is recommended.

Remember to use Personal Protective Equipment (PPE)

Installation

L-shaped stiffener – alternative 1

Insulation of stiffeners
Depending on the construction, starting with the insulation of the stiffeners is recommended. First by filling out the space, behind the stiffener, with SeaRox insulation. The insulation should fit the profile structure exactly. Then insulate around the stiffener with the required thickness of SeaRox insulation.

Insulation between stiffeners
Insulate the plate between stiffeners with SeaRox insulation. Joints must be tight and there must be no air gaps. For solutions with more than one layer of insulation, the joints should be staggered by at least 150 mm to ensure that joints are not aligned across both layers.

L-shaped stiffener – alternative 2

Insulation between stiffeners
Depending on the construction, it may be easier to start with insulation of the plate. Joints must be tight and there must be no air gaps. For solutions with more than one layer of insulation, the joints should be staggered by at least 150 mm to ensure that joints are not aligned across both layers.

Insulation of stiffeners
Insulate with SeaRox insulation around the stiffener. Fill out the space behind the stiffener with SeaRox insulation, the insulation should fit the profile structure exactly.

Installation

Bulb profile

Insulation of stiffeners
In most cases, a bulb profile is used. Typically, you start with insulation around the stiffener. No separate insulation behind the stiffener is needed but depending of the depth of the stiffener, a pin needs to be welded on the side of the stiffener to keep the insulation in place.

Insulation between stiffeners
Insulate the plate between stiffeners with SeaRox insulation. Be sure to make a safe and tight connection to the insulation around stiffeners to ensure no open joints.

Fixing the insulation

Fixing of insulation
All pieces of insulation must be fit firmly with at least one pin and fastened with spring washers without compressing the insulation.

Installation

Hybrid solutions (fire board and fire mat)
For our lightweight range of A-rated steel constructions based of the SeaRox FB 6000 and FM 6000 ranges, we offer alternative solutions for installation focusing on improved workability and faster installation. Alternative working procedures may be used, depending on available space and the construction.

Hybrid solutions – alternative 1

Insulation between stiffeners
Insulate the plate between stiffeners with SeaRox insulation. Joints must be tight with no air gap.

Insulation of stiffeners
Cut the insulation mat to the right size and insulate with a strip on the stiffeners. Stiffeners insulation at least 150 mm on either side.

Hybrid solutions – alternative 2

Insulation of stiffeners
Cut the insulation mat to the right size and insulate around the stiffener.

Insulation between stiffeners
Insulate the distance between stiffeners – already insulated – with SeaRox insulation. Joints must be tight with no air gap.

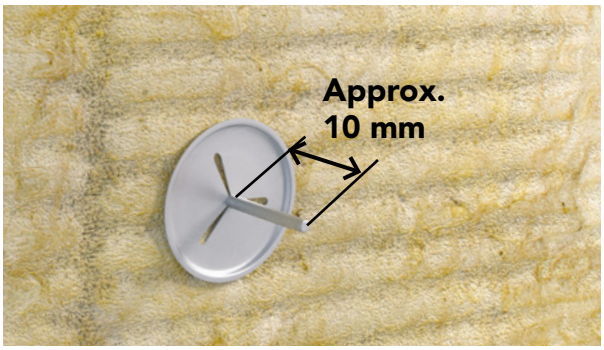
Pins

Different pins

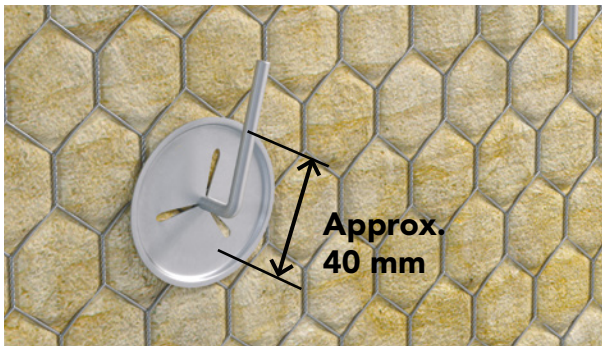
Steel pins are used for steel decks and bulkheads.

The steel pins are coated with copper for corrosion protection. Stainless steel pins with aluminium tip are used for aluminium constructions. The pins are normally 3 mm in diameter and are available in different lengths.

Securing the product



Securing the product
When installing the insulation, all pieces must fit firmly with at least one pin approx. 10 mm longer than the nominal thickness of the insulation. On A-constructions the material has to be fastened with spring washers without compressing the insulation.



Blast overpressure
For reinforcement of A- and H-class constructions to resist a blast overpressure, the insulation can be reinforced with steel mesh (galvanised or stainless). The mesh can be applied separately or factory applied on the insulation (wired mats). Optimum blast resistance is achieved by the use of pins approx. 40 mm longer than the nominal thickness of the insulation, washers should have a diameter of 38 mm, and the pins should be bent in different directions. The joints of the mesh should be fixed by twisting or stitched together with a steel wire (same quality as the mesh).

Washers

1. Washers

The spring washers used to slide over the pins for securing the insulation is recommended to be 30 to 38 mm in diameter and made of corrosion-protected materials. For A- and H-class divisions the washers (material and diameter) shall be in accordance with the approval.

2. Covering the steel washers

The washer can be fit with a plastic cap to cover the steel tip and to create an attractive surface.

Vapour barrier

In rooms where vapour will enter the insulation due to temperature or pressure differences, a vapour barrier is often needed. When water vapour moves from the hot room towards colder surfaces, it may condense in the wool or on the steel surface. The water increases the weight of insulation and may cause corrosion. In spaces where penetration of oil products is possible as spillage or vapour, the vapour barrier will work as protection.

There are several options to reduce water vapour ingress into the SeaRox® products, one of which is the surface of SeaRox® products, one of which is reinforced aluminium foil:

- All joints must be sealed with a tape width of 75-100 mm to ensure an airtight surface.
- Surfaces shall be dry and clean – free from dust, grease and oils before the tape is applied.
- Make sure all holes in the surface are closed.
- The surface material must have a low flame spread approval if it is used for marine applications.

Using aluminium tape to seal the joint between two slabs

All joints should be sealed with a tape with a width of 75-100 mm to ensure a tight surface. Ensure that the surfaces are dry and clean, free of any dust, oil or grease before the tape is applied. It is recommended to also to tape pins and washers to seal pin penetration points.

Storage and stacking

In order to secure the right conditions for storage of ROCKWOOL marine and offshore products, a specific set of conditions has been prepared. For example, products:

- Must at all times be stored indoors in a dry place in closed warehouse facilities.
- Must not be stacked in more than two layers when delivered on pallets.
- Must only be stored on the flat side when delivered in packages and must not be stacked at heights of more than 3 m.
- Must be protected from mechanical exposure; do not sit or step on the material.
- Must be transported in closed compartments, such as trailers, containers and other cargo holds, in order to avoid exposure to weather, condensation or other natural phenomena.

Storage of SeaRox insulation

The products must at all times be stored indoors in a dry place in closed warehouse facilities.

Stacking of SeaRox products

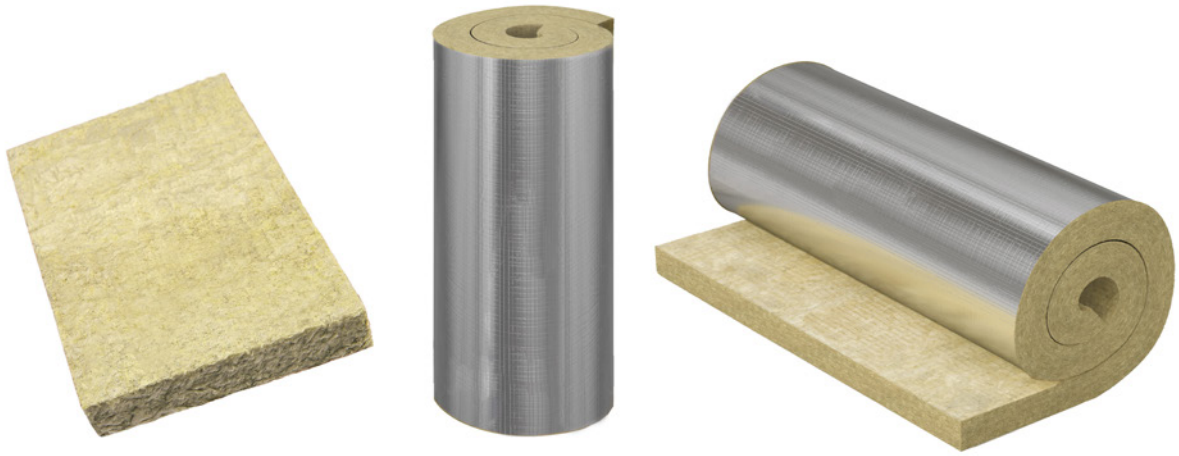
The products must not be stacked at heights of more than 3 m.

Do not sit on the SeaRox® material

The products must at all times during storage remain untouched and must not be affected by any kind of treading, sitting or any other similar kind of exposure.

Lightweight stone wool solutions

Economic and ecological demands in the shipbuilding and offshore industry are setting new standards for energy consumption and environmental impact.



SeaRox FB 6000 range

SeaRox FM 6000 range

SeaRox MA 7000 ALU

The commitment to a sustainable approach has become an increasingly prominent item on the agenda of shipowners, shipbuilders, naval architects and marine engineers. This includes safety, environmental protection, efficient operation and resource conservation.

Energy-efficiency measures also address the reduction of carbon emissions from international shipping; a key factor in ensuring international shipping contributes to efforts to mitigate climate change. Efforts to control energy consumption are likely to drive incremental efficiency improvement.

At ROCKWOOL Technical Insulation, we meet this challenge with a new range of high-performance lightweight stone wool solutions: the product ranges of SeaRox FB 6000 fire board, SeaRox FM 6000 fire mat for A-class fire rated divisions, and SeaRox MA 7000 for thermal insulation.

These new generation SeaRox products combine the solid product performance in fire, thermal and acoustic insulation of ROCKWOOL stone wool at an exceptionally low weight. Lower weight means lower fuel consumption and thus also lower carbon emissions.

Flexible properties

One of the characteristics of our new product range is the new look and feel compared to our traditional range of SeaRox fire protection products. They continue to be delivered in the practical dimensions of slabs and mats but due to the optimised production process and reduced density, the materials are softer and more flexible.

The SeaRox® FB 6000 and FM 6000 range

– multiple design possibilities

A complete range for improved workability and faster installation

Following the success of our lightweight SeaRox FB 6000 range, we have introduced the SeaRox FM 6000 series of lightweight fire mats. This novel combination opens up new design possibilities within A-class fire rated applications.

Lightweight for thermal insulation

To complete the range of lightweight offerings, we also offer a low weight product for thermal insulation of bulkhead and decks, SeaRox MA 7000.

The product is delivered as a highly compressed, compact roll. The product offers high thermal insulation combined with low weight.

Solutions certified by major classification bodies

Our new ROCKWOOL Technical Insulation lightweight solutions are MED-approved by DNV. The type approvals also include alternative installation designs to obtain the required fire rating.

Our latest certificates are published at
rti.rockwool.com

The complete range of lightweight stone wool products

The SeaRox FB 6000 range comprises exceptionally lightweight flexible stone wool fire boards. The SeaRox FM 6000 range consists of lightweight fire mats, specially designed to optimise the insulation speed of stiffeners in general and facilitate installation of deck constructions as one-layer solutions.

SeaRox MA 7000 is developed for thermal insulation combining low weight and high thermal performance. The SeaRox FM 6000 range and SeaRox MA 7000 are delivered with aluminium foil on one side as standard.

Today, the complete range of lightweight stone wool products consists of:

SeaRox FB 6000 series

- SeaRox FB 6020 (40 kg/m^3)
- SeaRox FB 6040 (60 kg/m^3)
- SeaRox FB 6050 (70 kg/m^3)

SeaRox FM 6000 series

- SeaRox FM 6020 (40 kg/m^3)
- SeaRox FM 6030 (50 kg/m^3)
- SeaRox FM 6040 (60 kg/m^3)
- SeaRox FM 6050 (70 kg/m^3)

SeaRox MA 7000

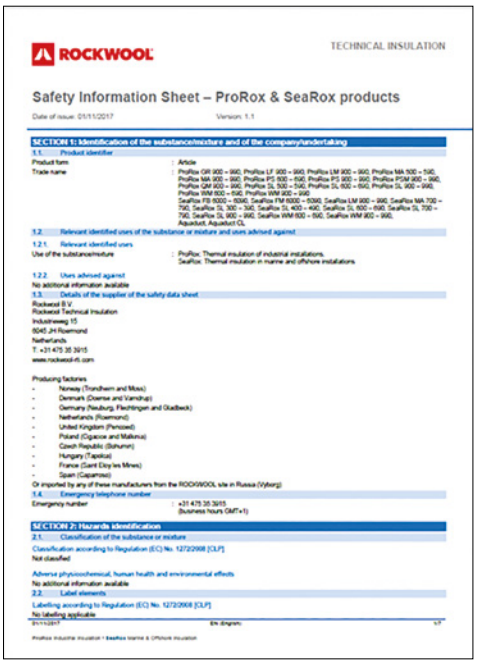
- SeaRox MA 7000 (26 kg/m^3)

Our commitment to health and safety

People come into contact with the insulation during installation, maintenance and scrapping of a vessel, but as the major part of the insulation is used in areas where people live and work, contact with the insulation is also inevitable during the normal use of the vessel. The possible health effects are important as there are major differences between materials.

SeaRox® and ProRox® products are safe

All stone wool fibers used in the ROCKWOOL SeaRox and ProRox products are safe to use. They are made of bio-soluble fibres complying with the Note Q criteria of the European Union regulations on classification, labelling and packaging of substances and mixtures (EC No 1272/2008 and No 790/2009) and so not classified as hazardous.


ROCKWOOL TECHNICAL INSULATION

Safety Information Sheet – ProRox & SeaRox products

Further reference is made to the Safety Information Sheet for the SeaRox® and ProRox® stone wool based products, and EUCEB.org

What is bio-persistence or bio-solubility?

Bio-persistence, or its opposite, bio-solubility, is one of the major parameters that determine the potential health effects of a fibre. It was recognised as such by IARC (International Agency for Research on Cancer under WHO) as early as 1988.

Wide differences in the bio-persistence of man-made mineral fibres have been demonstrated both in vivo and in vitro, depending on the chemical composition. The most durable man-made mineral fibres are also likely to be more hazardous to humans than relatively soluble fibres. ROCKWOOL stone wools under the SeaRox and ProRox brands dissolve more readily in physiological fluids in the lung than most other man-made vitreous fibres and thus do not persist in the lung. They have a low bio-persistence and thereby pose low/no risk of health effects.

The environment

ROCKWOOL SeaRox and ProRox are free of asbestos, heavy metals, bio persistent flame retardants etc., as documented in the green passports issued by ROCKWOOL Green Passport (Hong Kong International Convention).

Green Passports were introduced with IMO Res A.980 (24).

The Green Passport is a single document for each vessel listing all the potentially hazardous materials onboard as stated in the Inventory of Hazardous Materials Resolution MEPC.269(68).

This document stays with the ship throughout its life until it is decommissioned and sent to the ship demolition yard.

None of the ROCKWOOL Technical Insulation stone wool products for the marine and offshore market produced at any ROCKWOOL production plant will be classified as hazardous or potentially hazardous material under the abovementioned IMO resolution (MEPC.269(68) Tables A, B and C and EU regulation No. 1257/2013 of the European Parliament and Council.

3

Insulation for fire protection

A-class fire rated steel divisions

ROCKWOOL Technical Insulation provides a range of alternative solutions for A-class fire-rated divisions. This section offers an overview of the most common solutions available.

Optimised standard solutions

For many years, our customers have chosen our standard solutions based on SeaRox SL 620 slab. Having a thin slab with the best fire safety contributes to a safe environment for the people onboard ships and platforms.

Thickness and simplicity can be important parameters for insulation selection, when it can be done without compromising performance. With that in mind, we offer a superior set of standard solutions with thin insulation thicknesses, high acoustic performance and the highest fire safety according to IMO 2010 FTP Code.

Lightweight fire-safe solutions

The demand for SeaRox lightweight solutions for A-class fire insulation is increasing due to today's focus on energy efficiency, operationg cost and CO^2 emission. As a consequence, we have developed our range of A-class solutions with low weight, high acoustic and thermal properties and the highest fire-safety, combined with greater flexibility to accelarate and simplify installation for virtually every application and situation.

- **Safe and easy:** Reduced number of products and thicknesses minimises the risk of mistakes and eases maintenance and logistics
- **Flexible**: Freedom to select installation method and product type (board or mat)
- **Fit for purpose:** Our solutions are tailored for fast installation, thickness- or weight optimisation

Below you will find an overview of how the ROCKWOOL assortment of lightweight A-class constructions can be optimised to fit your needs.

In some cases, thickness can be a constraint. Especially in relation to stiffeners, cable trays to avoid collisions with pipes etc. In other situations, minimising the weight to optimise the energy efficiency and reduce CO^2 emissions might be most critical.

With our range of ligtweight offerings, you have the flexibility to combine products and optimise the actual product choice to minimise weight, thickness or number of products needed for the constructions – from 5 to only 1 material.

Our lightweight product range is supplied from our premium factory in Denmark, Europe.

Standard solutions

Construction		Plate			Stiffener		
		Product	Density (kg/m³)	Thickness (mm)	Product	Density (kg/m³)	Thickness (mm)
A-15	Bulkhead	SeaRox SL 620	100	50			
A-15	Deck	SeaRox SL 620	100	50			
A-30	Bulkhead	SeaRox SL 620	100	40	SeaRox SL 620	100	25
A-30	Deck	SeaRox SL 620	100	25	SeaRox SL 620	100	25
A-60	Bulkhead	SeaRox SL 620	100	60	SeaRox SL 620	100	25
A-60	Deck	SeaRox SL 620	100	40	SeaRox SL 620	100	25

Lightweight solutions

Construction		Plate			Stiffener		
		Product	Density (kg/m³)	Thickness (mm)	Product	Density (kg/m³)	Thickness (mm)
Option 1: Lowest thickness (5 products)							
A-15	Bulkhead	SeaRox FB or FM 6040	60	35			
A-15	Deck	SeaRox FB or FM 6040	60	35			
A-30	Bulkhead	SeaRox FB or FM 6040	60	50	SeaRox FB or FM 6050	70	30
A-30	Deck	SeaRox FM 6030	50	30	SeaRox FM 6030	50	30
A-60	Bulkhead	SeaRox FB or FM 6040	60	70	SeaRox FB or FM 6050	70	30
A-60	Deck	SeaRox FM 6040	60	50	SeaRox FB or FM 6050	70	30
					Alternative solution for stiffener SeaRox FB or FM 6040, 60 kg/m³ in 35mm		
Option 2: Lowest weight (4 products)							
A-15	Bulkhead	SeaRox FB or FM 6040	60	35			
A-15	Deck	SeaRox FB or FM 6040	60	35			
A-30	Bulkhead	SeaRox FB or FM 6020	40	70	SeaRox FB or FM 6040	60	35
A-30	Deck	SeaRox FM 6030	50	30	SeaRox FM 6030	50	30
A-60	Bulkhead	SeaRox FB or FM 6040	60	70	SeaRox FB or FM 6040	60	35
A-60	Deck	SeaRox FB or FM 6020	40	70	SeaRox FB or FM 6040	60	35
					Alternative solution for stiffener SeaRox FB or FM 6050, 70 kg/m³ in 30mm		
Option 3: Simple logistic – less waste (3 products)							
A-15	Bulkhead	SeaRox FB or FM 6040	60	35			
A-15	Deck	SeaRox FB or FM 6040	60	35			
A-30	Bulkhead	SeaRox FB or FM 6020 [1)]	40	70	SeaRox FB or FM 6040	60	35
A-30	Deck	SeaRox FB or FM 6040	60	35	SeaRox FB or FM 6040	60	35
A-60	Bulkhead	SeaRox FB or FM 6040	60	70	SeaRox FB or FM 6040	60	35
A-60	Deck	SeaRox FB or FM 6020 [1)]	40	70	SeaRox FB or FM 6040	60	35
		1) alternative SeaRox FM 6040, 60 kg/m³ in 50mm			Alternative solution for stiffener SeaRox FB or FM 6050, 70 kg/m³ in 30mm		
Option 4: Optimised logistic (2 products)							
A-15	Bulkhead	SeaRox FB or FM 6040	60	35			
A-15	Deck	SeaRox FB or FM 6040	60	35			
A-30	Bulkhead	SeaRox FB or FM 6040	60	70	SeaRox FB or FM 6040	60	35
A-30	Deck	SeaRox FB or FM 6040	60	35	SeaRox FB or FM 6040	60	35
A-60	Bulkhead	SeaRox FB or FM 6040	60	70	SeaRox FB or FM 6040	60	35
A-60	Deck	SeaRox FB or FM 6040	60	70	SeaRox FB or FM 6040	60	35
					Alternative solution for stiffener SeaRox FB or FM 6050, 70 kg/m³ in 30mm		
Option 5: Best logistic (1 product)							
A-15	Bulkhead	SeaRox FB or FM 6040	60	35			
A-15	Deck	SeaRox FB or FM 6040	60	35			
A-30	Bulkhead	SeaRox FB or FM 6040	60	2x35	SeaRox FB or FM 6040	60	35
A-30	Deck	SeaRox FB or FM 6040	60	35	SeaRox FB or FM 6040	60	35
A-60	Bulkhead	SeaRox FB or FM 6040	60	2x35	SeaRox FB or FM 6040	60	35
A-60	Deck	SeaRox FB or FM 6040	60	2x35	SeaRox FB or FM 6040	60	35

The described solutions are related to our MED certificates. For alternative options from specific classification societies, please check the individual certificates on our website.

Symbol guide for A-class constructions

The unique strengths and versatile properties of ROCKWOOL stone are integral to each of our products, closely aligning with the specific features and benefits of our SeaRox® product range.

By using clear symbols for all fire-rated constructions, we effectively communicate the advantages of each solution.

Fire safe solution

Our product solutions are tested according to IMO 2010 FTP Code to ensure highest fire safety.

Optimal sound properties

The acoustic capabilities of our products secure excellent noise reduction and better comfort.

Low weight solution

Our SeaRox FB & FM 6000 lightweight range will help to reduce energy consumption and emissions.

Fast installation

Our products are easy to handle and therefore fast to install, cutting labour time and reducing the total cost of installation.

Lowest water absorption

Our products feature excellent water repellent characteristics to lower the risk of water penetration. All SeaRox products have very low water absorption as standard in order to maintain optimal insulation performance.

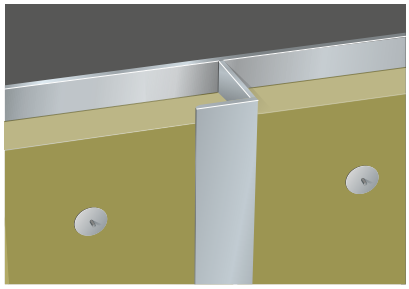
Thin stone wool solution

Our assortment contains thin products enabling you to maximise the available space.

A-constructions Steel Bulkhead

		Plate	Stiffener
LIGHTWEIGHT	A-15	SeaRox FB or FM 6040	
	A-30	SeaRox FB 6020	SeaRox FB 6050
	A-30	SeaRox FB or FM 6020	SeaRox FM 6040 or FM 6050
	A-30 **New**	SeaRox FB or FM 6040	SeaRox FM 6040 or FM 6050
	A-60	SeaRox FB 6040	SeaRox FB 6050
	A-60	SeaRox FB or FM 6040	SeaRox FM 6040 or FM 6050
	A-60 restricted	SeaRox FB 6020	SeaRox SeaRox FB 6050
	A-60 restricted	SeaRox FB or FM 6020	SeaRox FM 6040 or FM 6050
STANDARD	A-15	SeaRox SL 620	
	A-30	SeaRox SL 620	SeaRox SL 620
	A-60	SeaRox SL 620	SeaRox SL 620
	A-60 restricted	SeaRox SL 620	SeaRox SL 620
	A-60 corrugated - 2 mm	SeaRox SL 620	
	A-60 corrugated - 4 mm	SeaRox SL 620	
NON-STANDARD	A-60	SeaRox WM 620	SeaRox WM 620
	A-60	SeaRox WM 640	SeaRox WM 640
	A-60	SeaRox SL 640	SeaRox SL 640
	A-60 restricted	SeaRox SL 640	SeaRox SL 640

A-15 Steel Bulkhead



	Product	Thickness	Density	Weight
Plate	SeaRox FB 6040*	35 mm	60 kg/m^3	2.1 kg/m^2
Stiffener	No insulation			

*alternative product SeaRox FM 6040

Advantages

Construction notes

- Plate between stiffeners insulated with one layer of 35 mm SeaRox FB or FM 6040.
- No insulation on stiffeners.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with Ø 30-38 mm spring washers.

Application notes

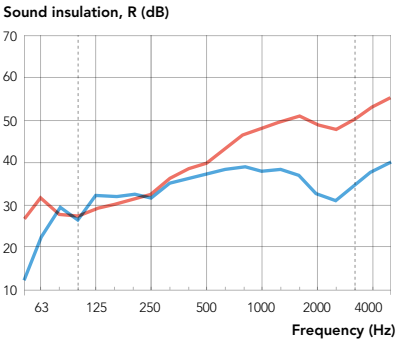
- The pins should exceed the insulation by approx. 10 mm.
- Alternative pin design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	26.6
63	31.2
80	27.9
100	27.5
125	29.1
160	29.9
200	31.4
250	33.0
315	36.1
400	38.5
500	39.8
630	43.1
800	46.4
1000	47.9
1250	50.0
1600	51.1
2000	48.7
2500	47.4
3150	50.6
4000	53.4
5000	55.1

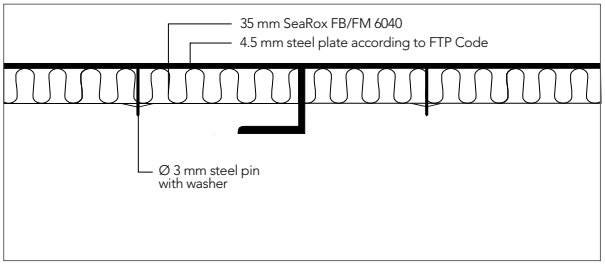


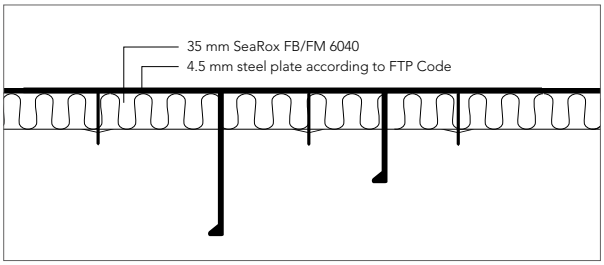
— Test set-up:
Plate: SeaRox FB 6040, 35 mm

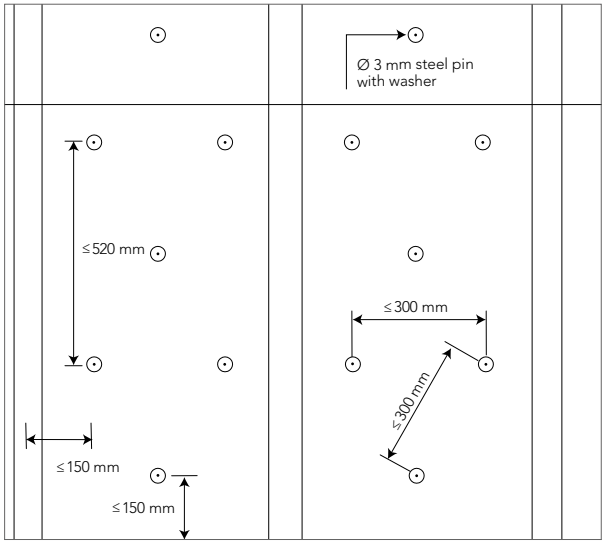
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

$R_w(C;C_{tr})$ = 45 (-2; -6) dB

Construction details







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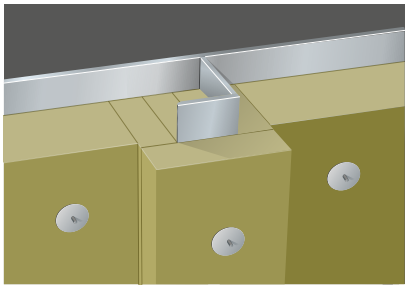
A-30 Steel Bulkhead



	Product	Thickness	Density	Weight
Plate	SeaRox FB 6020	70 mm	40 kg/m^3	2.8 kg/m^2
Stiffener	SeaRox FB 6050	30 mm	70 kg/m^3	2.1 kg/m^2

Advantages

Construction notes

- Stiffeners insulated with min. 30 mm SeaRox FB 6050.
- Steel plate between stiffeners insulated with min. 70 mm SeaRox FB 6020.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with Ø 30-38 mm spring washers.

Application notes

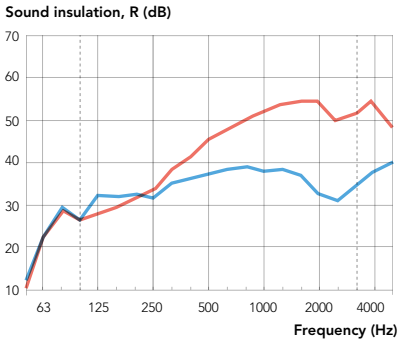
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Insulation can be placed on both sides of the steel plate.
- Alternative pin and stiffener design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	10.5
63	22.1
80	28.4
100	26.4
125	27.8
160	29.2
200	31.5
250	33.8
315	38.2
400	41.2
500	45.7
630	47.7
800	50.2
1000	52.3
1250	53.8
1600	54.7
2000	54.4
2500	49.8
3150	51.5
4000	54.4
5000	48.3



— Test set-up:
Plate: SeaRox FB 6020, 70 mm
Stiffener: SeaRox FB 6050, 30 mm

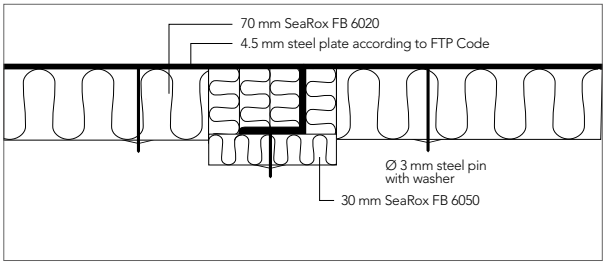
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

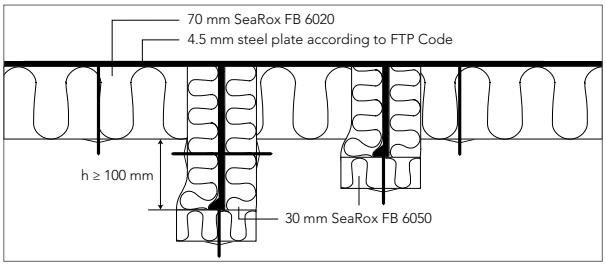
$R_w(C;C_{tr})$ = 46 (-2; -6) dB

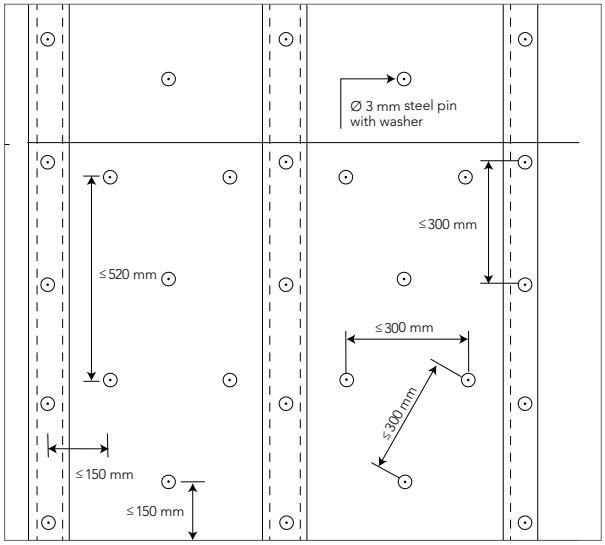
Sound absorption

Weighted sound absorption:
SeaRox FB 6020, 70 mm, α_w = 0.95

Construction details







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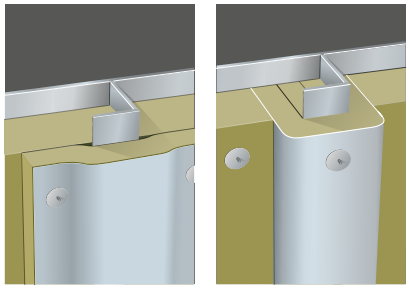
A-30 Steel Bulkhead



	Product	Thickness	Density	Weight
Plate	SeaRox FB 6020*	70 mm	40 kg/m^3	2.8 kg/m^2
Stiffener (alt. 1)	SeaRox FM 6050	30 mm	70 kg/m^3	2.1 kg/m^2
Stiffener (alt. 2)	SeaRox FM 6040	35 mm	60 kg/m^3	2.1 kg/m^2

*alternative product SeaRox FM 6020

Advantages

Construction notes

- Stiffeners insulated with min. 30 mm SeaRox FM 6050 or min. 35 mm SeaRox FM 6040.
- Steel plate between stiffeners insulated with min. 70 mm SeaRox FB or FM 6020.

or

- Steel plate between stiffeners insulated with min. 70 mm SeaRox FB or FM 6020.
- Stiffener insulated min. 150 mm on either side with min. 30 mm SeaRox FM 6050 or min. 35mm SeaRox FM 6040.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with washers of min. Ø 30-38 mm.

Application notes

- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Alternative pin and stiffener design acc. to drawings.

Optional surface

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	10.5
63	22.1
80	28.4
100	26.4
125	27.8
160	29.2
200	31.5
250	33.8
315	38.2
400	41.2
500	45.7
630	47.7
800	50.2
1000	52.3
1250	53.8
1600	54.7
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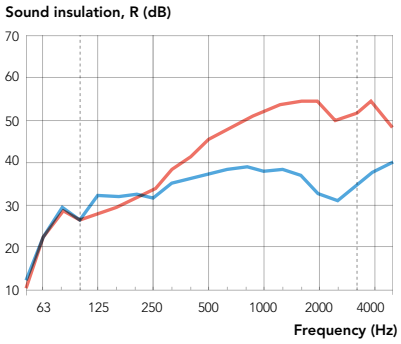
2500	49.8
3150	51.5
4000	54.4
5000	48.3



— Test set-up:
Plate: SeaRox FB 6020, 70 mm
Stiffener: SeaRox FB 6050, 30 mm

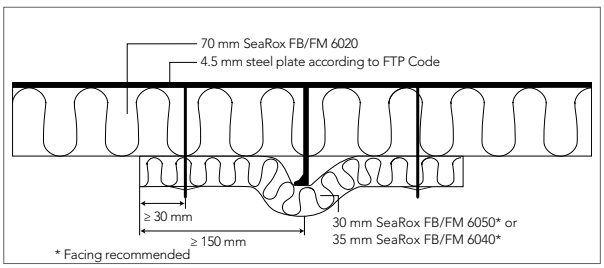
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

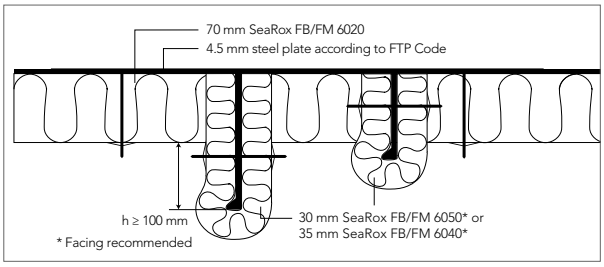
$R_w(C;C_{tr})$ = 46 (-2; -6) dB

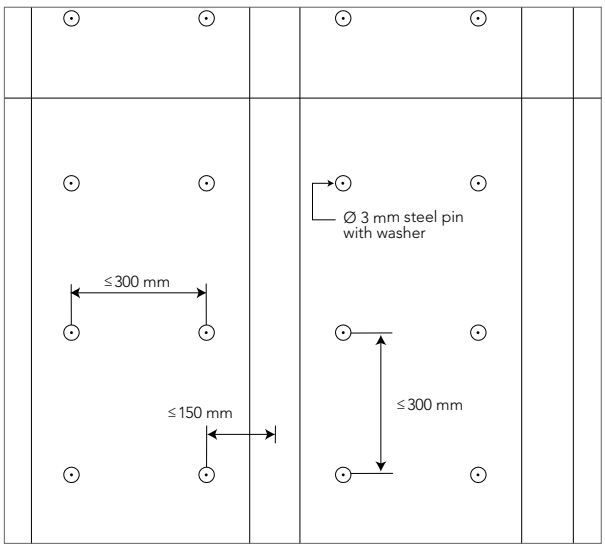
Sound absorption

Weighted sound absorption:
SeaRox FB 6020, 70 mm, α_w = 0.95

Construction details







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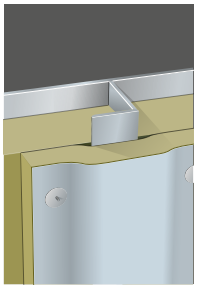
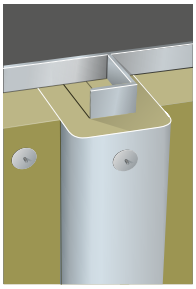
A-30 Steel Bulkhead





	Product	Thickness	Density	Weight
Plate	SeaRox FB 6040*	50 mm	60 kg/m^3	3.0 kg/m^2
Stiffener (alt. 1)	SeaRox FM 6050	30 mm	70 kg/m^3	2.1 kg/m^2
Stiffener (alt. 2)	SeaRox FM 6040	35 mm	60 kg/m^3	2.1 kg/m^2

*alternative product SeaRox FM 6040

Advantages

Construction notes

- Stiffeners insulated with min. 30 mm SeaRox FM 6050 or min. 35 mm SeaRox FM 6040.
- Steel plate between stiffeners insulated with min. 50 mm SeaRox FB or FM 6040.

or

- Steel plate between stiffeners insulated with min. 150 mm on either side with min. 30 mm SeaRox FM 6050 or min. 35 mm SeaRox FM 6040.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with washers of min. Ø 30-38 mm.

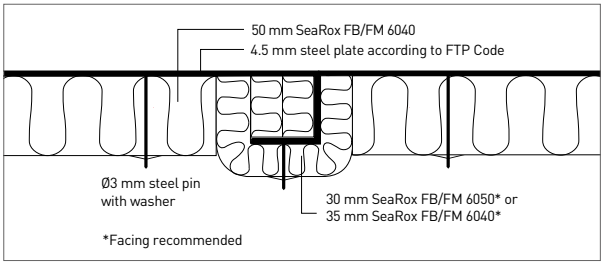
Application notes

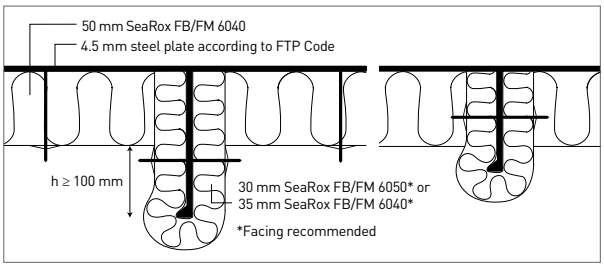
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Alternative pin and stiffener design acc. to drawings.

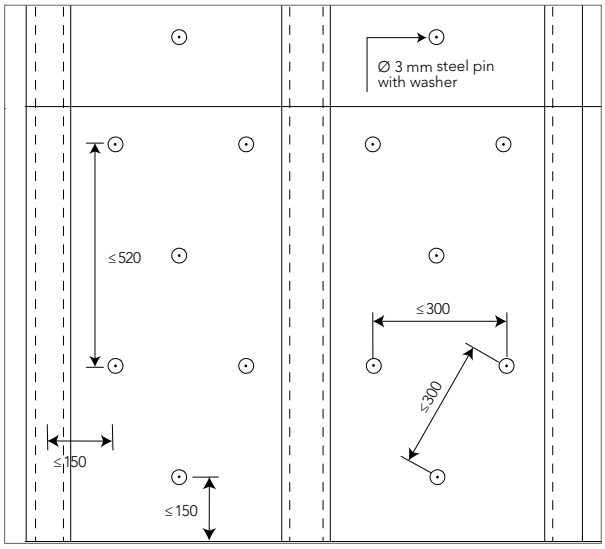
Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Construction details







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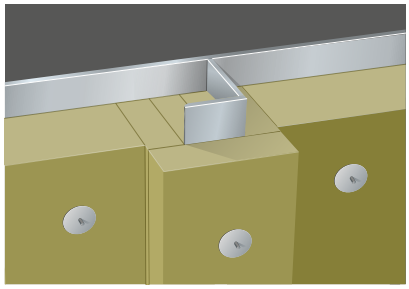
A-60 Steel Bulkhead



	Product	Thickness	Density	Weight
Plate	SeaRox FB 6040	70 mm	60 kg/m^3	4.2 kg/m^2
Stiffener	SeaRox FB 6050	30 mm	70 kg/m^3	2.1 kg/m^2

Advantages

Construction notes

- Stiffeners insulated with min. 30 mm SeaRox FB 6050.
- Steel plate between stiffeners insulated with min. 70 mm SeaRox FB 6040.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with Ø 30-38 mm spring washers.

Application notes

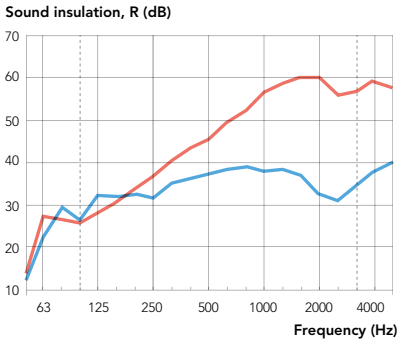
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Insulation can be placed on both sides of the steel plate.
- Alternative pin and stiffener design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	13.4
63	27.2
80	26.6
100	26.0
125	28.2
160	31.2
200	33.8
250	37.2
315	40.4
400	43.3
500	45.8
630	49.8
800	52.6
1000	56.6
1250	59.0
1600	59.9
2000	60.1
2500	55.9
3150	57.0
4000	59.7
5000	58.1



— Test set-up:
Plate: SeaRox FB 6040, 70 mm
Stiffener: SeaRox FB 6050, 30 mm

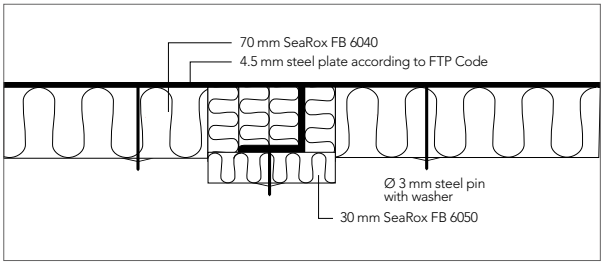
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

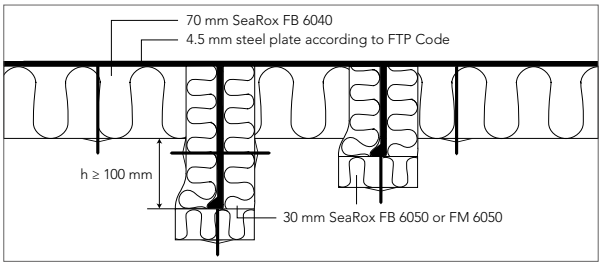
$R_w(C;C_{tr})$ = 48 (-2; -7) dB

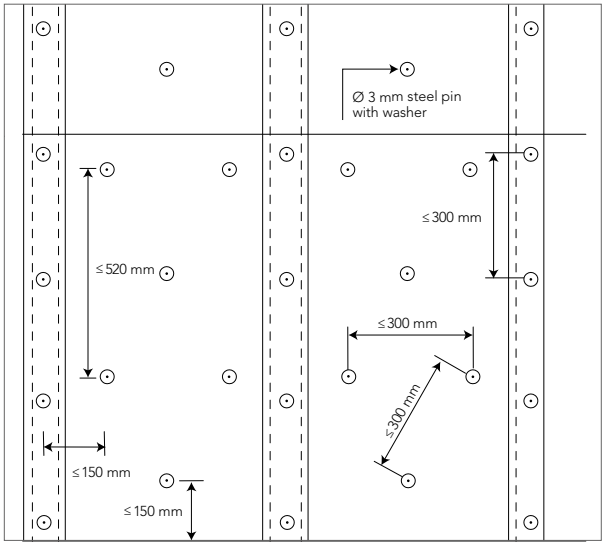
Sound absorption

Weighted sound absorption:
SeaRox FB 6040, 70 mm, α_w = 0.95

Construction details







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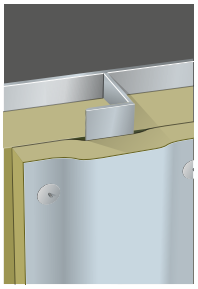
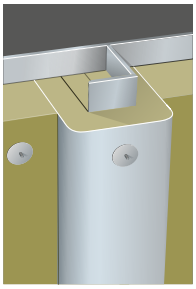
A-60 Steel Bulkhead





	Product	Thickness	Density	Weight
Plate	SeaRox FB 6040*	70 mm	60 kg/m^3	4.2 kg/m^2
Stiffener (alt. 1)	SeaRox FM 6050	30 mm	70 kg/m^3	2.1 kg/m^2
Stiffener (alt. 2)	SeaRox FM 6040	35 mm	60 kg/m^3	2.1 kg/m^2

*alternative product FM 6040

Advantages

Construction notes

- Stiffeners insulated with min. 30 mm SeaRox FM 6050 or min. 35 mm SeaRox FM 6040.
- Steel plate between stiffeners insulated with min. 70 mm SeaRox FB 6040 or FM 6040

or

- Steel plate between stiffeners insulated with min. 70 mm SeaRox FB or FM 6040.
- Stiffener insulated min. 150 mm on either side with min. 30 mm SeaRox FM 6050 or min. 35 mm SeaRox FM 6040.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with washers of min. Ø 30-38 mm.

Application notes

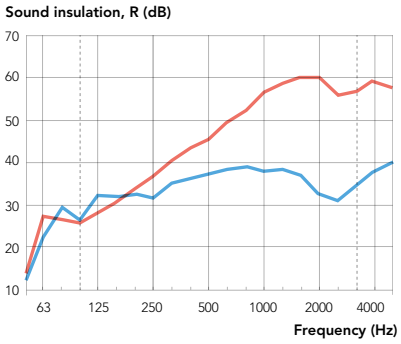
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Alternative pin and stiffener design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	13.4
63	27.2
80	26.6
100	26.0
125	28.2
160	31.2
200	33.8
250	37.2
315	40.4
400	43.3
500	45.8
630	49.8
800	52.6
1000	56.6
1250	59.0
1600	59.9
2000	60.1
2500	55.9
3150	57.0
4000	59.7
5000	58.1



— Test set-up:
Plate: SeaRox FB 6040, 70 mm
Stiffener: SeaRox FM 6050, 30 mm

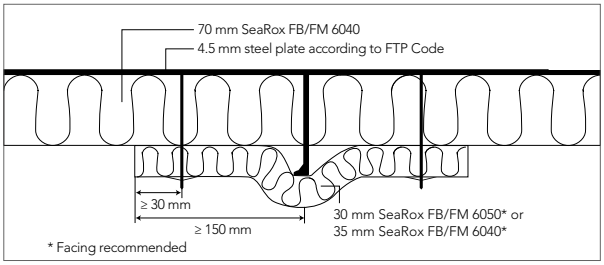
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

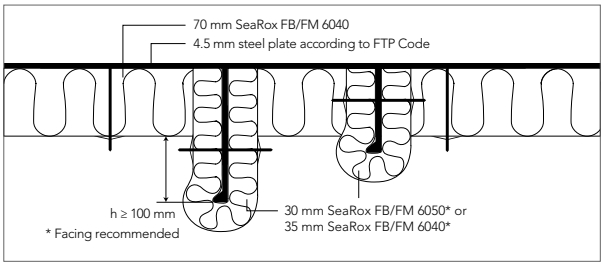
$R_w(C;C_{tr})$ = 48 (-2; -7) dB

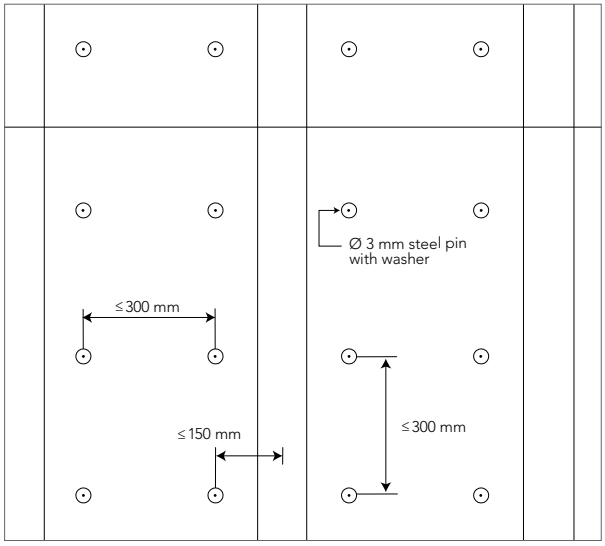
Sound absorption

Weighted sound absorption:
SeaRox FB 6040, 70 mm, α_w = 0.95

Construction details







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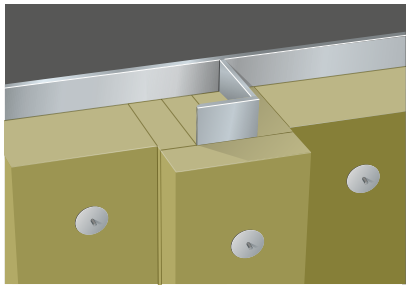
A-60 Steel Bulkhead, restricted



	Product	Thickness	Density	Weight
Plate	SeaRox FB 6020	70 mm	40 kg/m^3	2.8 kg/m^2
Stiffener	SeaRox FB 6050	30 mm	70 kg/m^3	2.1 kg/m^2

Advantages

Construction notes

- Stiffeners insulated with min. 30 mm SeaRox FB 6050.
- Steel plate between stiffeners insulated with min. 70 mm SeaRox FB 6020.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with Ø 30-38 mm spring washers.

Application notes

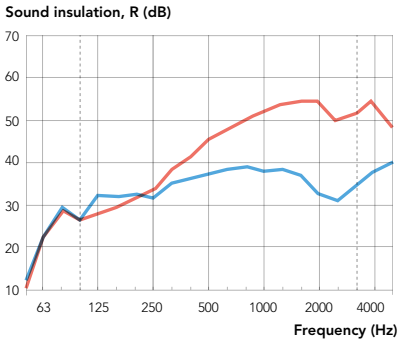
- Restricted application (fire against insulated side).
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Alternative pin and stiffener design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	10.5
63	22.1
80	28.4
100	26.4
125	27.8
160	29.2
200	31.5
250	33.8
315	38.2
400	41.2
500	45.7
630	47.7
800	50.2
1000	52.3
1250	53.8
1600	54.7
2000	54.4
2500	49.8
3150	51.5
4000	54.4
5000	48.3



— Test set-up:
Plate: SeaRox FB 6020, 70 mm
Stiffener: SeaRox FB 6050, 30 mm

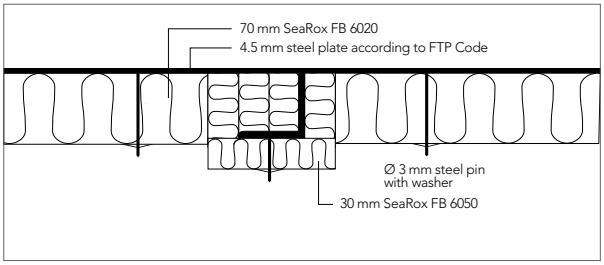
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

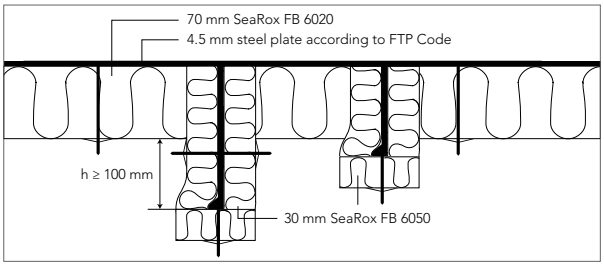
$R_w(C;C_{tr})$ = 46 (-2; -6) dB

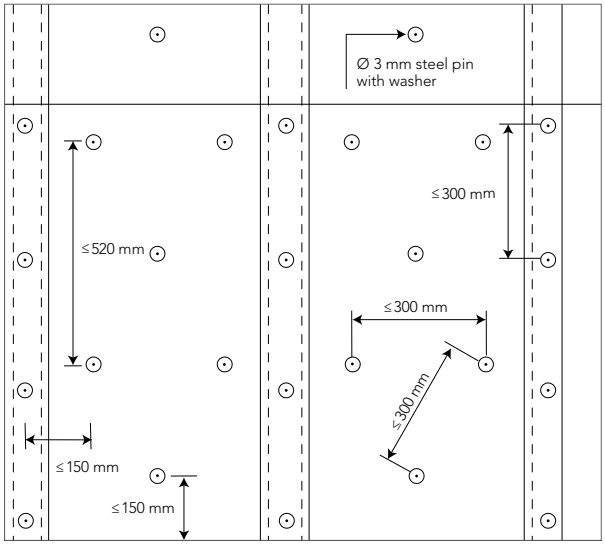
Sound absorption

Weighted sound absorption:
SeaRox FB 6020, 70 mm, α_w = 0.95

Construction details







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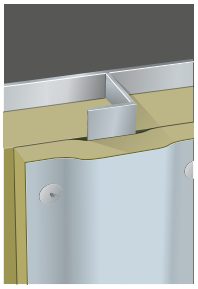
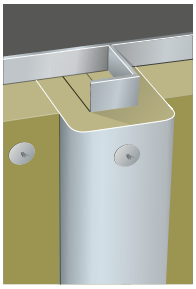
A-60 Steel Bulkhead, restricted





	Product	Thickness	Density	Weight
Plate	SeaRox FB 6020*	70 mm	40 kg/m^3	2.8 kg/m^2
Stiffener (alt. 1)	SeaRox FM 6050	30 mm	70 kg/m^3	2.1 kg/m^2
Stiffener (alt. 2)	SeaRox FM 6040	35 mm	60 kg/m^3	2.1 kg/m^2

*alternative product SeaRox FM 6020

Advantages

Construction notes

- Stiffeners insulated with min. 30 mm SeaRox FM 6050 or min. 35 mm SeaRox FM 6040.
- Steel plate between stiffeners insulated with min. 70 mm SeaRox FB 6020.

or

- Steel plate between stiffeners insulated with min. 70 mm SeaRox FB 6020.
- Stiffener insulated min. 150 mm on either side with min. 30 mm SeaRox FM 6050 or min. 35 mm SeaRox FM 6040.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with washers of min. Ø 30-38 mm.

Application notes

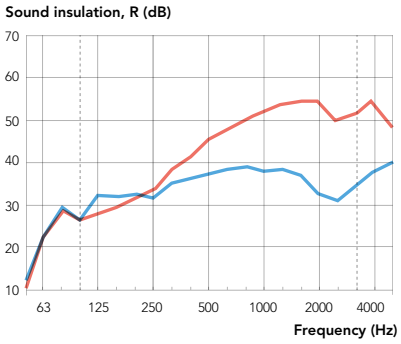
- Restricted application (fire against insulated side).
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Alternative pin and stiffener design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	10.5
63	22.1
80	28.4
100	26.4
125	27.8
160	29.2
200	31.5
250	33.8
315	38.2
400	41.2
500	45.7
630	47.7
800	50.2
1000	52.3
1250	53.8
1600	54.7
2000	54.4
2500	49.8
3150	51.5
4000	54.4
5000	48.3



— Test set-up:
Plate: SeaRox FB 6020, 70 mm
Stiffener: SeaRox FB 6050, 30 mm

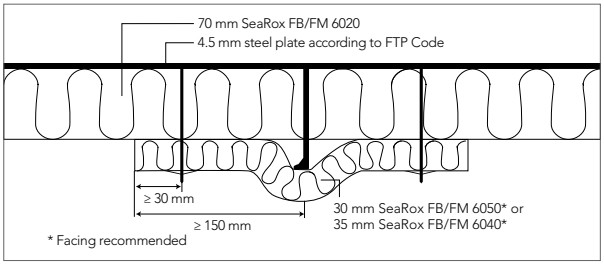
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

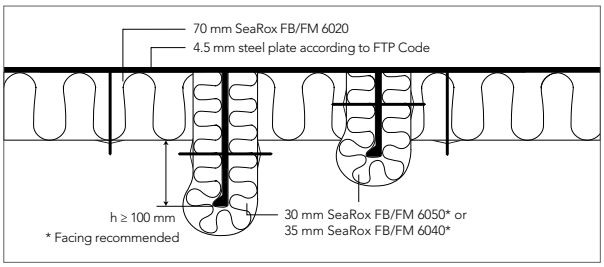
$R_w(C;C_{tr})$ = 46 (-2; -6) dB

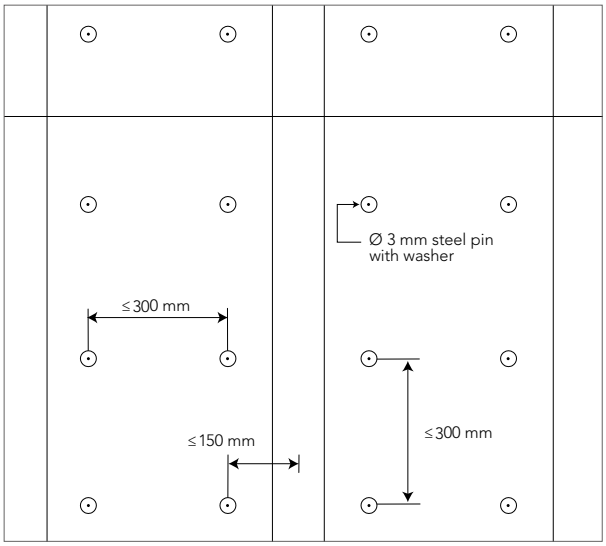
Sound absorption

Weighted sound absorption:
SeaRox FB 6020, 70 mm, α_w = 0.95

Construction details







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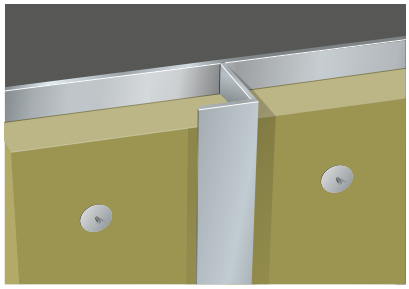
A-15 Steel Bulkhead



	Product	Thickness	Density	Weight
Plate	SeaRox SL 620	50 mm	100 kg/m^3	5.0 kg/m^2
Stiffener	No insulation			

Advantages

Construction notes

- Steel plate between stiffeners insulated with one layer min. 50 mm SeaRox SL 620.
- No insulation around stiffeners.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with Ø 30-38 mm spring washers.

Application notes

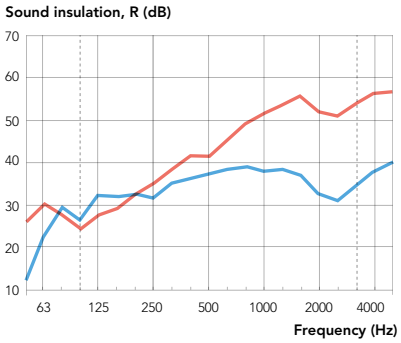
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Insulation can be placed on either side of the steel plate.
- Alternative pin design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	25.9
63	30.2
80	27.6
100	24.4
125	27.6
160	29.1
200	32.6
250	35.1
315	38.4
400	41.6
500	41.4
630	45.1
800	49.1
1000	51.4
1250	53.6
1600	55.7
2000	51.9
2500	50.9
3150	53.7
4000	56.3
5000	56.7



— Test set-up:
Plate: SeaRox SL 620, 50 mm

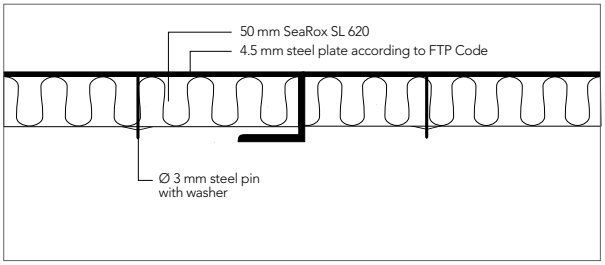
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

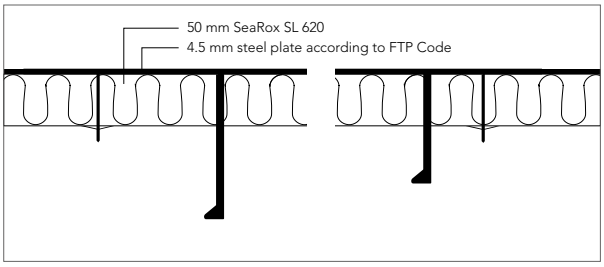
$R_w(C;C_{tr})$ = 46 (-2; -7) dB

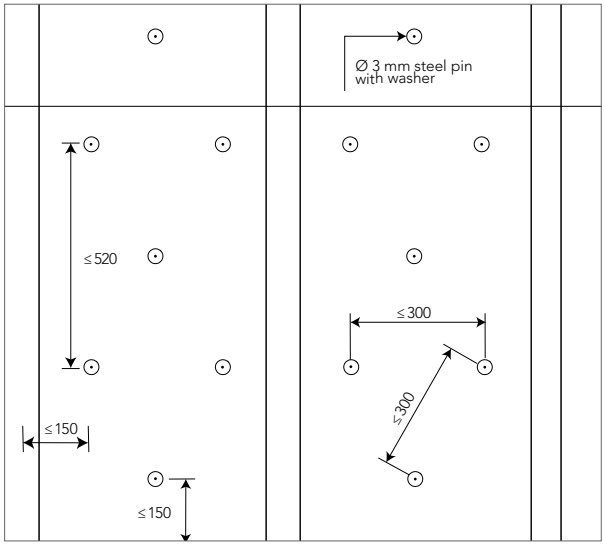
Sound absorption

Weighted sound absorption:
SeaRox SL 620, 50 mm, α_w = 0.85

Construction details







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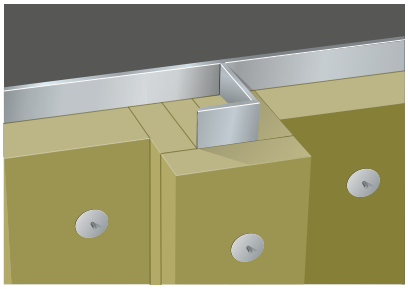
A-30 Steel Bulkhead



	Product	Thickness	Density	Weight
Plate	SeaRox SL 620	40 mm	100 kg/m^3	4.0 kg/m^2
Stiffener	SeaRox SL 620	25 mm	100 kg/m^3	2.5 kg/m^2

Advantages

Construction notes

- Stiffeners insulated with min. 25 mm SeaRox SL 620.
- Plate between stiffeners insulated with min. 40 mm SeaRox SL 620.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with Ø 30-38 mm spring washers.

Application notes

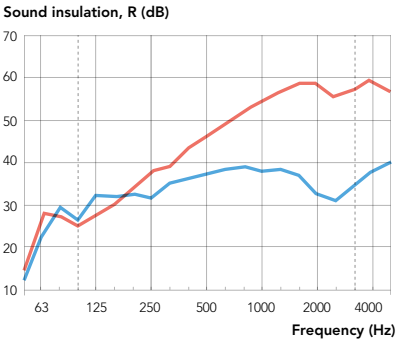
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Insulation can be placed on either side of the steel plate.
- Alternative pin and stiffener design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	14.5
63	27.7
80	27.2
100	25.5
125	27.7
160	30.0
200	34.2
250	38.0
315	39.2
400	43.1
500	46.1
630	48.8
800	51.9
1000	54.3
1250	56.4
1600	58.3
2000	58.5
2500	55.6
3150	56.8
4000	59.0
5000	57.1



— Test set-up:
Plate: SeaRox SL 620, 40 mm
Stiffener: SeaRox SL 620, 25 mm

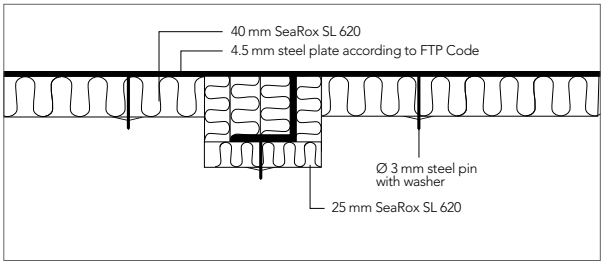
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

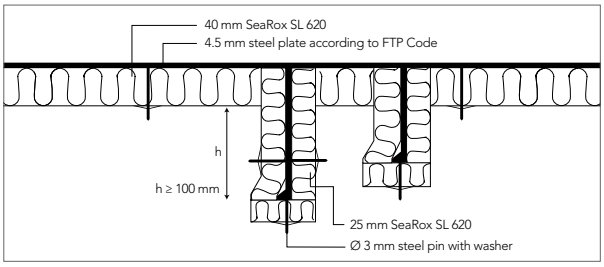
$R_w(C;C_{tr})$ = 48 (-2; -7) dB

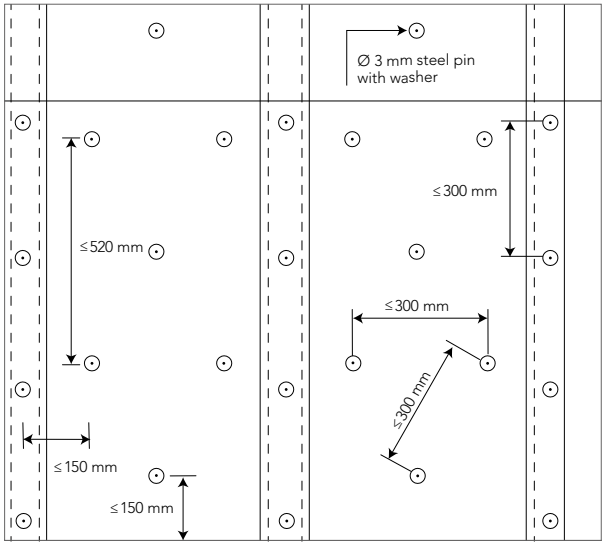
Sound absorption

Weighted sound absorption:
SeaRox SL 620, 40 mm, α_w = 0.80

Construction details







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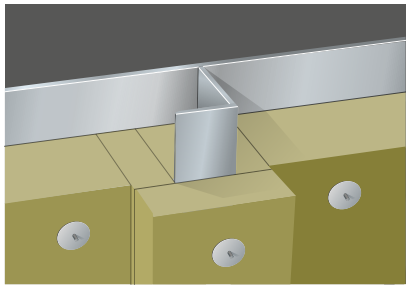
A-60 Steel Bulkhead



	Product	Thickness	Density	Weight
Plate	SeaRox SL 620	60 mm	100 kg/m^3	6.0 kg/m^2
Stiffener	SeaRox SL 620	25 mm	100 kg/m^3	2.5 kg/m^2

Advantages

Construction notes

- Stiffeners insulated with min. 25 mm SeaRox SL 620.
- Plate between stiffeners insulated with min. 60 mm SeaRox SL 620.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with Ø 30-38 mm spring washers.

Application notes

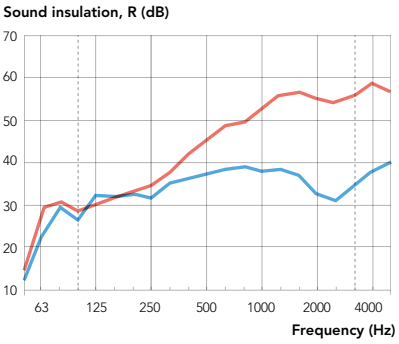
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Insulation can be placed on either side of the steel plate.
- Alternative pin and stiffener design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	14.3
63	29.1
80	30.8
100	28.2
125	30.4
160	31.4
200	33.0
250	34.7
315	38.3
400	42.3
500	45.0
630	48.9
800	49.7
1000	52.7
1250	56.3
1600	57.1
2000	55.3
2500	54.3
3150	55.3
4000	59.0
5000	57.2



— Test set-up:
Plate: SeaRox SL 620, 60 mm
Stiffener: SeaRox SL 620, 25 mm

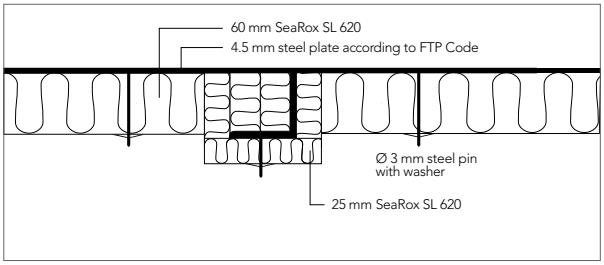
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

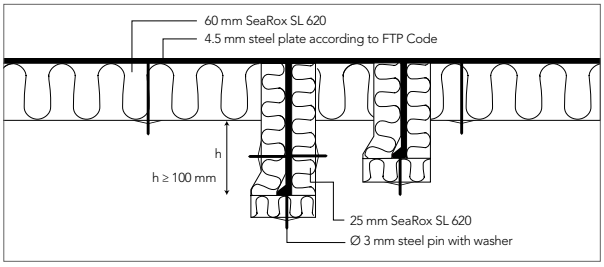
$R_w(C;C_{tr})$ = 48 (-2; -7) dB

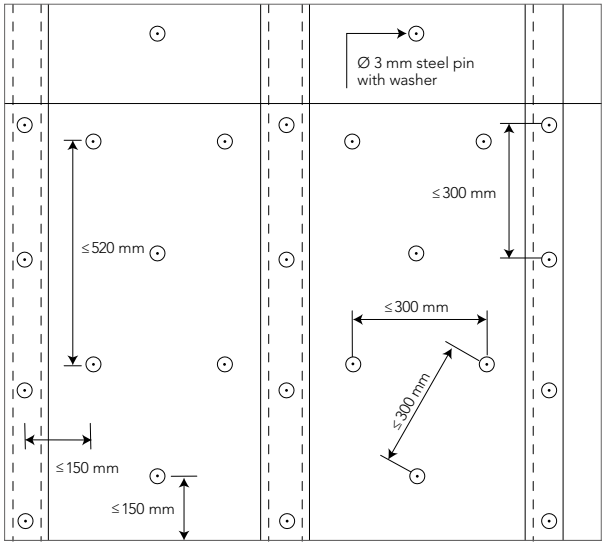
Sound absorption

Weighted sound absorption:
SeaRox SL 620, 60 mm, α_w = 0.90

Construction details







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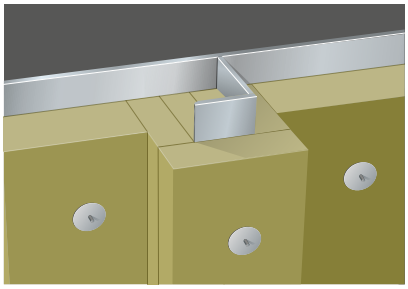
A-60 Steel Bulkhead, restricted



	Product	Thickness	Density	Weight
Plate	SeaRox SL 620	40 mm	100 kg/m^3	4.0 kg/m^2
Stiffener	SeaRox SL 620	25 mm	100 kg/m^3	2.5 kg/m^2

Advantages

Construction notes

- Stiffeners insulated with min. 25 mm SeaRox SL 620.
- Plate between stiffeners insulated with min. 40 mm SeaRox SL 620.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with Ø 30-38 mm spring washers.

Application notes

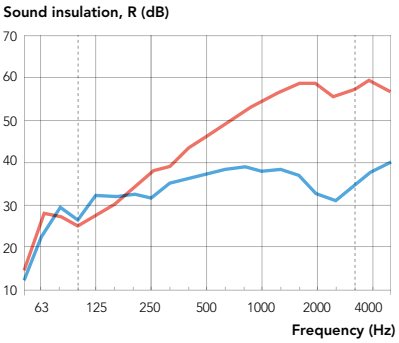
- Restricted application (fire against insulated side).
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Insulation can be placed on either side of the steel plate.
- Alternative pin and stiffener design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	14.5
63	27.7
80	27.2
100	25.5
125	27.7
160	30.0
200	34.2
250	38.0
315	39.2
400	43.1
500	46.1
630	48.8
800	51.9
1000	54.3
1250	56.4
1600	58.3
2000	58.5
2500	55.6
3150	56.8
4000	59.0
5000	57.1



Test set-up:
Plate: SeaRox SL 620, 40 mm
Stiffener: SeaRox SL 620, 25 mm

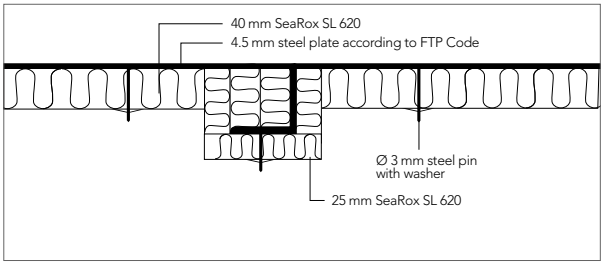
Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

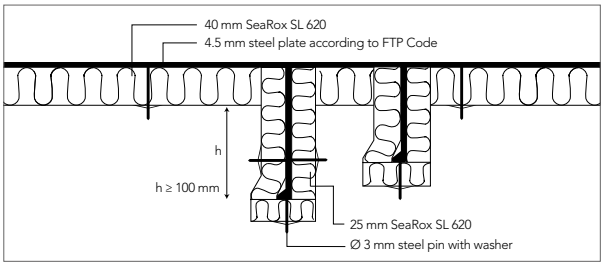
$R_w(C;C_{tr})$ = 48 (-2; -7) dB

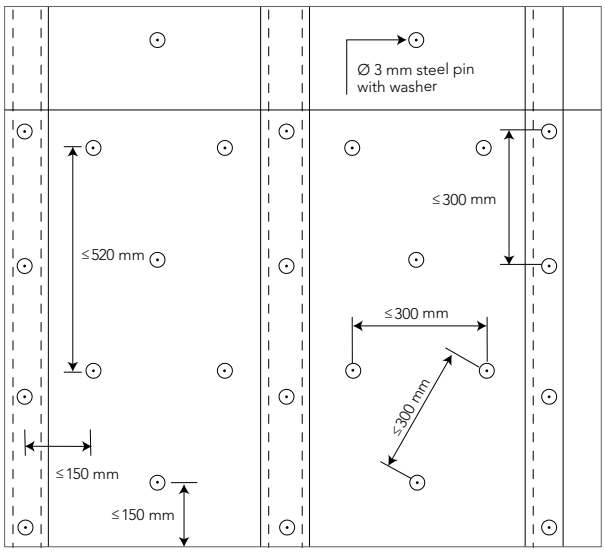
Sound absorption

Weighted sound absorption:
SeaRox SL 620, 40 mm, α_w = 0.80

Construction details







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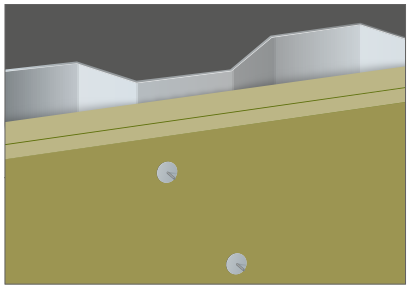
A-60 Steel Bulkhead, corrugated 2 mm



	Product	Thickness	Density	Weight
Plate	SeaRox SL 620*	50+30 mm	100 kg/m^3	8.0 kg/m^2

*alternatively SeaRox SL 620 : 2 x 40 mm

Advantages

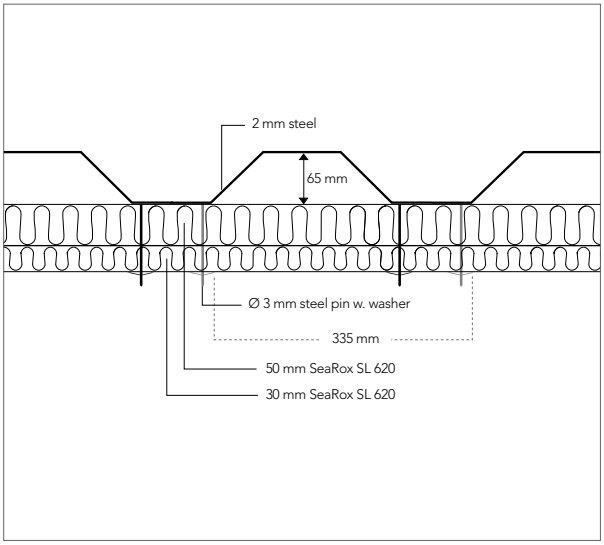
Construction notes

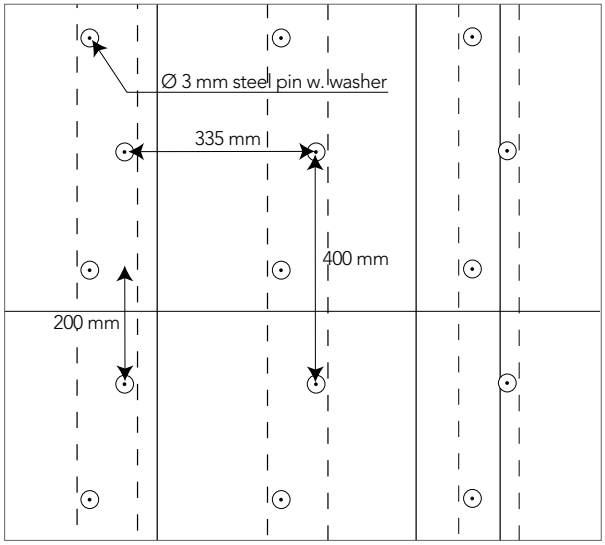
- 2 mm corrugated steel plate insulated with 50 mm and 30 mm or 2 x 40 mm SeaRox SL 620.
- Dimension of corrugation: 100 mm x 67.5 mm x 65 mm, pitch 335 mm.
- Insulation fixed with two rows of pins on top of corrugation.
- No insulation of void.

Application notes

- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Joints must be staggered, 150 mm overlap is recommended.

Construction details





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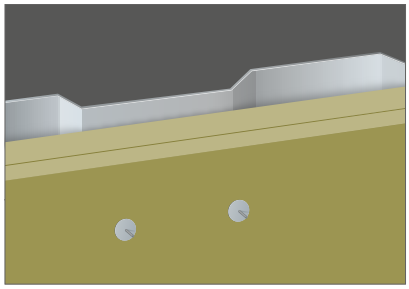
A-60 Steel Bulkhead, corrugated 4 mm



	Product	Thickness	Density	Weight
Plate	SeaRox SL 620*	50+30 mm	100 kg/m^3	8.0 kg/m^2

*alternatively SeaRox SL 620: 2 x 40 mm

Advantages

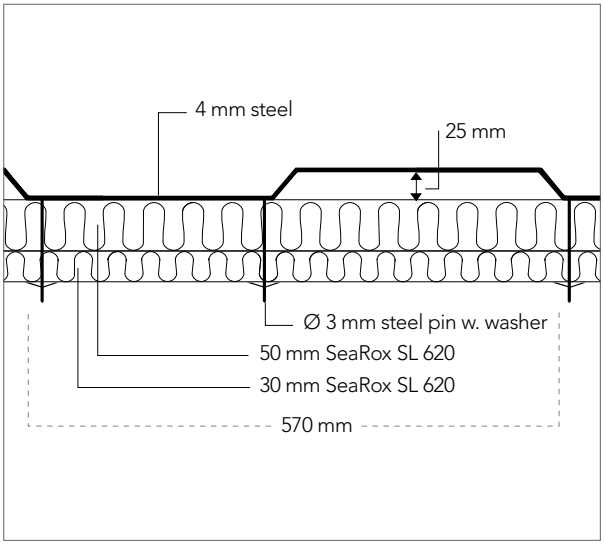
Construction notes

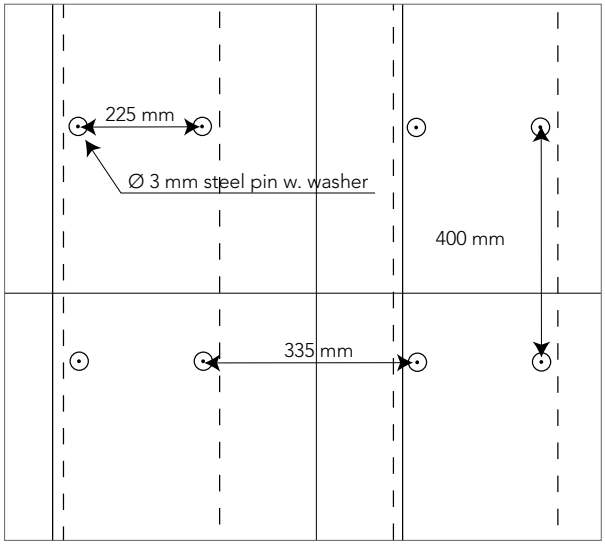
- 4 mm corrugated steel plate insulated with 50 mm and 30 mm or 2 x 40mm SeaRox SL 620.
- Dimension of corrugation: 260 mm x 35 mm x 25 mm, pitch 570 mm.
- Insulation fixed with two rows of pins on top of corrugation.
- No insulation of void.

Application notes

- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Joints must be staggered, 150 mm overlap is recommended.

Construction details





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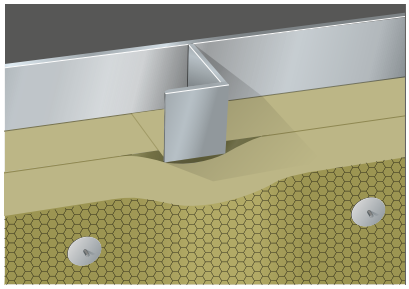
A-60 Steel Bulkhead



	Product	Thickness	Density	Weight
Plate	SeaRox WM 620	2 x 45 mm	90 kg/m^3	8.1 kg/m^2
Stiffener	SeaRox WM 620	45 mm	90 kg/m^3	4.1 kg/m^2

Advantages

Construction notes

- Plate between stiffeners insulated with one layer of 45 mm SeaRox WM 620.
- Stiffeners and plate insulated in the same process with 45 mm SeaRox WM 620.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with Ø 30-38 mm spring washers.

Application notes

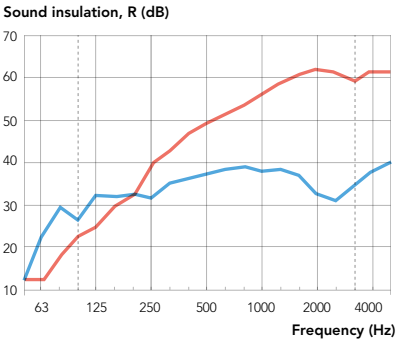
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Insulation can be placed on either side of the steel plate.
- Wire mesh must be twisted together at joints.

Optional surface (on request)

- Reinforced aluminium foil.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	12.7
63	12.7
80	18.6
100	23.6
125	25.1
160	30.3
200	32.9
250	39.9
315	43.2
400	46.9
500	49.6
630	51.5
800	53.3
1000	56.0
1250	59.1
1600	60.7
2000	61.9
2500	61.5
3150	59.5
4000	61.7
5000	61.2



— Test set-up:
Plate: SeaRox WM 90, 2 x 45 mm
Stiffener: SeaRox WM 90, 45 mm

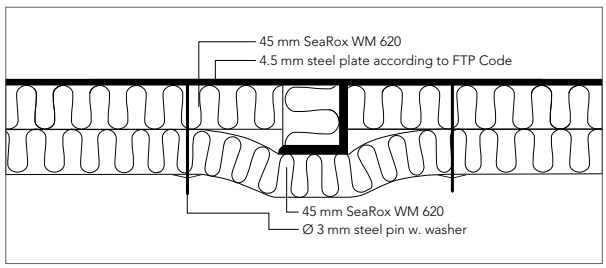
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 7 mm
(without insulation)

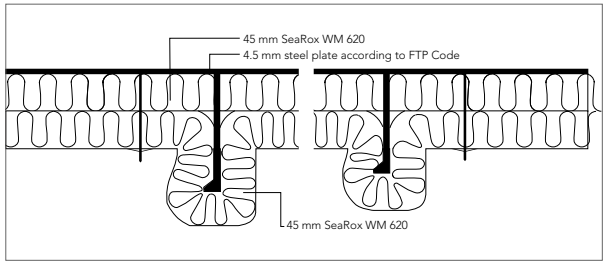
$R_w(C;C_{tr})$ = 49 (-3; -9) dB

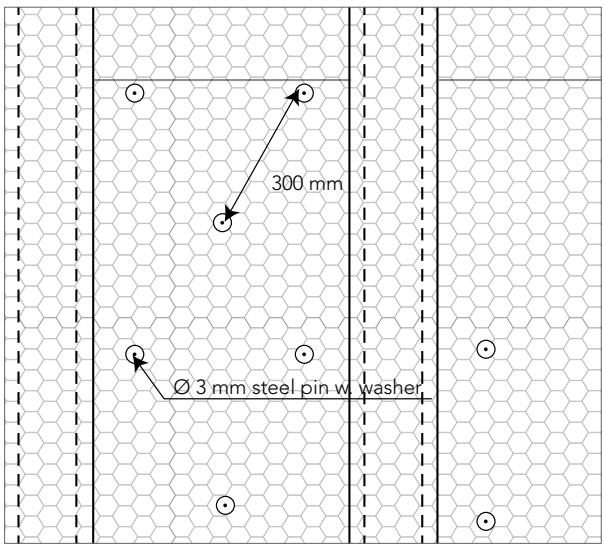
Sound absorption

Weighted sound absorption:
SeaRox WM 620, 2 x 45mm, α_w = 0.95

Construction details







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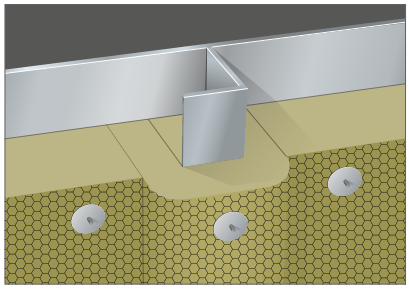
A-60 Steel Bulkhead



	Product	Thickness	Density	Weight
Plate	SeaRox WM 640	75 mm	105 kg/m^3	7.9 kg/m^2
Stiffener	SeaRox WM 640	30 mm	105 kg/m^3	3.2 kg/m^2

Advantages

Construction notes

- Stiffeners insulated with 30 mm SeaRox WM 640.
- Plate between stiffeners insulated with one layer of 75 mm SeaRox WM 640.
- Ø 3 mm pins fixed with approx. 300 mm distance.
- Insulation secured with washers of Ø 38 mm.

Application notes

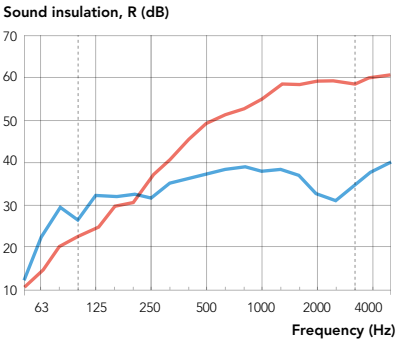
- All connections must be tight.
- Gap under the stiffener must be filled out completely.
- The pins should exceed the insulation by approx. 10 mm.
- Wire mesh must be twisted together at joints.
- Insulation can be placed on either side of the steel plate.

Optional surface (on request)

- Reinforced aluminium foil.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	10.2
63	15.2
80	20.6
100	23.0
125	24.9
160	30.0
200	30.7
250	37.7
315	41.5
400	45.9
500	49.3
630	51.4
800	52.8
1000	55.2
1250	58.5
1600	58.6
2000	59.4
2500	59.4
3150	58.3
4000	60.5
5000	60.9



— Test set-up:
Plate: SeaRox WM 105, 75 mm
Stiffener: SeaRox WM 105, 30 mm

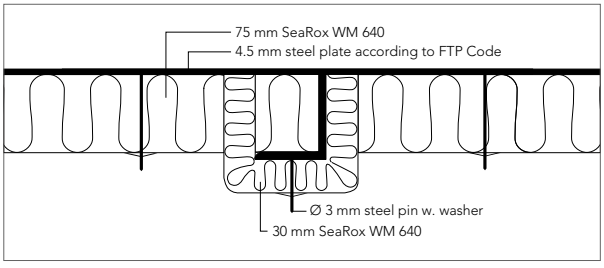
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 7 mm
(without insulation)

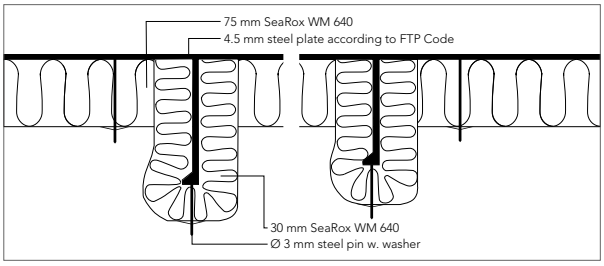
$R_w(C;C_{tr})$ = 47 (-2; -8) dB

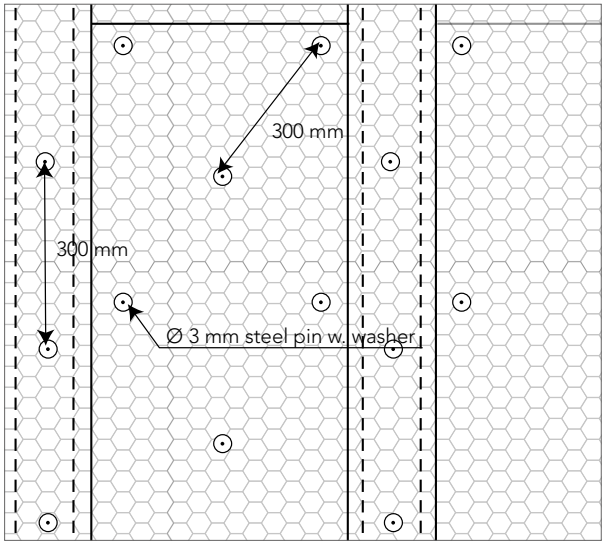
Sound absorption

Weighted sound absorption:
SeaRox WM 640, 75 mm, α_w = 0.90

Construction details







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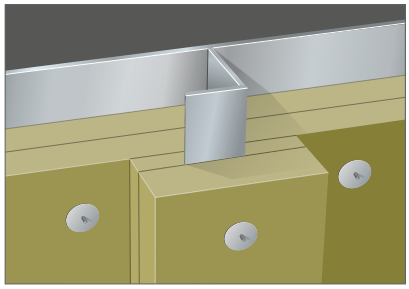
A-60 Steel Bulkhead



	Product	Thickness	Density	Weight
Plate	SeaRox SL 640	2 x 30 mm	130 kg/m^3	7.8 kg/m^2
Stiffener	SeaRox SL 640	30 mm	130 kg/m^3	3.9 kg/m^2

Advantages

Construction notes

- Plate between stiffeners insulated with two layers of 30 mm SeaRox SL 640.
- Stiffeners insulated with 30 mm SeaRox SL 640.
- Ø 3 mm pins fixed with approx. 300 mm distance.
- Insulation secured with washers of Ø 38 mm.

Application notes

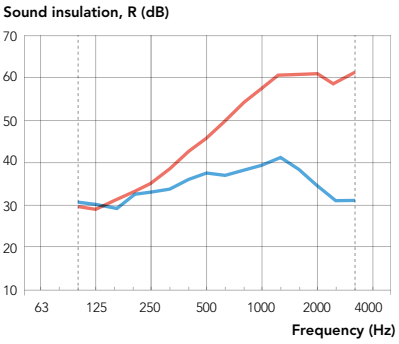
- All connections must be tight.
- Gap under the stiffener must be filled out completely.
- The pins should exceed the insulation by approx. 10 mm.
- Insulation must be placed on fire-exposed side of the steel plate.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
100	29.9
125	28.8
160	31.7
200	34.2
250	35.8
315	39.2
400	43.2
500	46.3
630	49.5
800	54.3
1000	57.4
1250	60.1
1600	60.3
2000	60.4
2500	58.9
3150	61.0



— Test set-up:
Plate: SeaRox SL 640, 2 x 30 mm
Stiffener: SeaRox SL 640, 30 mm

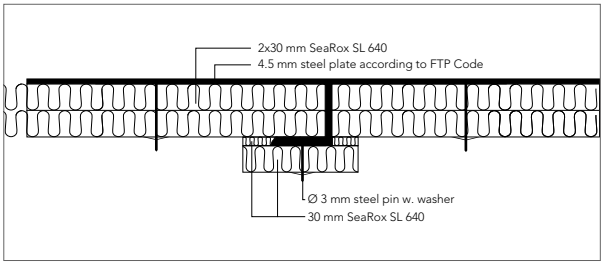
— Steel Bulkhead 1500/ 1500/ 5 mm
L-profile: 60/ 30/ 5 mm
(without insulation)

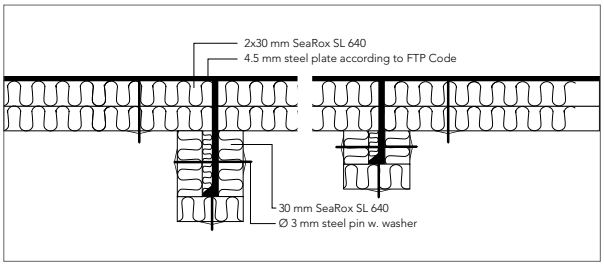
$R_w(C;C_{tr})$ = 48 (-1; -2) dB

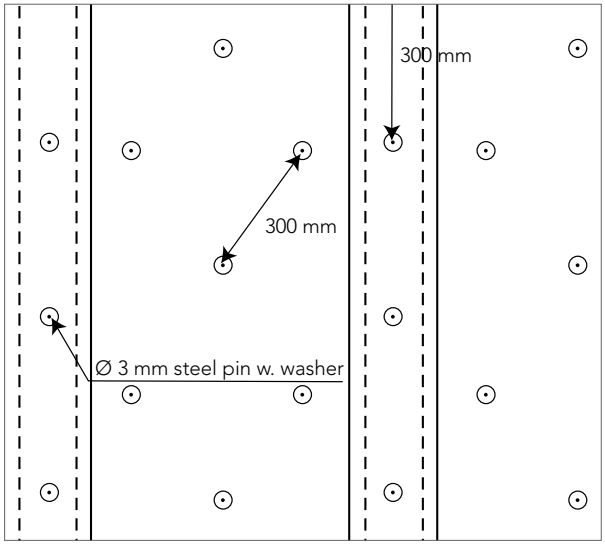
Sound absorption

Weighted sound absorption:
SeaRox SL 640, 2x30 mm, α_w = 0.90

Construction details







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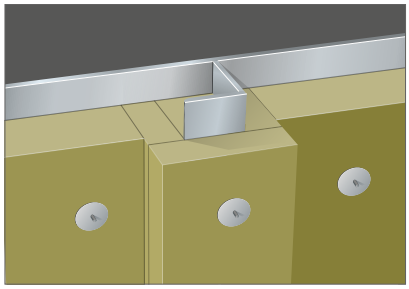
A-60 Steel Bulkhead, restricted



	Product	Thickness	Density	Weight
Plate	SeaRox SL 640	40 mm	130 kg/m^3	5.2 kg/m^2
Stiffener	SeaRox SL 640	40 mm	130 kg/m^3	5.2 kg/m^2

Advantages

Construction notes

- Plate between stiffeners insulated with one layer of 40 mm SeaRox SL 640.
- Stiffeners insulated with 40 mm SeaRox SL 640.
- Ø 3 mm pins fixed with approx. 300 mm distance.
- Insulation secured with washers of Ø 38 mm.

Application notes

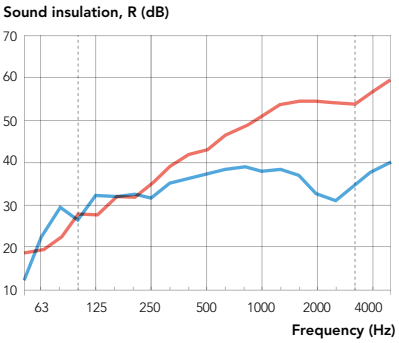
- Restricted application (fire against insulated side).
- All connections must be tight.
- Gap under the stiffener must be filled out completely.
- The pins should exceed the insulation by approx. 10 mm.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	18.7
63	19.7
80	22.5
100	28.1
125	27.5
160	31.8
200	32.1
250	35.2
315	39.8
400	41.9
500	43.0
630	46.4
800	48.4
1000	51.2
1250	53.7
1600	54.5
2000	54.4
2500	54.1
3150	53.7
4000	56.7
5000	59.3



— Test set-up:
Plate: SeaRox SL 640, 40 mm
Stiffener: SeaRox SL 640, 40 mm

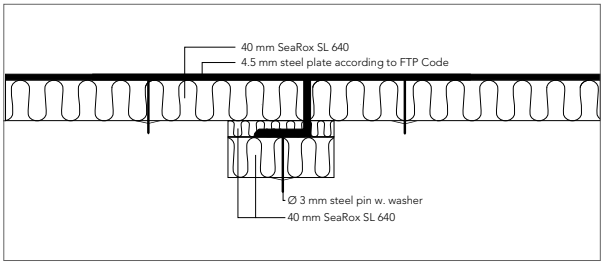
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1880 / 140 / 7 mm
(without insulation)

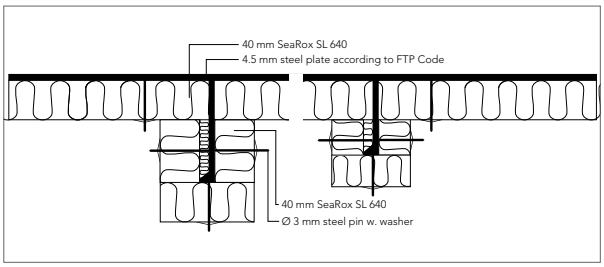
$R_w(C;C_{tr})$ = 47 (-2; -6) dB

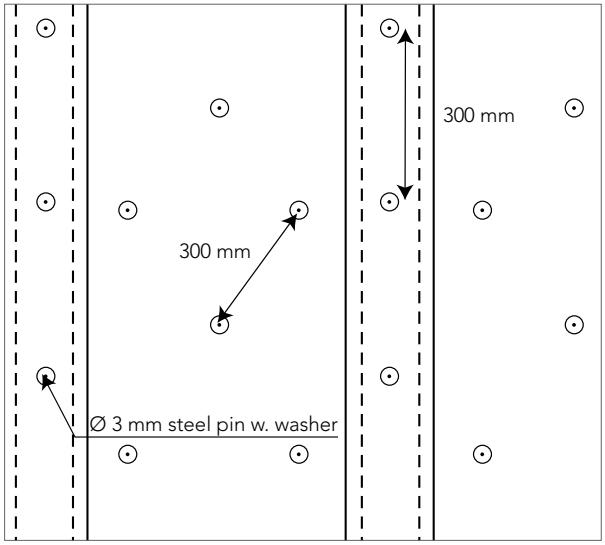
Sound absorption

Weighted sound absorption:
SeaRox SL 640, 40 mm, α_w = 0.80

Construction details







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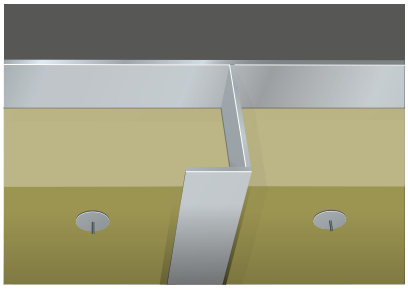
A-constructions Steel Deck

			Plate	Stiffener
LIGHTWEIGHT	A-15		SeaRox FB 6020	
	A-15		SeaRox FB or FM 6040	
	A-30		SeaRox FB 6050	SeaRox FB 6050
	A-30		SeaRox FM 6030, FM 6040 or FM 6050	SeaRox FM 6030, FM 6040 or FM 6050
	A-30		SeaRox FB or FM 6050	SeaRox FM 6040 or FM 6050
	A-60		SeaRox FB 6020	SeaRox FM 6050
	A-60		SeaRox FM 6040	SeaRox FM 6040
	A-60		SeaRox FB of FM 6020	SeaRox FM 6040 or FM 6050
	A-60	New	SeaRox FM 6040	SeaRox FM 6040 or FM 6050
STANDARD	A-15		SeaRox SL 620	
	A-30		SeaRox SL 620	SeaRox SL 620
	A-60		SeaRox SL 620	SeaRox SL 620
NON-STANDARD	A-60		SeaRox WM 620	SeaRox WM 620
	A-60		SeaRox SL 660	SeaRox SL 660

A-15 Steel Deck



	Product	Thickness	Density	Weight
Plate	SeaRox FB 6020	70 mm	40 kg/m^3	2.8 kg/m^2
Stiffener	No insulation			

Advantages

Construction notes

- Plate between stiffeners insulated with one layer of min. 70 mm SeaRox FB 6020.
- No insulation on stifferners.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with Ø 30-38 mm spring washers.

Application notes

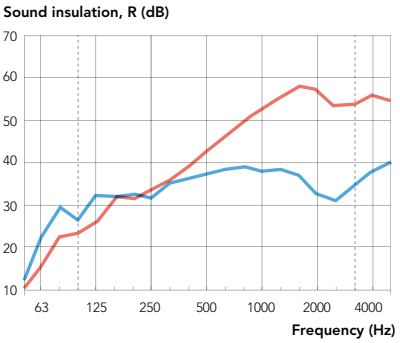
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Alternative pin design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	9.8
63	15.8
80	22.7
100	23.4
125	26.7
160	32.1
200	31.2
250	33.9
315	36.1
400	39.0
500	43.2
630	46.5
800	49.7
1000	52.7
1250	55.9
1600	58.1
2000	56.9
2500	53.2
3150	53.5
4000	55.7
5000	54.8



— Test set-up:
Plate: SeaRox FB 6020, 70 mm

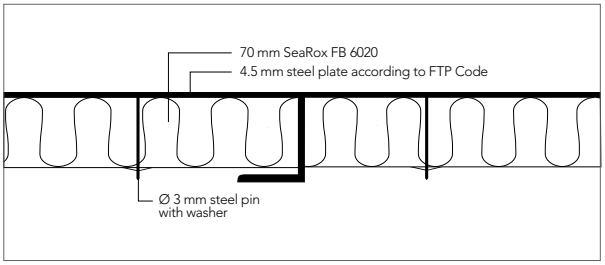
— Steel Bulkhead 1500 / 1880 / 5 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

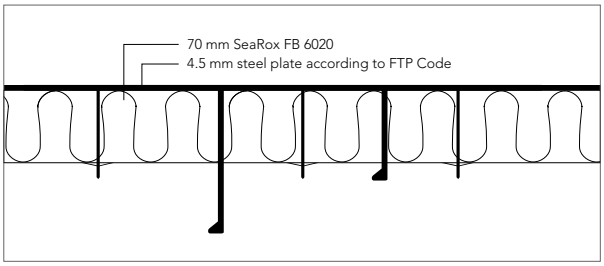
$R_w(C;C_{tr})$ = 45 (-1; -6) dB

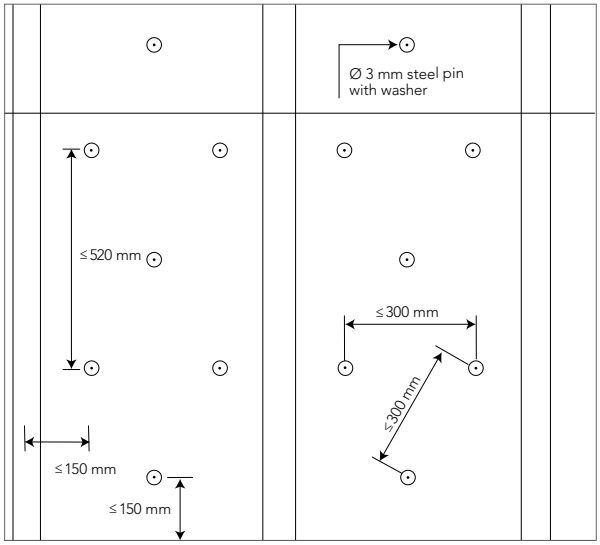
Sound absorption

Weighted sound absorption:
SeaRox FB 6020, 70 mm, α_w = 0.95

Construction details







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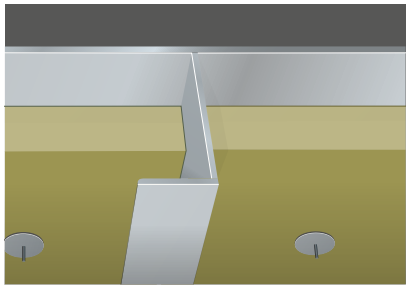
A-15 Steel Deck



	Product	Thickness	Density	Weight
Plate	SeaRox FB 6040*	35 mm	60 kg/m^3	2.1 kg/m^2
Stiffener	No insulation			

*alternative product SeaRox FM 6040

Advantages

Construction notes

- Plate between stiffeners insulated with one layer of min. 35 mm SeaRox FB or FM 6040.
- No insulation on stifferners.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with Ø 30-38 mm spring washers.

Application notes

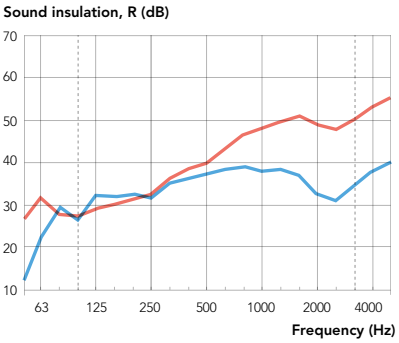
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Alternative pin design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	26.6
63	31.2
80	27.9
100	27.5
125	29.1
160	29.9
200	31.4
250	33.0
315	36.1
400	38.5
500	39.8
630	43.1
800	46.4
1000	47.9
1250	50.0
1600	51.1
2000	48.7
2500	47.4
3150	50.6
4000	53.4
5000	55.1

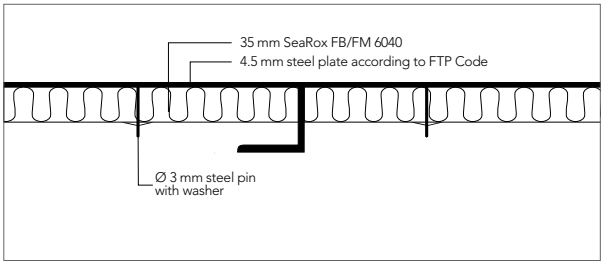


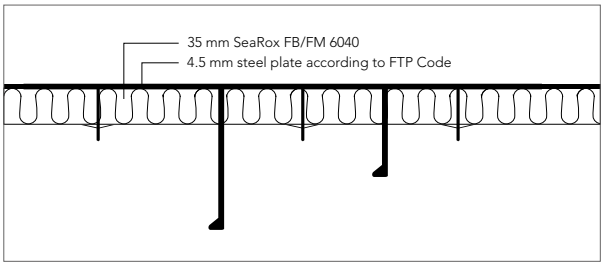
— Test set-up:
Plate: SeaRox FB 6040, 35 mm

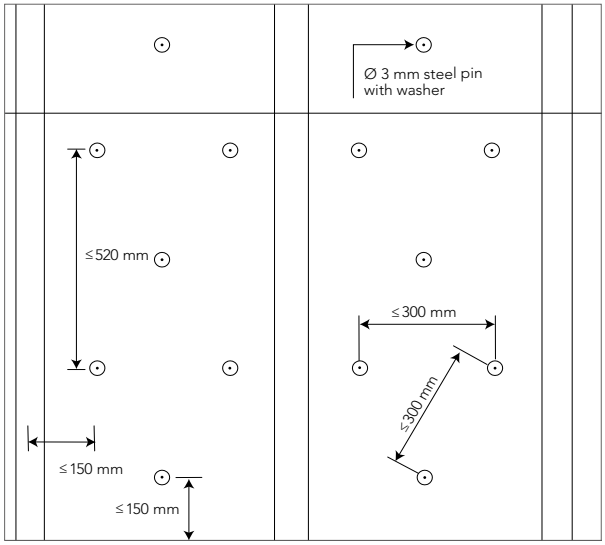
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

$R_w(C;C_{tr})$ = 45 (-2; -6) dB

Construction details







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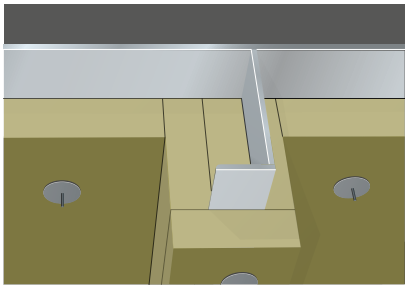
A-30 Steel Deck



	Product	Thickness	Density	Weight
Plate	SeaRox FB 6050	30 mm	70 kg/m^3	2.1 kg/m^2
Stiffener	SeaRox FB 6050	30 mm	70 kg/m^3	2.1 kg/m^2

Advantages

Construction notes

- Stiffeners insulated with min. 30 mm SeaRox FB 6050.
- Steel plate between stiffeners insulated with min. 30 mm SeaRox FB 6050.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with washers of min. Ø 30-38 mm.

Application notes

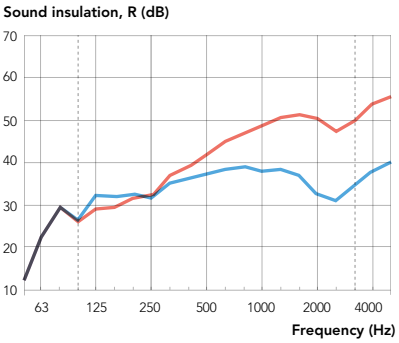
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Alternative pin and stiffener design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	10.9
63	22.2
80	29.3
100	26.1
125	29.3
160	29.7
200	31.5
250	32.4
315	36.8
400	39.2
500	42.0
630	45.0
800	46.9
1000	48.9
1250	50.5
1600	51.6
2000	50.5
2500	47.4
3150	49.8
4000	54.0
5000	55.6



— Test set-up:
Plate: SeaRox FB 6050, 30 mm
Stiffener: SeaRox FB 6050, 30 mm

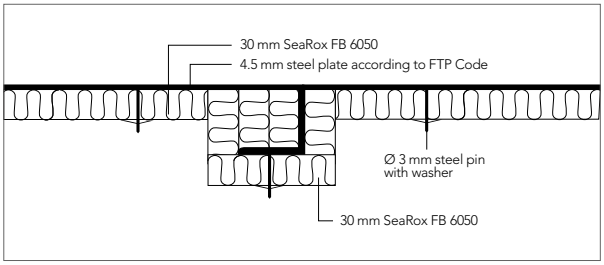
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

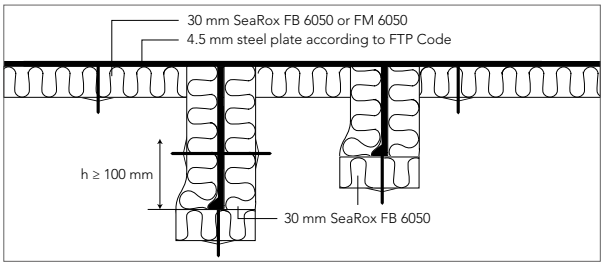
$R_w(C;C_{tr})$ = 45 (-2; -6) dB

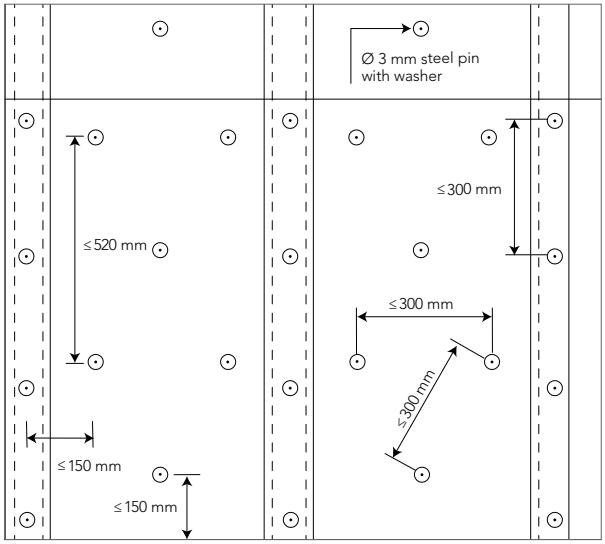
Sound absorption

Weighted sound absorption:
SeaRox FB 6050, 30 mm, α_w = 0.55

Construction details







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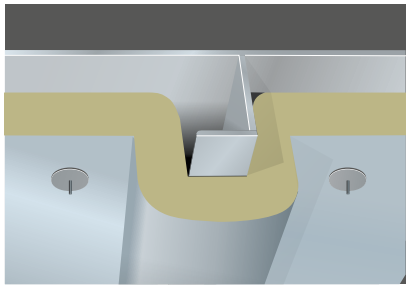
A-30 Steel Deck



	Product	Thickness	Density	Weight
Plate	SeaRox FM 6030 ALU	30 mm	50 kg/m^3	1.5 kg/m^2
Stiffener	SeaRox FM 6030 ALU	30 mm	50 kg/m^3	1.5 kg/m^2

Alternative products SeaRox FM 6050, 30mm or SeaRox FM 6040, 35mm

Advantages

Construction notes

- Plate and stiffeners insulated with one layer of min. 30 mm SeaRox FM 6030 ALU, 35mm FM 6040 or 30mm FM 6050.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with washers of Ø 30-38 mm.

Application notes

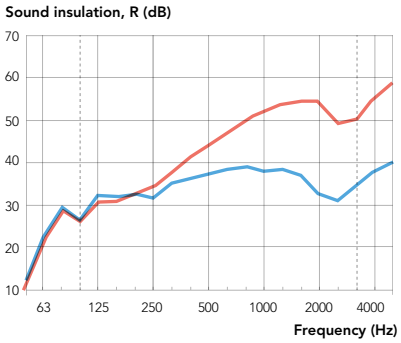
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Alternative pin and stiffener design acc. to drawings.

Surface (as standard)

- Reinforced aluminium foil.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	9.8
63	20.4
80	29.3
100	26.3
125	30.8
160	30.6
200	32.0
250	34.7
315	37.8
400	40.9
500	43.7
630	47.2
800	50.0
1000	52.6
1250	53.7
1600	54.6
2000	53.9
2500	49.4
3150	50.4
4000	55.4
5000	58.3



— Test set-up:
Plate: SeaRox FM 6030 ALU, 30 mm
Stiffener: SeaRox FM 6030 ALU, 30 mm

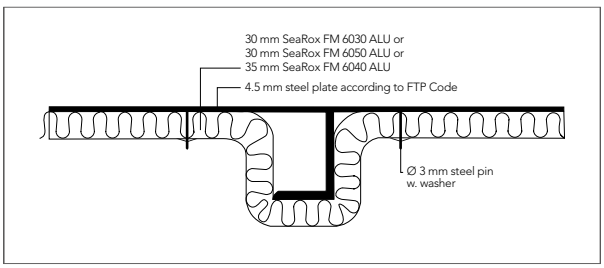
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

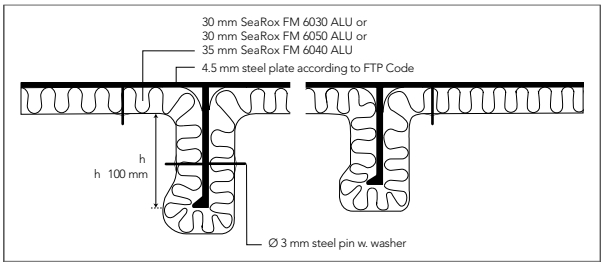
Rw(C;Ctr) = 46 (-1; -6) dB

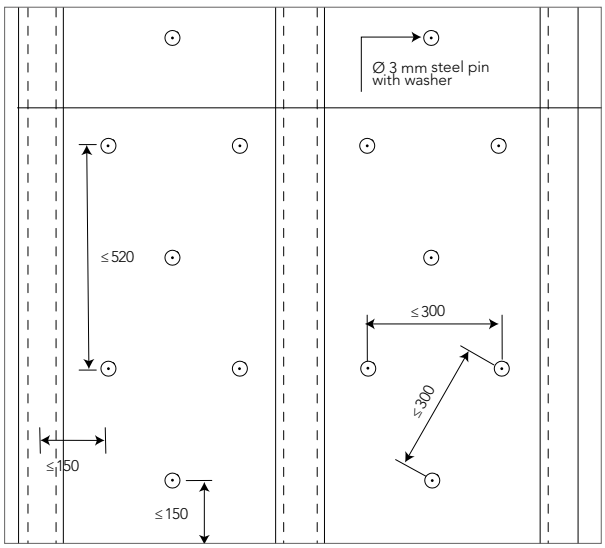
Sound absorption

Weighted sound absorption:
SeaRox FM 6030 ALU, α_w = 0.60

Construction details







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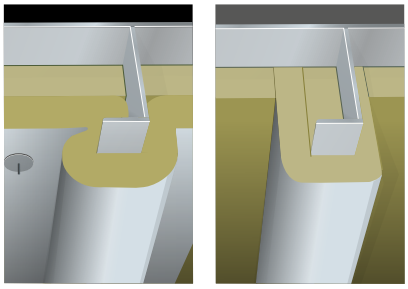
A-30 Steel Deck

	Product	Thickness	Density	Weight
Plate	SeaRox FB 6050*	30 mm	70 kg/m^3	2.1 kg/m^2
Stiffener (alt. 1)	SeaRox FM 6050	30 mm	70 kg/m^3	2.1 kg/m^2
Stiffener (alt. 2)	SeaRox FM 6040	35 mm	60 kg/m^3	2.1 kg/m^2

*alternative product SeaRox FM 6050



Advantages

Construction notes

- Stiffeners insulated with min. 30 mm SeaRox FM 6050 or min. 35mm SeaRox FM 6040.
- Steel plate between stiffeners insulated with min. 30 mm SeaRox FB 6050 or FM 6050..

or

- Steel plate between stiffeners insulated with min. 30 mm SeaRox FB or FM 6050.
- Stiffener insulated min. 150 mm on either side with min. 30 mm SeaRox FM 6050 or min. 35mm SeaRox FM 6040.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with washers of min. Ø 30-38 mm.

Application notes

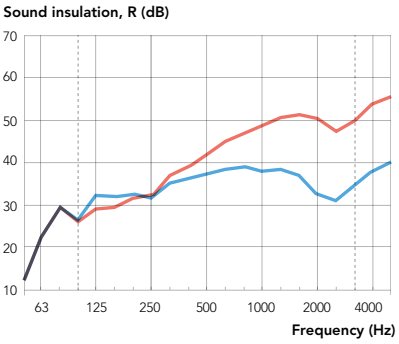
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Alternative pin and stiffener design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	10.9
63	22.2
80	29.3
100	26.1
125	29.3
160	29.7
200	31.5
250	32.4
315	36.8
400	39.2
500	42.0
630	45.0
800	46.9
1000	48.9
1250	50.5
1600	51.6
2000	50.5
2500	47.4
3150	49.8
4000	54.0
5000	55.6



— Test set-up:
Plate: SeaRox FB 6050, 30 mm
Stiffener: SeaRox FB 6050, 30 mm

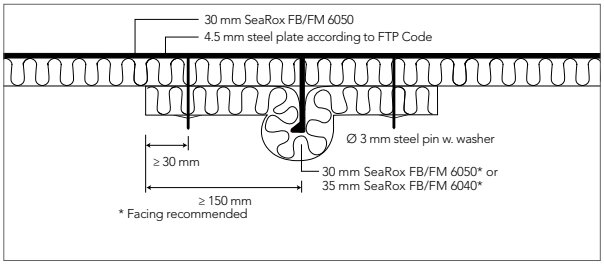
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

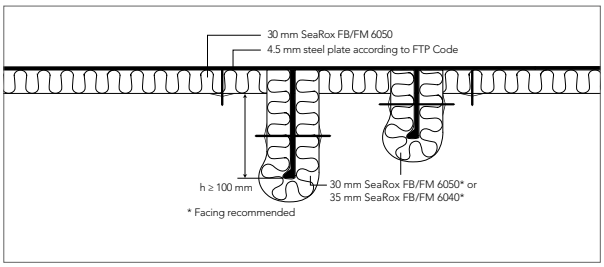
$R_w(C;C_{tr})$ = 45 (-2; -6) dB

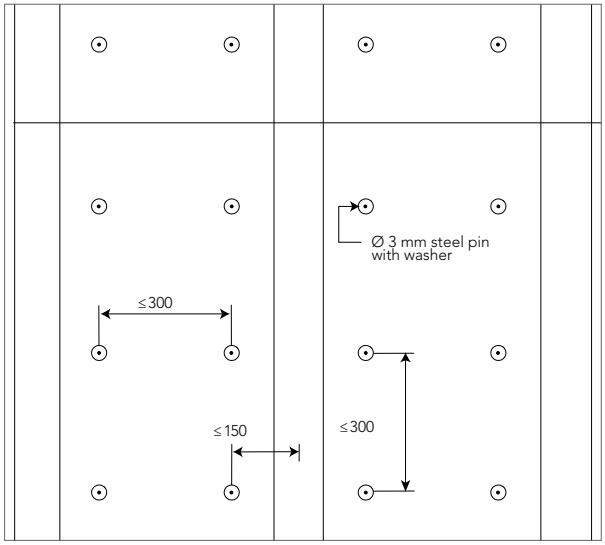
Sound absorption

Weighted sound absorption:
SeaRox FB 6050, 30 mm, α_w = 0.55

Construction details







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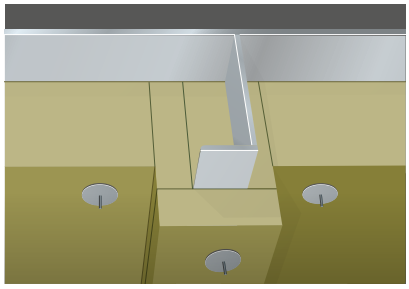
A-60 Steel Deck



	Product	Thickness	Density	Weight
Plate	SeaRox FB 6020	70 mm	40 kg/m^3	2.8 kg/m^2
Stiffener	SeaRox FB 6050	30 mm	70 kg/m^3	2.1 kg/m^2

Advantages

Construction notes

- Stiffeners insulated with min. 30 mm SeaRox FB 6050.
- Plate between stiffeners insulated with one layer of min. 70 mm SeaRox FB 6020.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with washers of Ø 30-38 mm.

Application notes

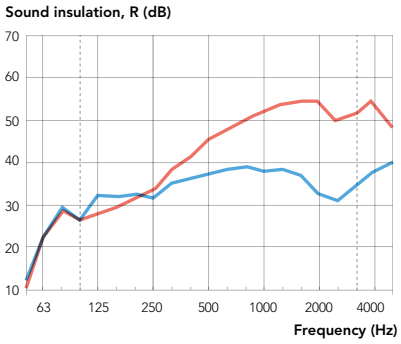
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Alternative pin and stiffener design acc. to certificates.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	10.5
63	22.1
80	28.4
100	26.4
125	27.8
160	29.2
200	31.5
250	33.8
315	38.2
400	41.2
500	45.7
630	47.7
800	50.2
1000	52.3
1250	53.8
1600	54.7
2000	54.4
2500	49.8
3150	51.5
4000	54.4
5000	48.3



— Test set-up:
Plate: SeaRox FB 6020, 70 mm
Stiffener: SeaRox FB 6050, 30 mm

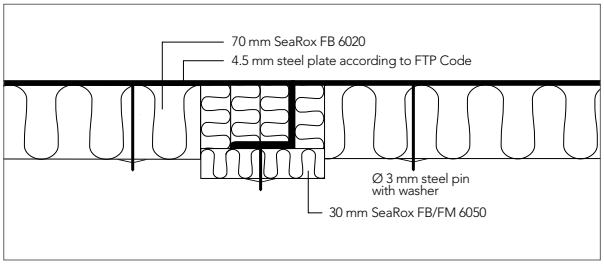
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

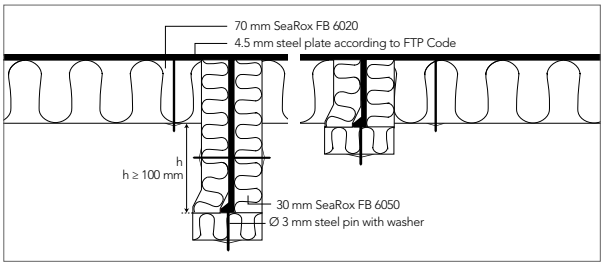
$R_w(C;C_{tr})$ = 46 (-2; -6) dB

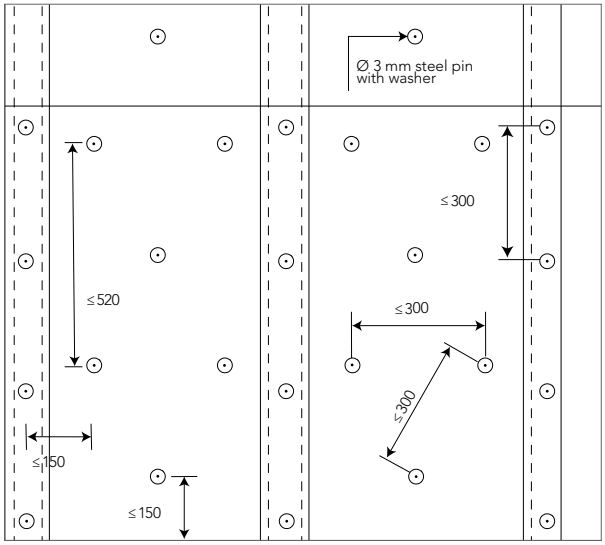
Sound absorption

Weighted sound absorption:
SeaRox FB 6020, 70 mm, α_w = 0.95

Construction details







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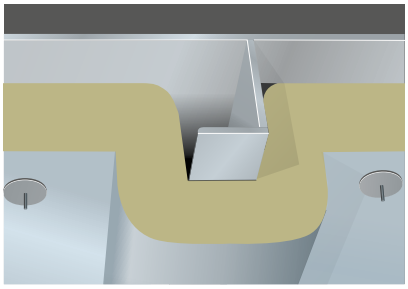
A-60 Steel Deck



	Product	Thickness	Density	Weight
Plate	SeaRox FM 6040	50 mm	60 kg/m^3	3.0 kg/m^2
Stiffener	SeaRox FM 6040	50 mm	60 kg/m^3	3.0 kg/m^2

Advantages

Construction notes

- Plate and stiffeners insulated with one layer of min. 50 mm SeaRox FM 6040.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with washers of Ø 30-38 mm.

Application notes

- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	11.4
63	20.1
80	29.3
100	26.6
125	30.5
160	28.5
200	31.0
250	34.3
315	37.5
400	41.6
500	45.0
630	49.2
800	51.4
1000	53.8
1250	54.9
1600	55.8
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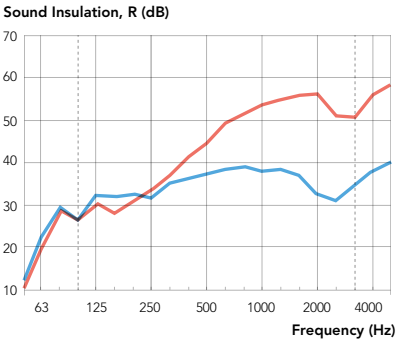
2500	51.1
3150	51.3
4000	56.1
5000	58.7



— Test set-up:
Plate: SeaRox FM 6040 ALU, 50 mm
Stiffener: SeaRox FM 6040 ALU, 50 mm

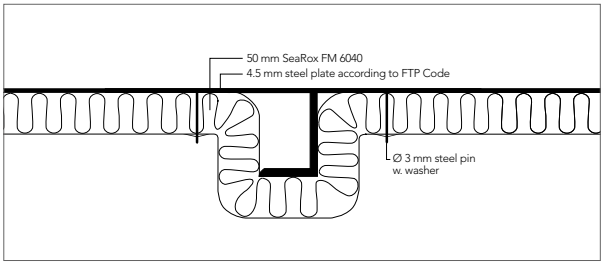
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

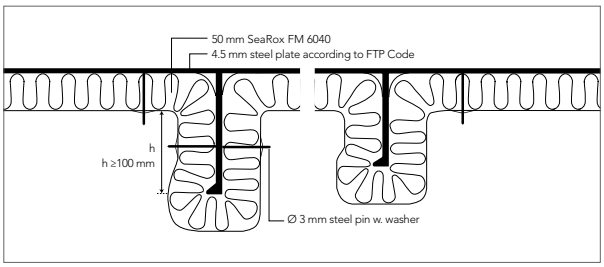
$R_w(C;C_{tr})$ = 47 (-2; -7) dB

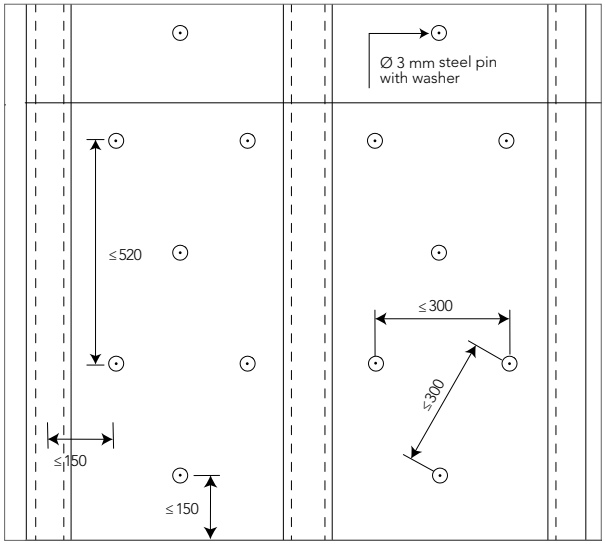
Sound absorption

Weighted sound absorption:
SeaRox FM 6040 ALU, 50 mm, α_w = 0.65

Construction details







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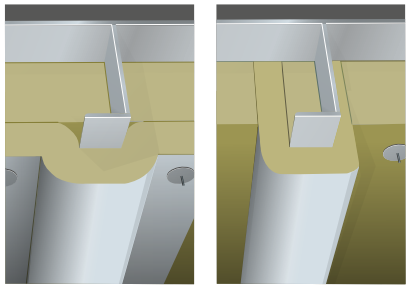
A-60 Steel Deck



	Product	Thickness	Density	Weight
Plate	SeaRox FB 6020*	70 mm	40 kg/m^3	2.8 kg/m^2
Stiffener (alt. 1)	SeaRox FM 6050	30 mm	70 kg/m^3	2.1 kg/m^2
Stiffener (alt. 2)	SeaRox FM 6040	35 mm	60 kg/m^3	2.1 kg/m^2

*alternative product SeaRox FM 6020

Advantages

Construction notes

- Stiffeners insulated with min. 30 mm SeaRox FM 6050 or min. 35 mm SeaRox FM 6040.
- Steel plate between stiffeners insulated with min. 70 mm SeaRox FB 6020 or FM 6020..

or

- Steel plate between stiffeners insulated with min. 70 mm SeaRox FB 6020 or FM 6020.
- Stiffener insulated with min. 150 mm on either side with min. 30 mm SeaRox FM 6050 or min. 35 mm SeaRox FM 6040.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with washers of min. Ø 30-38 mm.

Application notes

- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Alternative pin and stiffener design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	10.5
63	22.1
80	28.4
100	26.4
125	27.8
160	29.2
200	31.5
250	33.8
315	38.2
400	41.2
500	45.7
630	47.7
800	50.2
1000	52.3
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1600	54.7
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3150	51.5
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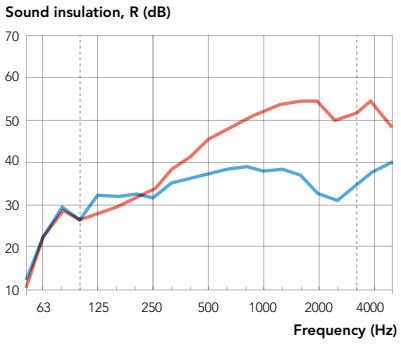
5000	48.3



— Test set-up:
Plate: SeaRox FB 6020, 70 mm
Stiffener: SeaRox FB 6050, 30 mm

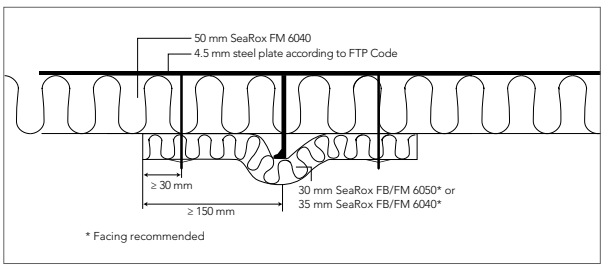
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

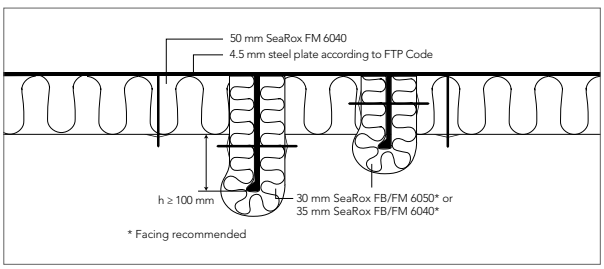
$R_w(C;C_{tr})$ = 46 (-2; -6) dB

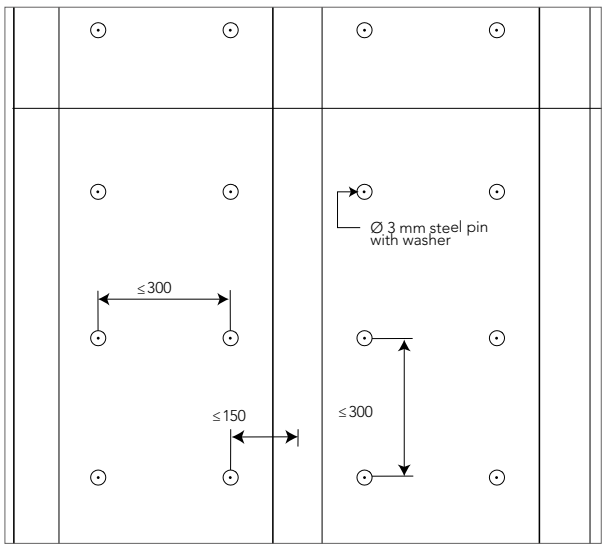
Sound absorption

Weighted sound absorption:
SeaRox FB 6020, 70 mm, α_w = 0.95

Construction details







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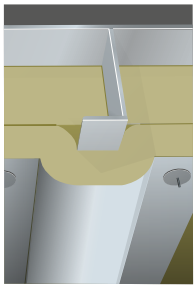
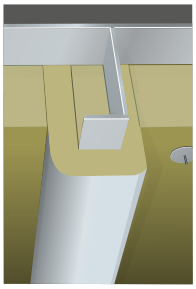
LIGHTWEIGHT **New**

A-60 Steel Deck





	Product	Thickness	Density	Weight
Plate	SeaRox FM 6040	50 mm	60 kg/m^3	3.0 kg/m^2
Stiffener (alt. 1)	SeaRox FM 6050	30 mm	70 kg/m^3	2.1 kg/m^2
Stiffener (alt. 2)	SeaRox FM 6040	35 mm	60 kg/m^3	2.1 kg/m^2

Advantages

Construction notes

- Stiffeners insulated with min. 30 mm SeaRox FM 6050 or min. 35 mm SeaRox FM 6040.
- Steel plate between stiffeners insulated with min. 50 mm SeaRox FM 6040.

or

- Steel plate between stiffeners insulated with min. 50 mm SeaRox FM 6040.
- Stiffener insulated with min. 150 mm on either side with min. 30 mm SeaRox FM 6050 or min. 35 mm SeaRox FM 6040.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with washers of min. Ø 30-38 mm.

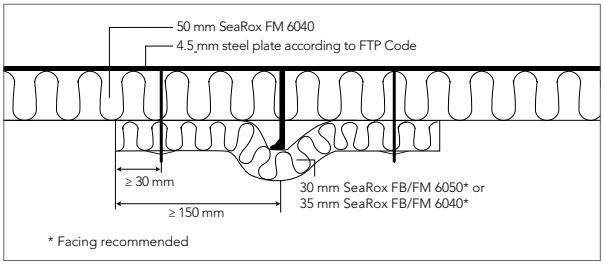
Application notes

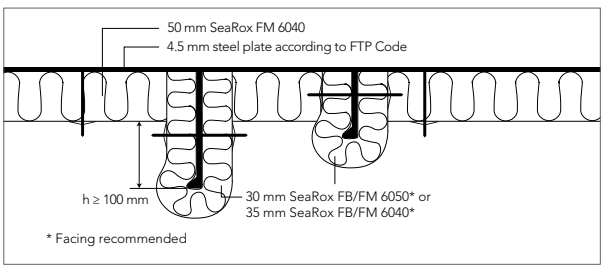
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Alternative pin and stiffener design acc. to drawings.

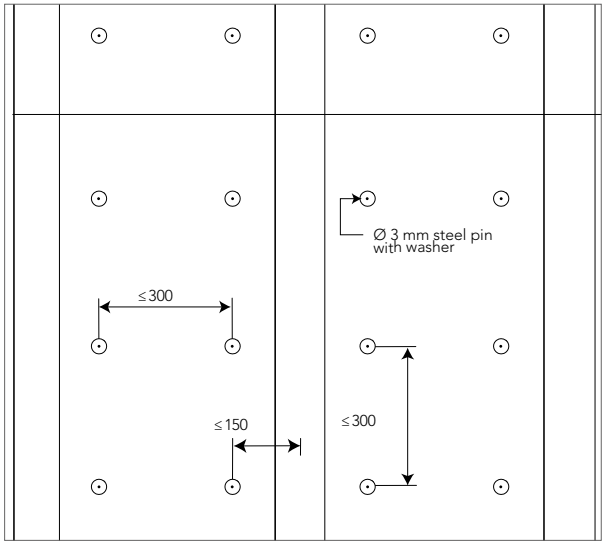
Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Construction details







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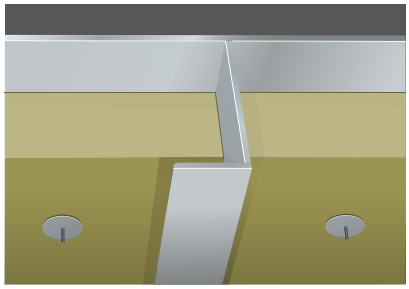
A-15 Steel Deck



	Product	Thickness	Density	Weight
Plate	SeaRox SL 620	50 mm	100 kg/m^3	5.0 kg/m^2
Stiffener	No insulation			

Advantages

Construction notes

- Plate between stiffeners insulated with one layer of min. 50 mm SeaRox SL 620.
- No insulation on stiffeners.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with washers of Ø 30-38 mm.

Application notes

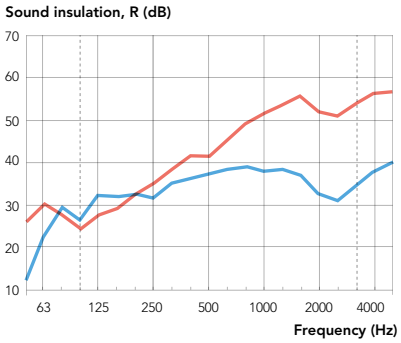
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Alternative pin design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	25.9
63	30.2
80	27.6
100	24.4
125	27.6
160	29.1
200	32.6
250	35.1
315	38.4
400	41.6
500	41.4
630	45.1
800	49.1
1000	51.4
1250	53.6
1600	55.7
2000	51.9
2500	50.9
3150	53.7
4000	56.3
5000	56.7



— Test set-up:
Plate: SeaRox SL 620, 50 mm

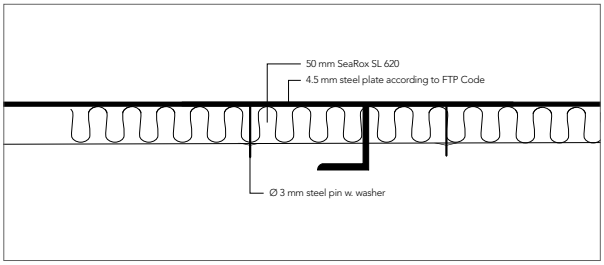
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

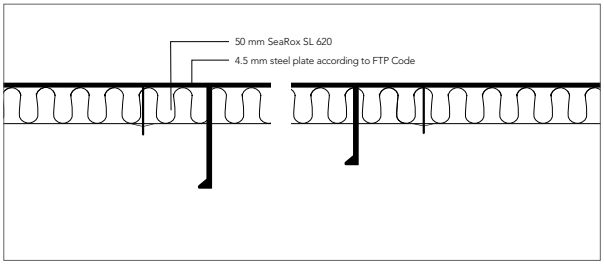
$R_w(C;C_{tr})$ = 46 (-2; -7) dB

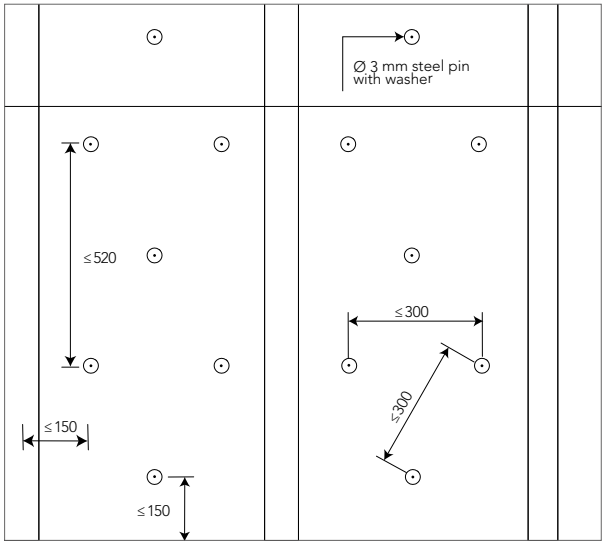
Sound absorption

Weighted sound absorption:
SeaRox SL 620, 50 mm, α_w = 0.85

Construction details







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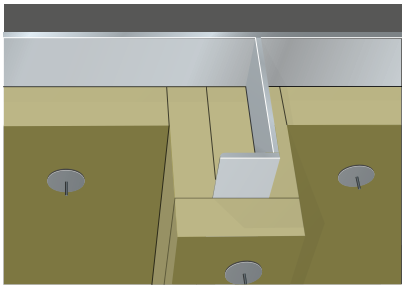
A-30 Steel Deck



	Product	Thickness	Density	Weight
Plate	SeaRox SL 620	25 mm	100 kg/m^3	2.5 kg/m^2
Stiffener	SeaRox SL 620	25 mm	100 kg/m^3	2.5 kg/m^2

Advantages

Construction notes

- Stiffeners insulated with min. 25 mm SeaRox SL 620.
- Plate between stiffeners insulated with min. 25 mm SeaRox SL 620.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with Ø 30-38 mm spring washers.

Application notes

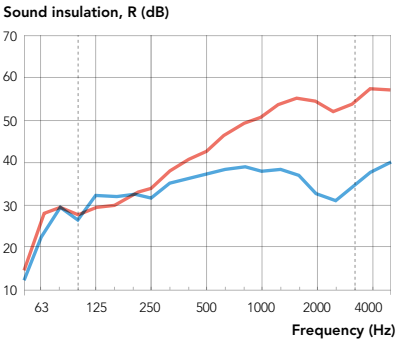
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Alternative pin and stiffener design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	14.3
63	27.8
80	29.9
100	27.4
125	29.8
160	30.1
200	32.4
250	34.1
315	38.2
400	40.8
500	42.6
630	46.7
800	49.3
1000	50.9
1250	54.0
1600	55.2
2000	54.7
2500	52.3
3150	53.8
4000	57.7
5000	57.2



— Test set-up:
Plate: SeaRox SL 620, 25 mm
Stiffener: SeaRox SL 620, 25 mm

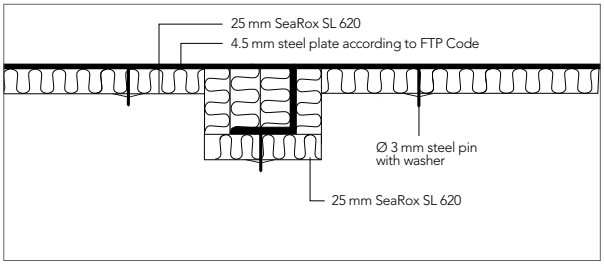
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

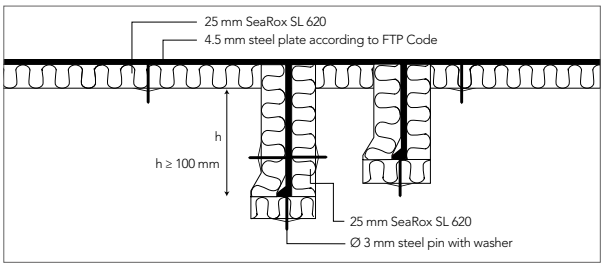
$R_w(C;C_{tr})$ = 47 (-2; -7) dB

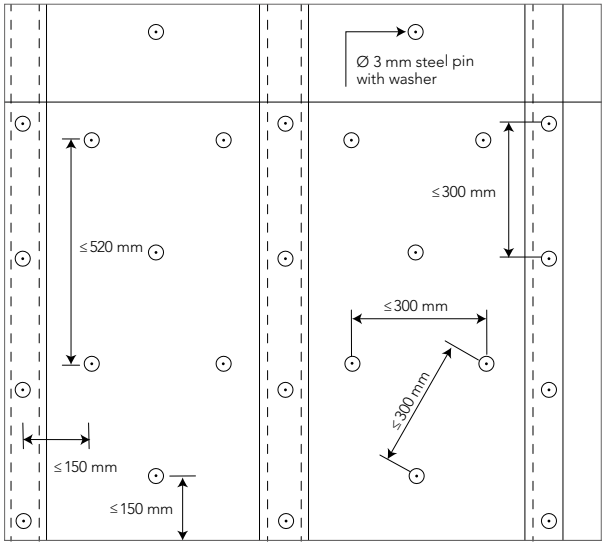
Sound absorption

Weighted sound absorption:
SeaRox SL 620, 30 mm, α_w = 0.60

Construction details







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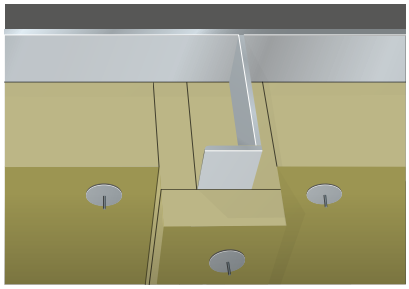
A-60 Steel Deck



	Product	Thickness	Density	Weight
Plate	SeaRox SL 620	40 mm	100 kg/m^3	4.0 kg/m^2
Stiffener	SeaRox SL 620	25 mm	100 kg/m^3	2.5 kg/m^2

Advantages

Construction notes

- Stiffeners insulated with min. 25 mm SeaRox SL 620.
- Plate between stiffeners insulated with min. 40 mm SeaRox SL 620.
- Ø 3 mm pins fixed with max. 300 mm distance.
- Insulation secured with Ø 30-38 mm spring washers.

Application notes

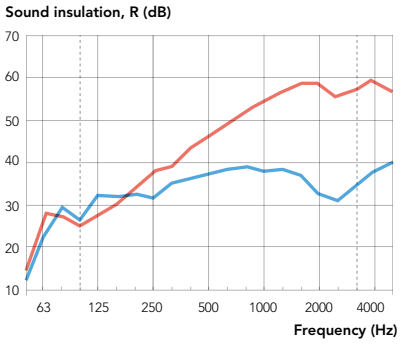
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Alternative pin and stiffener design acc. to drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	14.5
63	27.7
80	27.2
100	25.5
125	27.7
160	30.0
200	34.2
250	38.0
315	39.2
400	43.1
500	46.1
630	48.8
800	51.9
1000	54.3
1250	56.4
1600	58.3
2000	58.5
2500	55.6
3150	56.8
4000	59.0
5000	57.1



— Test set-up:
Plate: SeaRox SL 620, 40 mm
Stiffener: SeaRox SL 620, 25 mm

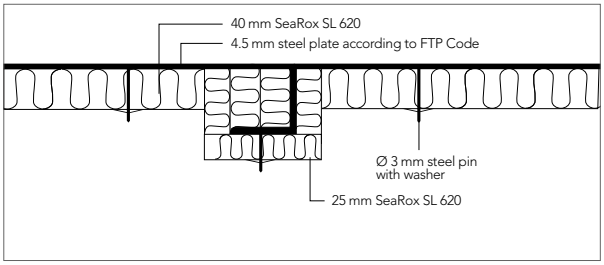
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

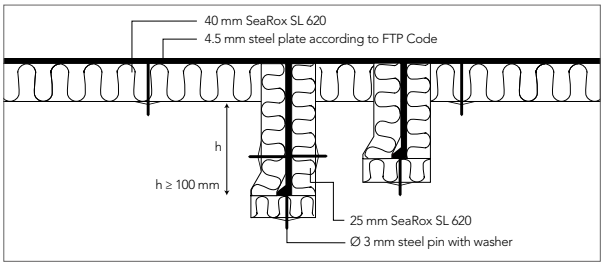
$R_w(C;C_{tr})$ = 48 (-2; -7) dB

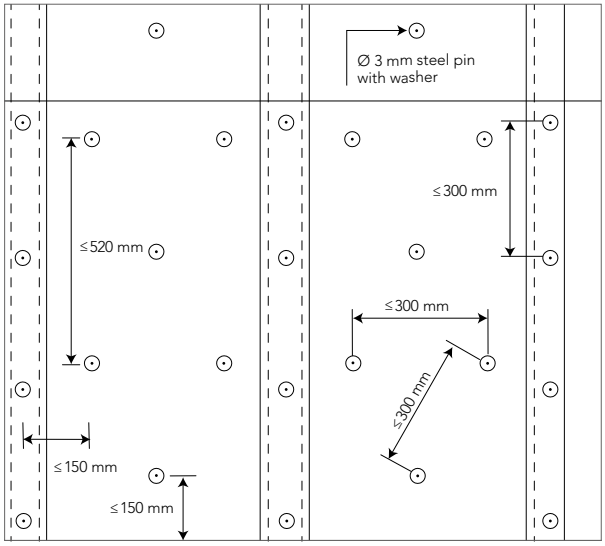
Sound absorption

Weighted sound absorption:
SeaRox SL 620, 40 mm, α_w = 0.80

Construction details







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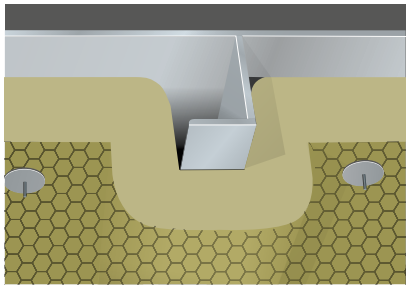
A-60 Steel Deck



	Product	Thickness	Density	Weight
Plate	SeaRox WM 620	45 mm	90 kg/m^3	4.1 kg/m^2
Stiffener	SeaRox WM 620	45 mm	90 kg/m^3	4.1 kg/m^2

Advantages

Construction notes

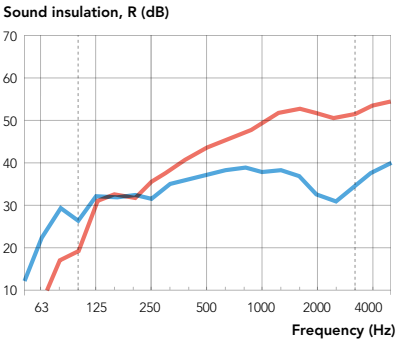
- Plate and stiffeners insulated with one layer of 45 mm SeaRox WM 620.
- Ø 3 mm pins fixed with approx. 300 mm distance.
- Insulation secured with washers of Ø 38 mm.

Application notes

- All connections must be tight.
- Wire mesh must be twisted together at joints.
- The pins should exceed the insulation by approx. 10 mm.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	10.1
63	8.4
80	17.2
100	19.4
125	31.4
160	32.7
200	32.1
250	35.8
315	38.8
400	41.1
500	43.7
630	45.2
800	47.1
1000	49.5
1250	52.1
1600	53.0
2000	51.8
2500	50.9
3150	51.6
4000	53.8
5000	54.7



— Test set-up:
Plate /Stiffener: SeaRox WM 620, 45 mm

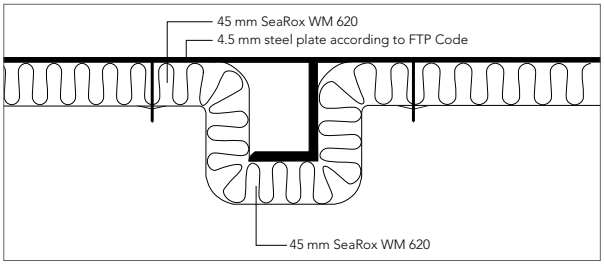
— Steel Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

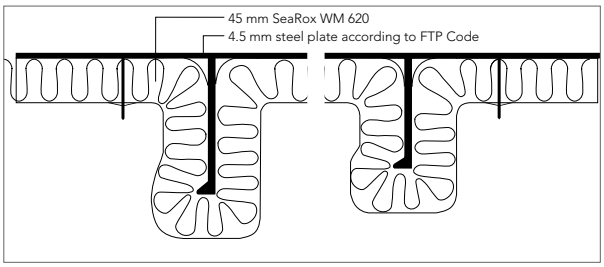
$R_w(C;C_{tr})$ = 46 (-2; -8) dB

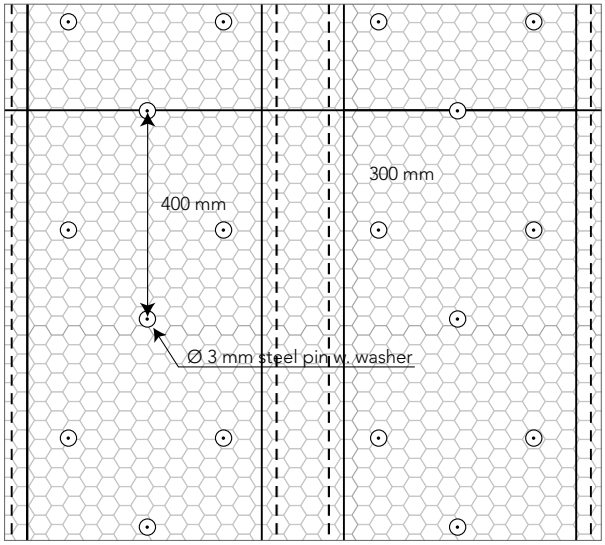
Sound absorption

Weighted sound absorption:
SeaRox WM 620, 45 mm, α_w = 0.90

Construction details







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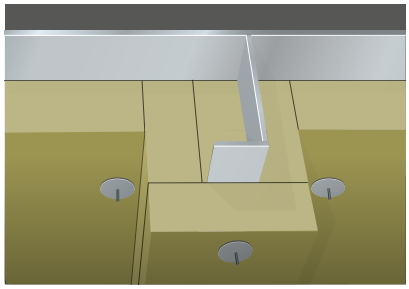
A-60 Steel Deck



	Product	Thickness	Density	Weight
Plate	SeaRox SL 640	40 mm	130 kg/m^3	5.2 kg/m^2
Stiffener	SeaRox SL 640	40 mm	130 kg/m^3	5.2 kg/m^2

Advantages

Construction notes

- Plate between stiffeners insulated with one layer of 40 mm SeaRox SL 640.
- Stiffeners insulated with 40 mm SeaRox SL 640.
- Ø 3 mm pins fixed with approx. 300 mm distance.
- Insulation secured with washers of Ø 38 mm.

Application notes

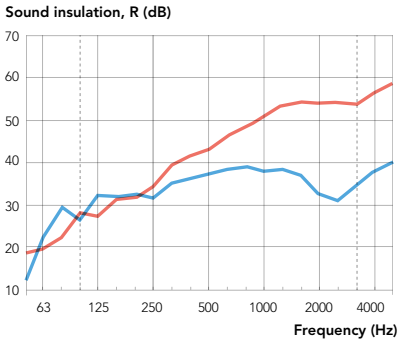
- All connections must be tight.
- Gap under the stiffener must be filled out completely.
- The pins should exceed the insulation by approx. 10 mm.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	18.7
63	19.7
80	22.5
100	28.1
125	27.5
160	31.8
200	32.1
250	35.2
315	39.8
400	41.9
500	43.0
630	46.4
800	48.4
1000	51.2
1250	53.7
1600	54.5
2000	54.4
2500	54.1
3150	53.7
4000	56.7
5000	59.3



— Test set-up: Plate /Stiffener: SeaRox SL 640, 40 mm

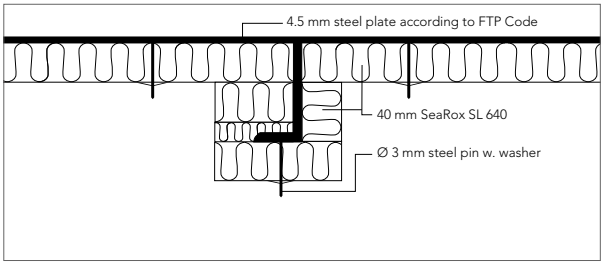
— Steel Bulkhead 1500 / 1880 / 6 mm Bulb profiles, 1820 / 140 / 10 mm (without insulation)

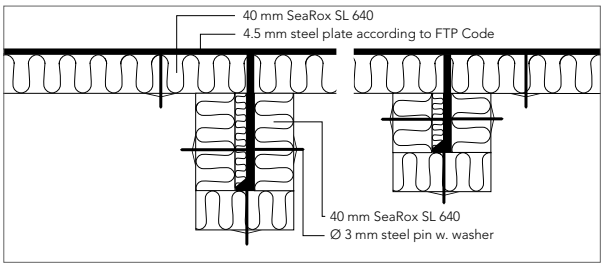
$R_w(C;C_{tr})$ = 47 (-2; -6) dB

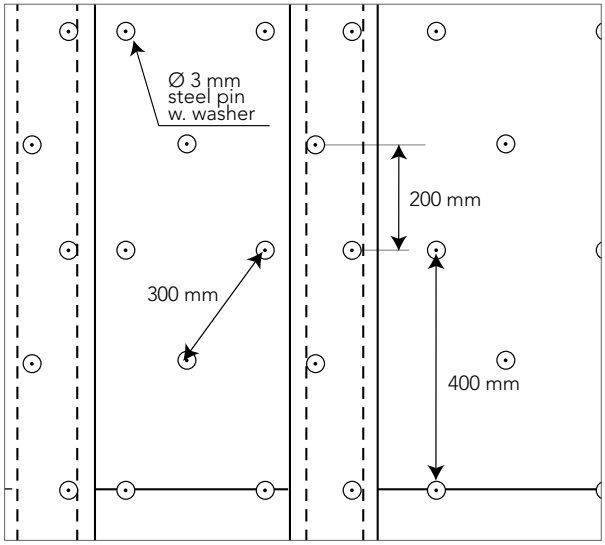
Sound absorption

Weighted sound absorption:
SeaRox SL 640, 40 mm, α_w = 0.90

Construction details







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Floating floor

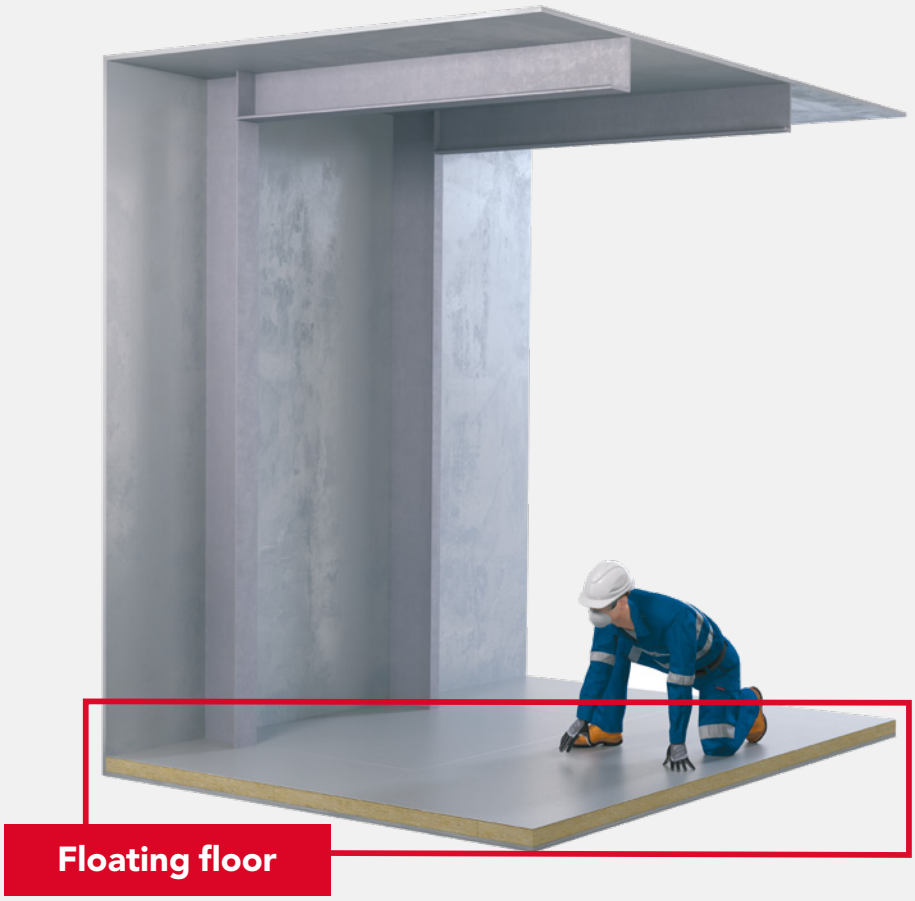
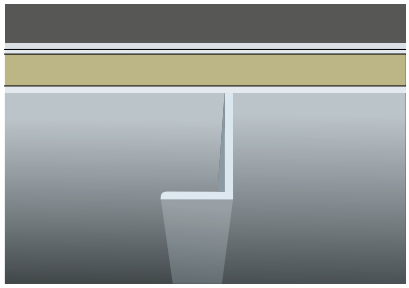


	Plate
A-60	SeaRox SL 436 / SeaRox SL 440 / SeaRox SL 480

A-60 Floating floor

	Product	Thickness	Density
Plate	SeaRox SL 436 SeaRox SL 440 SeaRox SL 480	60 mm	140-200 kg/m^3



Advantages

Construction notes

- The floor insulated with one or two layers of equal thickness and staggered joints with a total insulation thickness of minimum 60 mm of SeaRox SL 436, SeaRox SL 440 or SeaRox SL 480.
- Insulation covered by a 2 x 1.5 mm steel plate applied staggered and glued together with a two-component solvent-free glue (certified for low flame spread).

Application notes

- Do not step directly on the wool during installation. Always use a board or similar when moving around on the wool.
- It is recommended to disconnect surface steel plates from the steel bulkhead with a rigid ROCKWOOL product placed edgeways and sealed with a flexible sealant.

Covering

- The wool must be covered by at least two layers of 1.5 mm thick steel sheets glued together with butted joints.
- Indication for static load on insulation material:
  SeaRox SL 436: ≥ 12 kPa
  SeaRox SL 440: ≥ 30 kPa
  SeaRox SL 480: ≥ 40 kPa

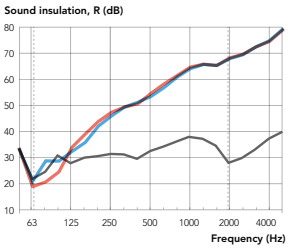
Sound reduction

SeaRox SL 436:
$R_w(C) = 55$ (-4) dB

f Frequency	R 1/3 Octave
Hz	dB
50	33.0
63	18.9
80	20.7
100	24.5
125	33.9
160	38.9
200	43.7
250	47.2
315	49.2
400	50.4
500	54.4
630	58.0
800	61.2
1000	64.4
1250	65.5
1600	65.0
2000	67.9
2500	69.3
3150	72.1
4000	74.1
5000	78.4

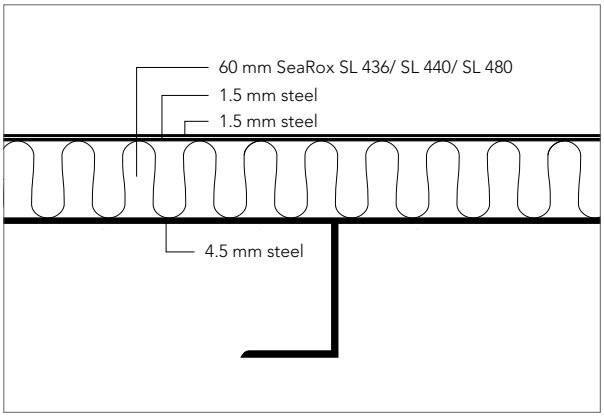
SeaRox SL 480:
$R_w(C) = 54$ (-2) dB

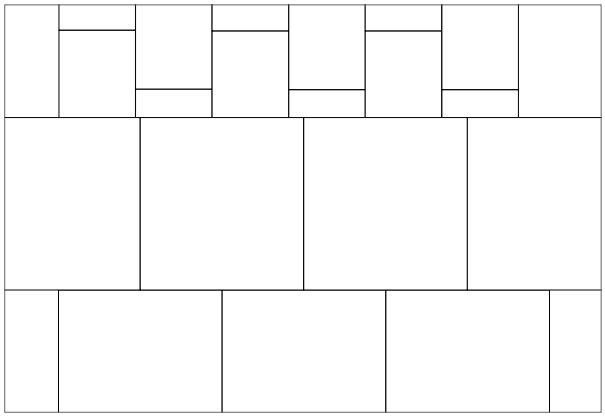
f Frequency	R 1/3 Octave
Hz	dB
50	33.0
63	20.9
80	28.7
100	28.6
125	32.3
160	35.7
200	41.9
250	45.8
315	49.2
400	51.0
500	53.2
630	56.6
800	60.6
1000	63.8
1250	65.4
1600	65.0
2000	67.6
2500	69.1
3150	72.1
4000	74.4
5000	78.7



- Test set-up: 6mm test deck, 60mm SeaRox SL 436, 2x1.5mm steel plate
- Test set-up: 6mm test deck, 2x30mm SeaRox SL 480, 2x1.5mm steel plate
- Reference deck

Construction details





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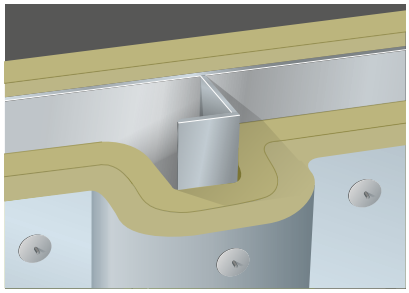
A-constructions
Aluminium Bulkhead & Deck

		Plate	Stiffener
LIGHTWEIGHT	A-60 Bulkhead, 6mm	SeaRox FM 6040	SeaRox FM 6040
	A-60 Bulkhead restricted, 6 mm	SeaRox FM 6040	SeaRox FM 6040
	A-60 Deck, 6 mm	SeaRox FM 6040	SeaRox FM 6040
	A-60 Bulkhead, 4 mm	SeaRox FB or FM 6050	SeaRox FB or FM 6050
	A-60 Bulkhead restricted, 4 mm	SeaRox FB or FM 6050	SeaRox FB or FM 6050
	A-60 Deck, 4 mm	SeaRox FB or FM 6050	SeaRox FB or FM 6050
STANDARD	A-60 Bulkhead, 6mm	SeaRox SL 620	SeaRox SL 620
	A-60 Deck, 6 mm	SeaRox SL 620	SeaRox SL 620

A-60 Aluminium Bulkhead 6 mm



	Product	Thickness	Density	Weight
Plate	SeaRox FM 6040 ALU	2 x 35 mm*	60 kg/m^3	4.2 kg/m^2
Stiffener	SeaRox FM 6040 ALU	2 x 35 mm	60 kg/m^3	4.2 kg/m^2

* insulation of both sides of aluminium plate

Advantages

Construction notes

- Aluminium plate and stiffeners insulated with two layers of min. 35 mm SeaRox FM 6040 ALU. Both stiffener side and non stiffener side to be insulated.
- Ø 3 mm aluminium-tipped stainless steel pins fixed with max. 300 mm distance.
- Insulation secured with Ø 38 mm stainless steel spring washers.

Application notes

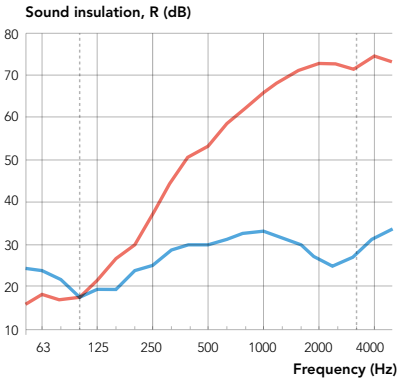
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Joints must be staggered according to test drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	15.7
63	18.4
80	16.8
100	17.3
125	21.5
160	26.7
200	30.0
250	37.5
315	44.9
400	50.6
500	53.5
630	58.4
800	61.9
1000	65.7
1250	68.7
1600	71.0
2000	72.7
2500	72.5
3150	71.3
4000	74.5
5000	73.1

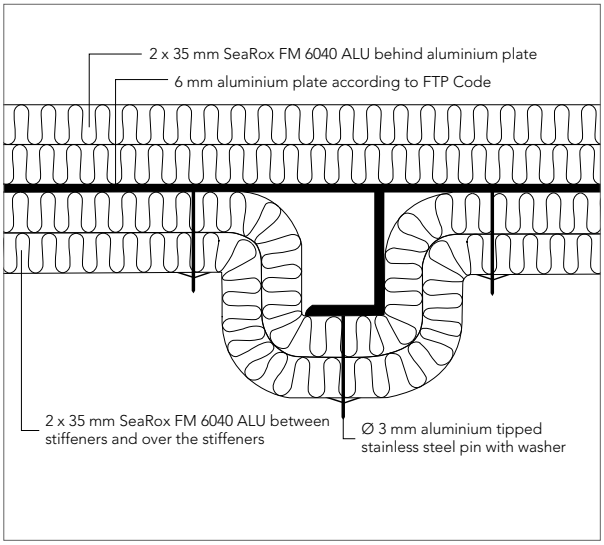


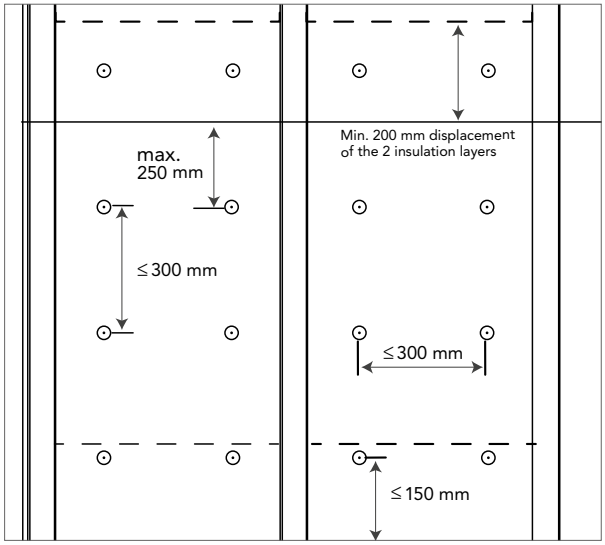
— Test set-up:
Plate: SeaRox FM 6040 ALU, 2 x 35 mm
Stiffener: SeaRox FM 6040 ALU, 2 x 35 mm

— Aluminium Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

$R_w(C;C_{tr})$ = 46 (-4; -11) dB

Construction details





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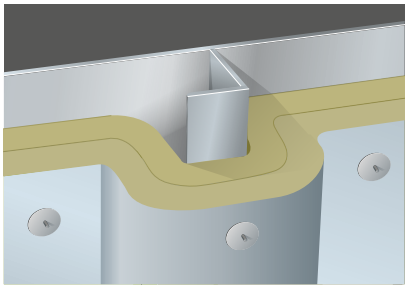
A-60 Aluminium Bulkhead, restricted 6 mm



	Product	Thickness	Density	Weight
Plate	SeaRox FM 6040 ALU	2 x 35 mm	60 kg/m^3	4.2 kg/m^2
Stiffener	SeaRox FM 6040 ALU	2 x 35 mm	60 kg/m^3	4.2 kg/m^2

Advantages

Construction notes

- Aluminium plate and stiffeners insulated with two layers of min. 35 mm SeaRox FM 6040 ALU.
- Ø 3 mm aluminium-tipped stainless steel pins fixed with max. 300 mm distance.
- Insulation secured with Ø 38 mm stainless steel spring washers.

Application notes

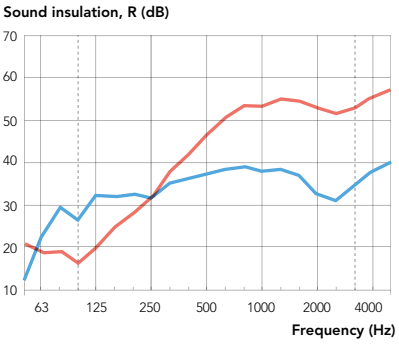
- Restricted application (fire against insulated side).
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Joints must be staggered according to test drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	21.1
63	18.9
80	19.3
100	16.6
125	20.2
160	25.5
200	28.3
250	32.1
315	38.2
400	42.5
500	46.6
630	51.1
800	53.2
1000	53.5
1250	54.6
1600	54.5
2000	52.7
2500	51.9
3150	52.6
4000	55.5
5000	57.5

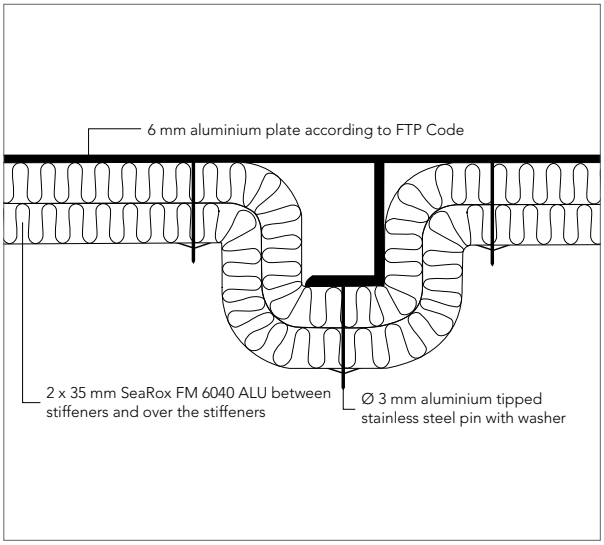


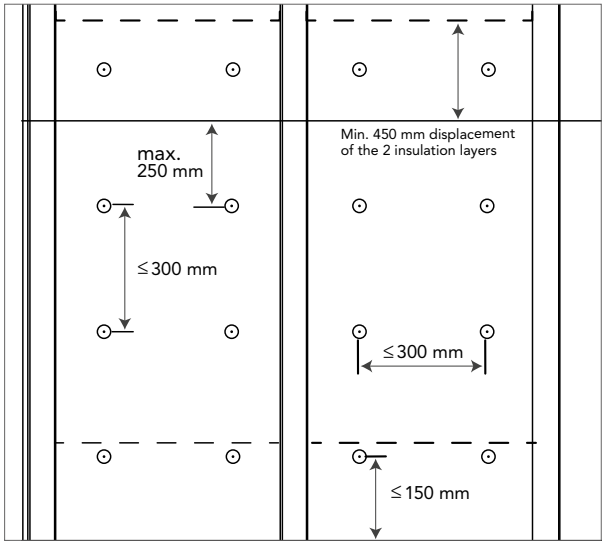
— Test set-up:
Plate: SeaRox FM 6040 ALU, 2 x 35 mm
Stiffener: SeaRox FM 6040 ALU, 2 x 35 mm

— Aluminium Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

$R_w(C;C_{tr})$ = 43 (-3; -9) dB

Construction details





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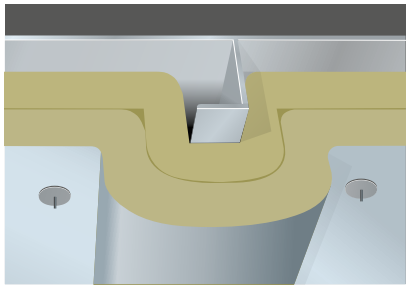
A-60 Aluminium Deck 6 mm



	Product	Thickness	Density	Weight
Plate	SeaRox FM 6040 ALU	2 x 35 mm	60 kg/m^3	4.2 kg/m^2
Stiffener	SeaRox FM 6040 ALU	2 x 35 mm	60 kg/m^3	4.2 kg/m^2

Advantages

Construction notes

- Aluminium plate and stiffeners insulated with two layers of min. 35 mm SeaRox FM 6040 ALU.
- Ø 3 mm aluminium-tipped stainless steel pins fixed with max. 300 mm distance.
- Insulation secured with Ø 38 mm stainless steel spring washers.

Application notes

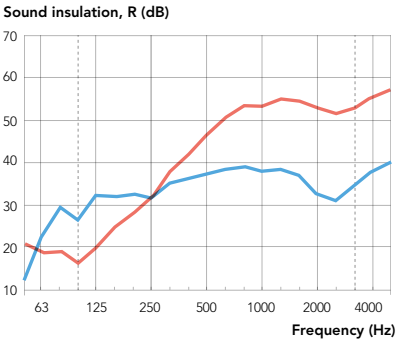
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.
- Joints must be staggered according to test drawings.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency Hz	R 1/3 Octave dB
50	21.1
63	18.9
80	19.3
100	16.6
125	20.2
160	25.5
200	28.3
250	32.1
315	38.2
400	42.5
500	46.6
630	51.1
800	53.2
1000	53.5
1250	54.6
1600	54.5
2000	52.7
2500	51.9
3150	52.6
4000	55.5
5000	57.5

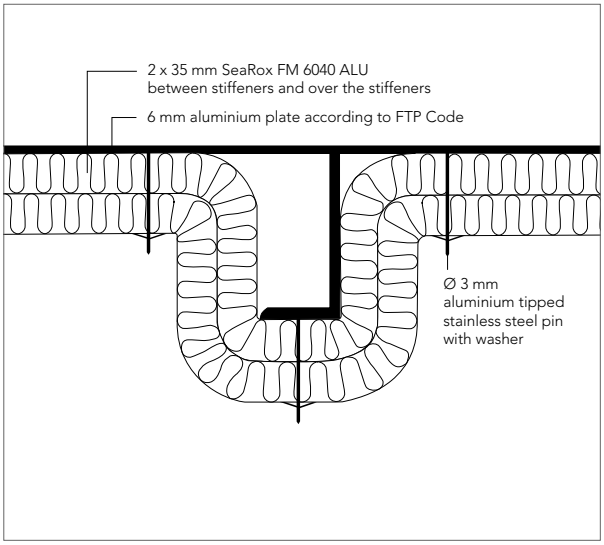


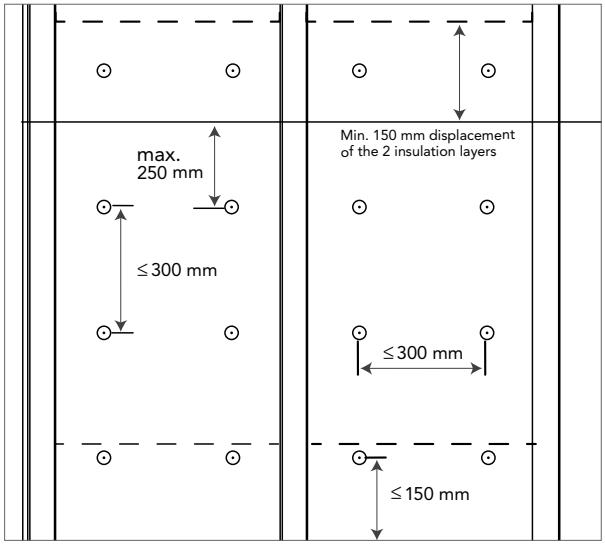
— Test set-up:
Plate: SeaRox FM 6040 ALU, 2 x 35 mm
Stiffener: SeaRox FM 6040 ALU, 2 x 35 mm

— Aluminium Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

$R_w(C;C_{tr})$ = 43 (-3; -9) dB

Construction details





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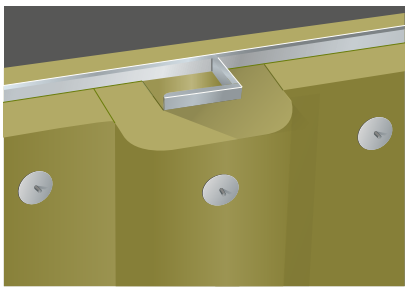
A-60 Aluminium Bulkhead 4 mm



	Product	Thickness	Density	Weight
Plate	SeaRox FM 6050 ALU*	75 mm**	70 kg/m^3	5.3 kg/m^2
Stiffener	SeaRox FM 6050 ALU*	75 mm	70 kg/m^3	5.3 kg/m^2

* alternative product SeaRox FB 6050 ** insulation on both sides of alu plate

Advantages

Construction notes

- Aluminium plate and stiffeners insulated with one layer of 75 mm SeaRox FM 6050 ALU or SeaRox FB 6050.
- Fire test on 70 mm insulation thickness, approved for 75 mm.
- Ø 3 mm aluminium-tipped stainless steel pins fixed with max 300 mm distance.
- Insulation secured with Ø 38 mm stainless steel spring washers.

Application notes

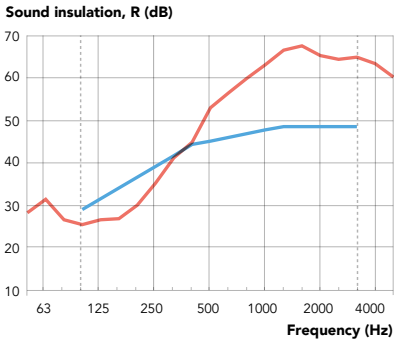
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	21.2
63	24.9
80	19.2
100	17.9
125	19.2
160	19.6
200	23.2
250	29.4
315	36.3
400	40.7
500	50.1
630	54.3
800	58.4
1000	62.0
1250	66.1
1600	67.2
2000	64.6
2500	63.5
3150	64.1
4000	62.4
5000	58.7

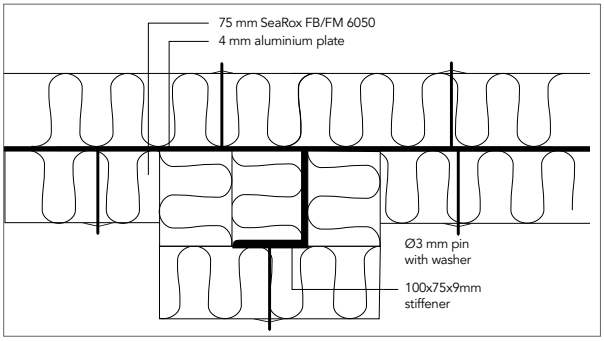


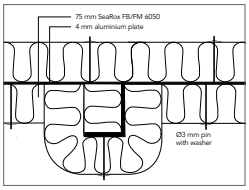
— Test set-up:
Plate (4mm): SeaRox FB 6050, 75 mm (both sides of alu plate), Stiffener (140x10 mm): SeaRox FB 6050, 75 mm

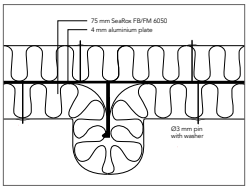
— Alu Bulkhead: 1500 / 1180 / 4 mm
Bulp profile: 1820 / 140 / 10 mm (without insulation)

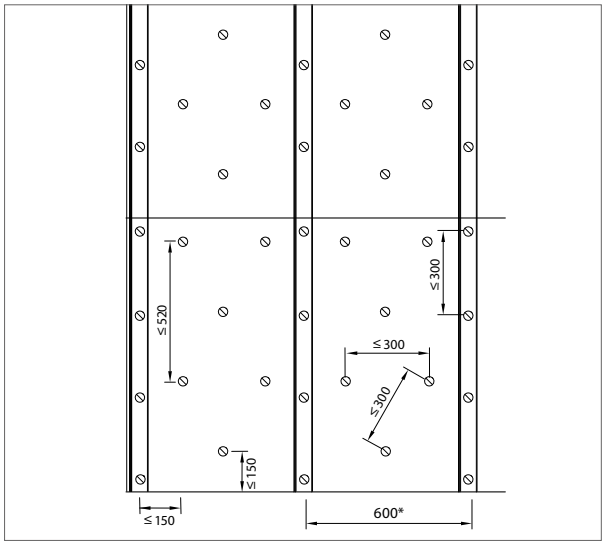
$R_w(C;C_{tr})$ = 41 (-3; -9) dB

Construction details









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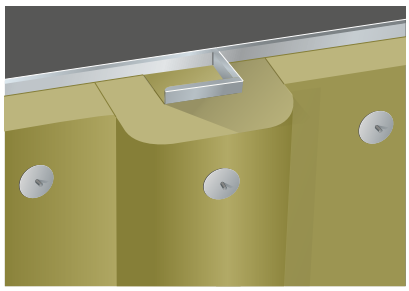
A-60 Aluminium Bulkhead, restricted 4 mm



	Product	Thickness	Density	Weight
Plate	SeaRox FM 6050 ALU*	75 mm	70 kg/m^3	5.3 kg/m^2
Stiffener	SeaRox FM 6050 ALU*	75 mm	70 kg/m^3	5.3 kg/m^2

* alternative product SeaRox FB 6050

Advantages

Construction notes

- Aluminium plate and stiffeners insulated with one layer of 75 mm SeaRox FM 6050 ALU or SeaRox FB 6050
- Ø 3 mm aluminium-tipped stainless steel pins fixed with max 300 mm distance
- Insulation secured with Ø 38 mm stainless steel spring washers

Application notes

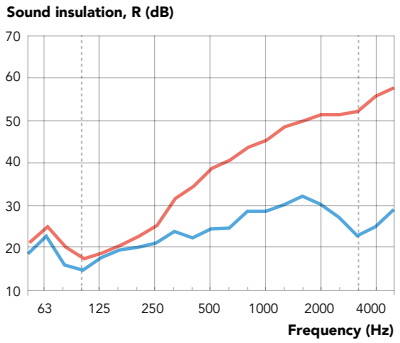
- All connections must be tight
- The pins should exceed the insulation by approx. 10 mm.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	21.3
63	25.0
80	20.3
100	17.6
125	18.9
160	20.8
200	22.8
250	25.4
315	31.6
400	34.4
500	38.6
630	40.5
800	43.5
1000	45.1
1250	48.3
1600	49.5
2000	51.0
2500	51.1
3150	51.8
4000	55.3
5000	57.3

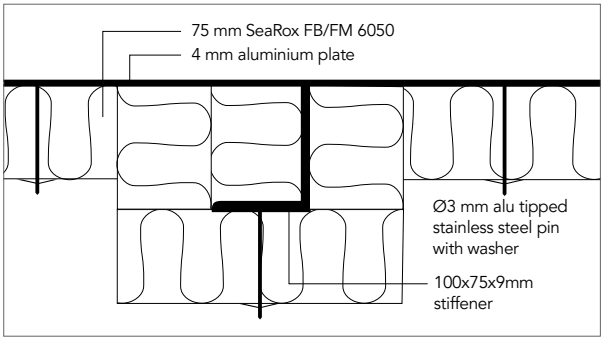


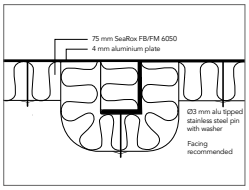
Test set-up:
Plate: SeaRox FB 6050, 75 mm
Stiffener: SeaRox FB 6050, 75 mm

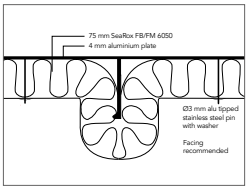
Alu Bulkhead: 1500 / 1180 / 4 mm
Bulb profile: 1820 / 140 / 10 mm (without insulation)

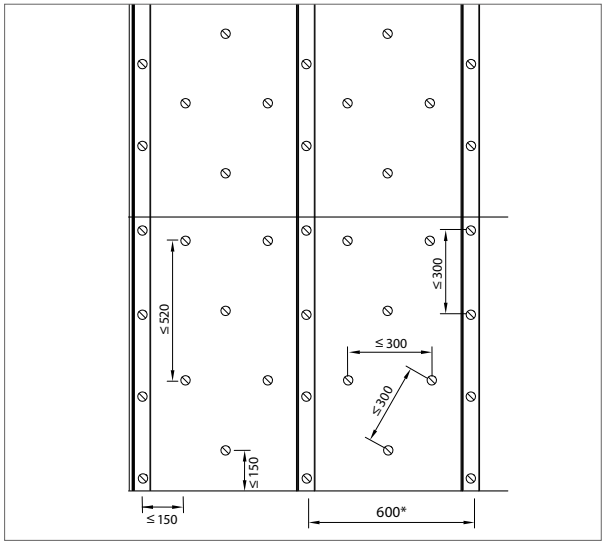
$R_w(C;C_{tr})$ = 39 (-3; -8) dB

Construction details









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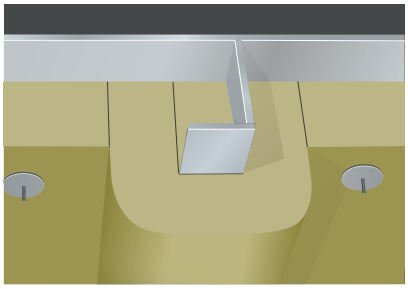
A-60 Aluminium Deck 4 mm



	Product	Thickness	Density	Weight
Plate	SeaRox FM 6050 ALU*	75 mm	70 kg/m^3	5.3 kg/m^2
Stiffener	SeaRox FM 6050 ALU*	75 mm	70 kg/m^3	5.3 kg/m^2

* alternative product SeaRox FB 6050

Advantages

Construction notes

- Aluminium plate and stiffeners insulated with one layer of 75 mm SeaRox FM 6050 ALU or SeaRox FB 6050
- Ø 3 mm aluminium tipped stainless steel pins fixed with max 300 mm distance
- Insulation secured with Ø 38 mm stainless steel spring washers

Application notes

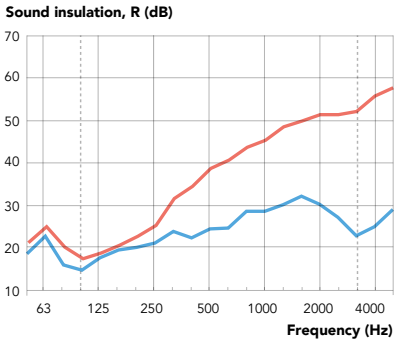
- All connections must be tight.
- The pins should exceed the insulation by approx. 10 mm.

Optional surface (on request)

- Reinforced aluminium foil.
- Glass cloth.

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	21.3
63	25.0
80	20.3
100	17.6
125	18.9
160	20.8
200	22.8
250	25.4
315	31.6
400	34.4
500	38.6
630	40.5
800	43.5
1000	45.1
1250	48.3
1600	49.5
2000	51.0
2500	51.1
3150	51.8
4000	55.3
5000	57.3

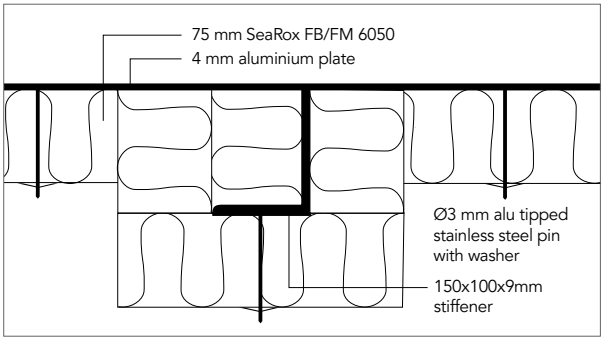


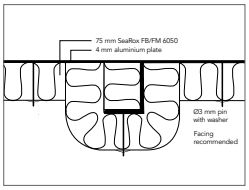
— Test set-up:
Plate: SeaRox FB 6050, 75 mm
Stiffener: SeaRox FB 6050, 75 mm

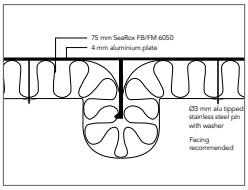
— Alu Bulkhead: 1500 / 1180 / 4 mm
Bulb profile: 1820 / 140 / 10 mm
(without insulation)

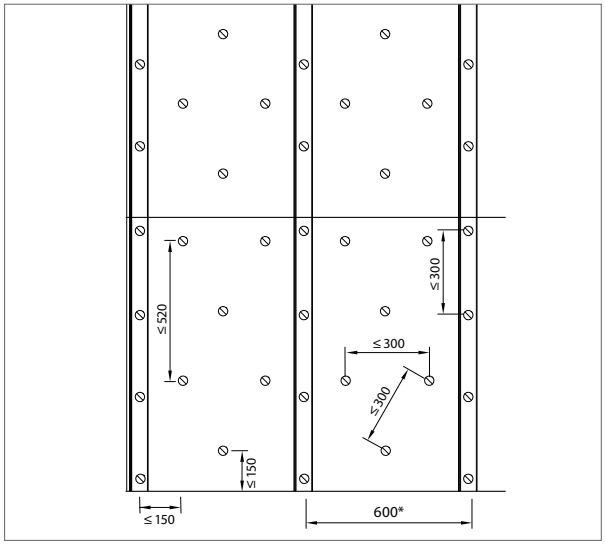
$R_w(C;C_{tr})$ = 39 (-3; -8) dB

Construction details



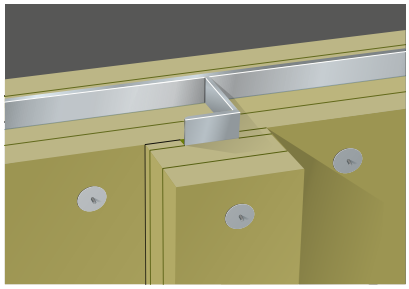






Certification: Check rti.rockwool.com for latest update

A-60 Aluminium Bulkhead 6 mm



	Product	Thickness	Density	Weight
Plate	SeaRox SL 620	2 x 30 mm*	100 kg/m^3	6.0 kg/m^2
Stiffener	SeaRox SL 620	2 x 30 mm	100 kg/m^3	6.0 kg/m^2

* insulation of both sides of aluminium plate

Advantages

Construction notes

- Stiffeners insulated with two layers of min. 30 mm SeaRox SL 620.
- Plate between stiffeners insulated with two layers of 30 mm SeaRox SL 620. Insulation on both sides of the aluminium plate.
- Ø 3 mm aluminium-tipped stainless steel pins fixed with approx. 300 mm distance.
- Insulation secured with stainless steel washers of Ø 38 mm.

Application notes

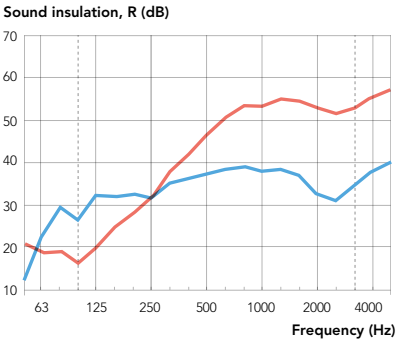
- All the connections must be tight.
- Gap under the stiffener must be filled out completely.
- Joints must be staggered, 150 mm overlap is recommended.

Optional surface (on request)

- Reinforced aluminium foil
- Glass cloth

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	13.2
63	16.8
80	18.0
100	18.1
125	16.8
160	20.1
200	23.2
250	29.5
315	35.1
400	40.7
500	45.6
630	49.3
800	52.6
1000	55.8
1250	58.0
1600	59.6
2000	61.0
2500	58.9
3150	56.4
4000	59.1
5000	59.5



— Test set-up:
Plate: SeaRox SL 620, 2 x 30 mm
Stiffener: SeaRox SL 620, 2 x 30 mm

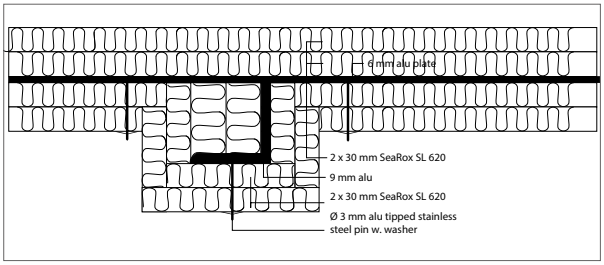
— Aluminium Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

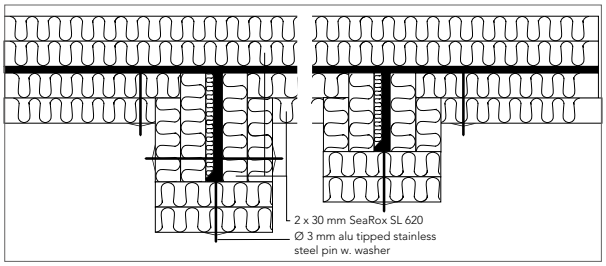
$R_w(C;C_{tr})$ = 40 (-3; -8) dB

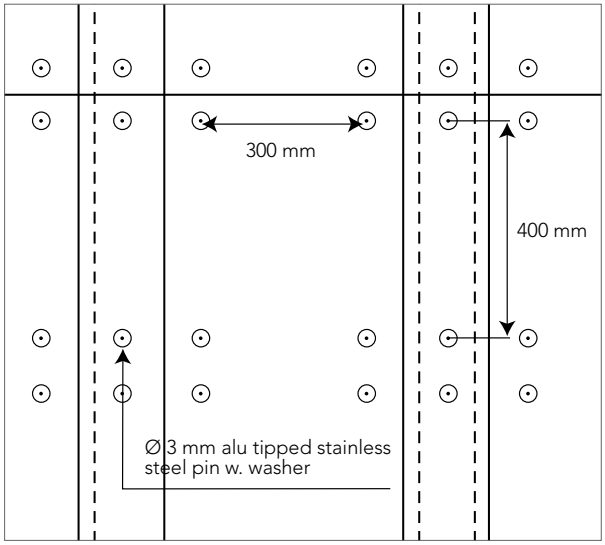
Sound absorption

Weighted sound absorption:
SeaRox SL 620, 60 mm:, α_w = 0.90

Construction details

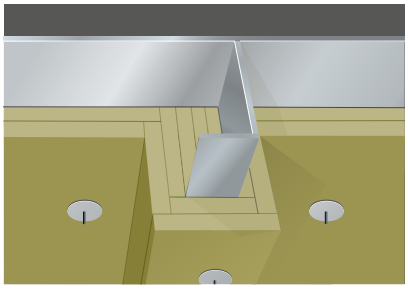






Certification: Check rti.rockwool.com for latest update

A-60 Aluminium Deck 6 mm



	Product	Thickness	Density	Weight
Plate	SeaRox SL 620	2 x 30 mm	100 kg/m^3	6.0 kg/m^2
Stiffener	SeaRox SL 620	2 x 30 mm	100 kg/m^3	6.0 kg/m^2

Advantages

Construction notes

- Stiffeners insulated with two layers of 30 mm SeaRox SL 620.
- Plate between stiffeners insulated with two layers of 30 mm SeaRox SL 620.
- Ø 3 mm aluminium-tipped stainless steel pins fixed with approx. 300/400 mm distance.
- Insulation secured with stainless steel washers of Ø 38 mm.

Application notes

- All the connections must be tight.
- Gap under the stiffener must be filled out completely.
- Joints must be staggered, 150 mm overlap is recommended.
- The pins should exceed the insulation by approx. 10 mm.

Optional surface (on request)

- Reinforced aluminium foil
- Glass cloth

Sound reduction

f Frequency	R 1/3 Octave
Hz	dB
50	12.4
63	16.3
80	19.6
100	18.5
125	19.9
160	21.5
200	23.0
250	30.0
315	32.7
400	36.2
500	40.4
630	43.8
800	47.6
1000	50.9
1250	53.8
1600	55.6
2000	55.2
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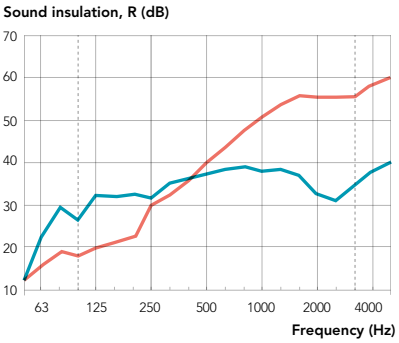
4000	58.4
5000	59.6



Test set-up:
Plate: SeaRox SL 620, 2 x 30 mm
Stiffener: SeaRox SL 620, 2 x 30 mm

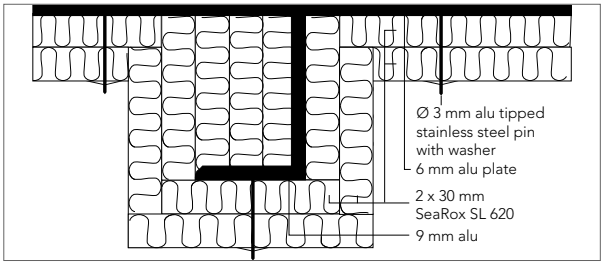
Aluminium Bulkhead 1500 / 1880 / 6 mm
Bulb profiles, 1820 / 140 / 10 mm
(without insulation)

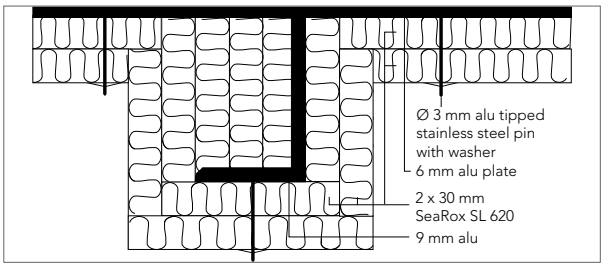
$R_w(C;C_{tr})$ = 40 (-2; -7) dB

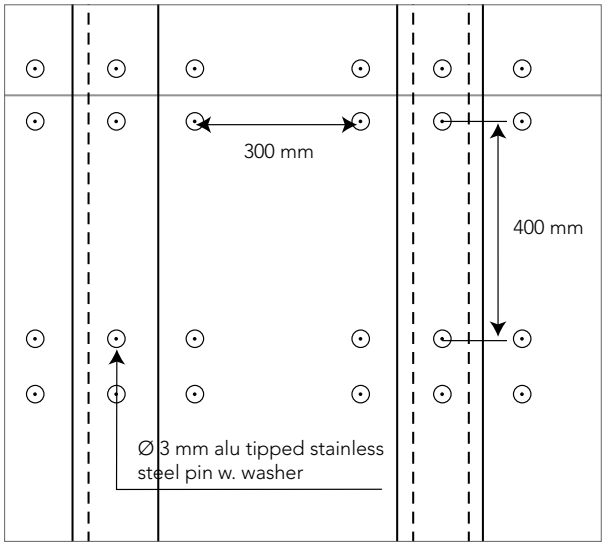
Sound absorption

Weighted sound absorption:
SeaRox SL 620, 60 mm:, α_w = 0.90

Construction details







Certification: Check rti.rockwool.com for latest update

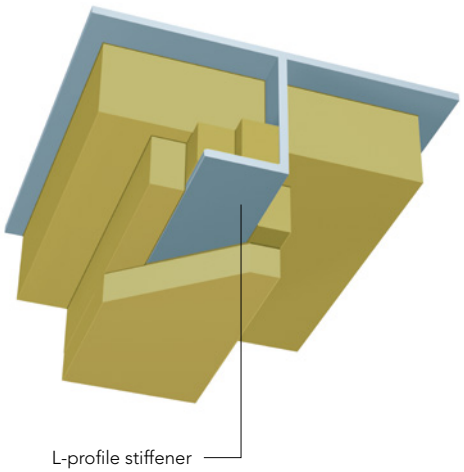
Stiffeners

Stiffeners are used in most bulkhead and deck constructions to give them the strength they need. To prevent heat transmission, it is important that the stiffener is insulated correctly.

As part of the development of our lightweight range for A-class constructions, we have developed a set of guidance to standardise and optimise the insulation of stiffeners.

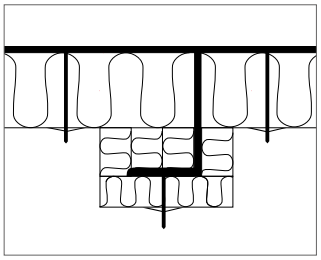
Typically, the details are approved by the classification society and included as reference in our certificates.

In this section you will find a description of the main principles. For detailed design, check specific certificate and related drawings.

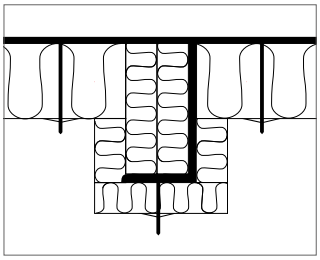


L-profile stiffener

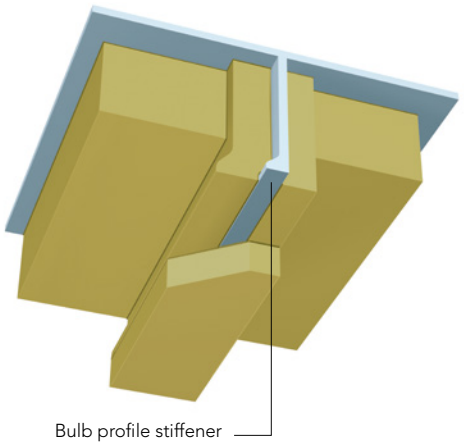
An alternative design can be used, depending on the product and construction:



Insulation of L-profile, with SeaRox SL 620

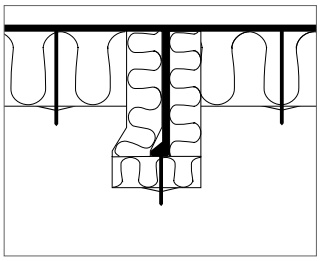


Insulation of L-profile, with SeaRox SL 620

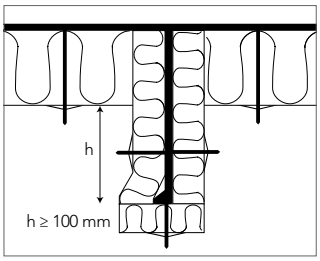


Bulb profile stiffener

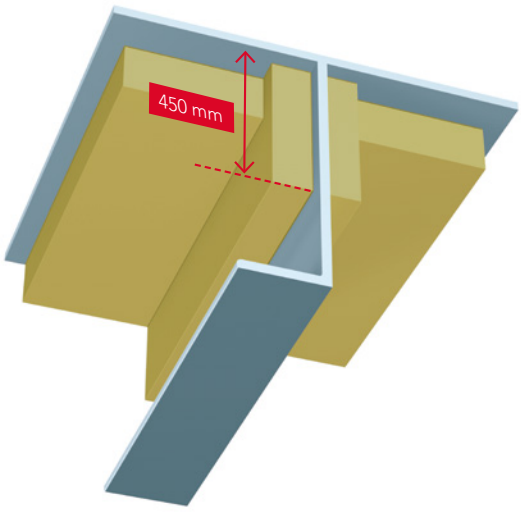
The insulation of the bulb-profile stiffener typically follows the profile and is fixed depending on the length of the profile as shown below:



Insulation of Bulb profile, with SeaRox SL 620

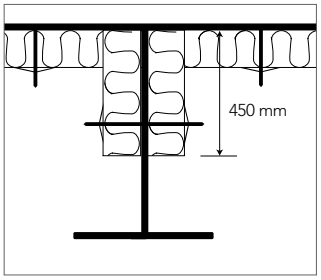


Insulation of Bulb profile, with SeaRox SL 620

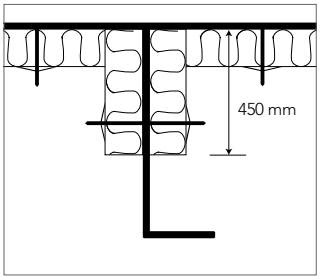


Profile > 450 mm

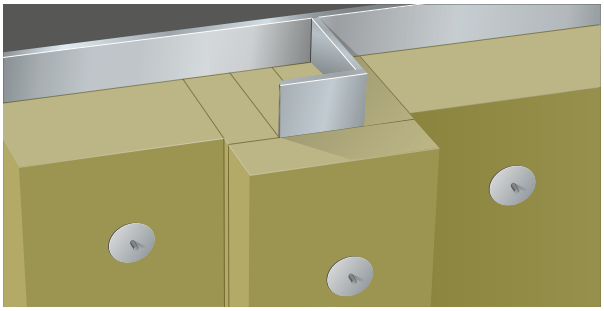
If the stiffener depth is more than 450 mm, the insulation can be stopped at 450 mm. The procedure for insulation of stiffeners should be approved by a local surveyor.



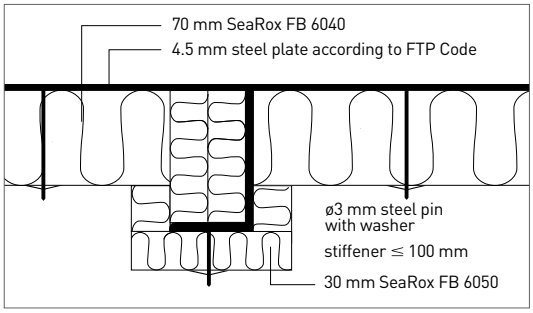
Insulation of stiffener with SeaRox SL 620



Insulation of stiffener with SeaRox SL 620

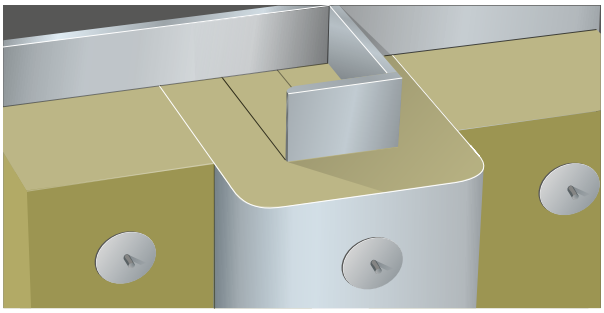


- Easy handling
- Soft and flexible slabs
- Optimal visual appearance

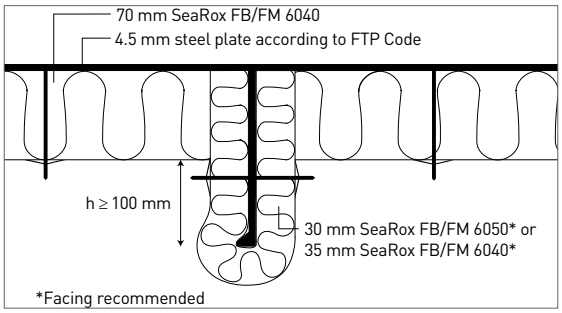


Standard slab design – box concept

Insulation with SeaRox FB 6040 on the plate and around the stiffeners.



- Fast installation
- No open gaps
- Reduced cut-off waste
- Alternative use of FB or FM



Insulation of stiffeners with "hybrid solution" alternative 1 – wrap concept

Insulation with SeaRox FM 6040 around the stiffeners and SeaRox FB or FM 6040 on the plate

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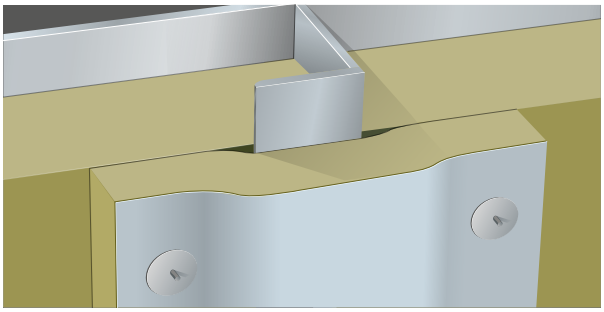
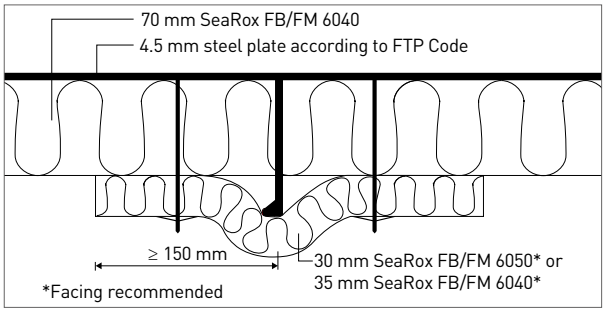


- Fast installation
- Reduced cut-off waste
- Less pins
- Safer (no pins on stiffeners)



Insulation of stiffeners with "hybrid solution" alternative 2 – quick cover concept

Insulation with SeaRox FB or FM 6040 between the stiffeners and SeaRox FM 6040 on top of the stiffeners

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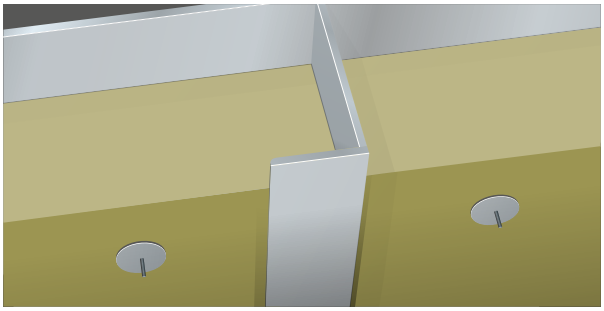
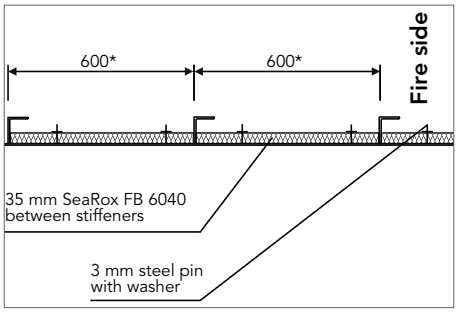


- Fast installation
- Thin insulation
- Alternative use of FB of FM
- Only valid for A-15 application



No insulation on stiffeners

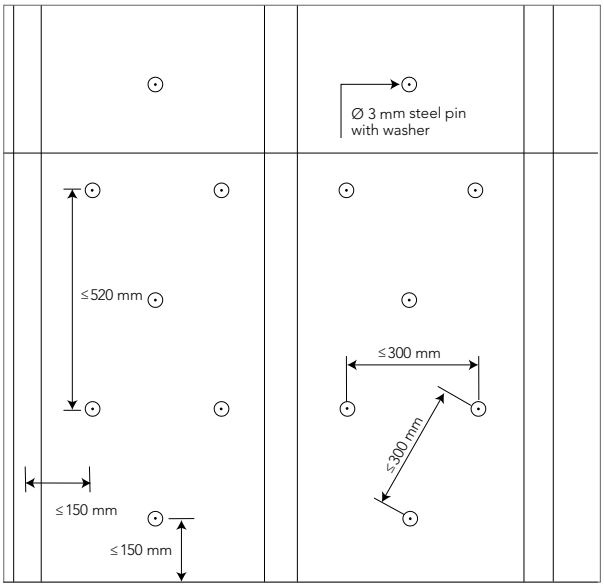
Insulation only on steel plate – only valid for A-15 application

Pin pattern

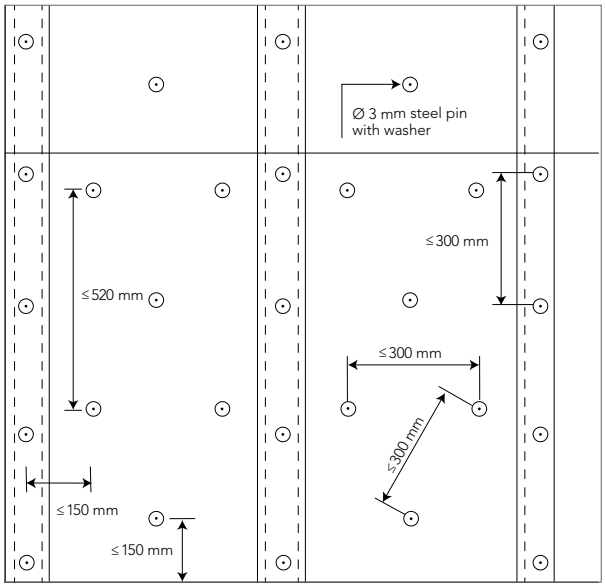
For all our lightweight constructions tested in accordance with IMO FTP Code 2010, the following alternative standard pin patterns are approved.

Option A: Diagonal pattern

No insulation on stiffener or insulation with mats/rolls

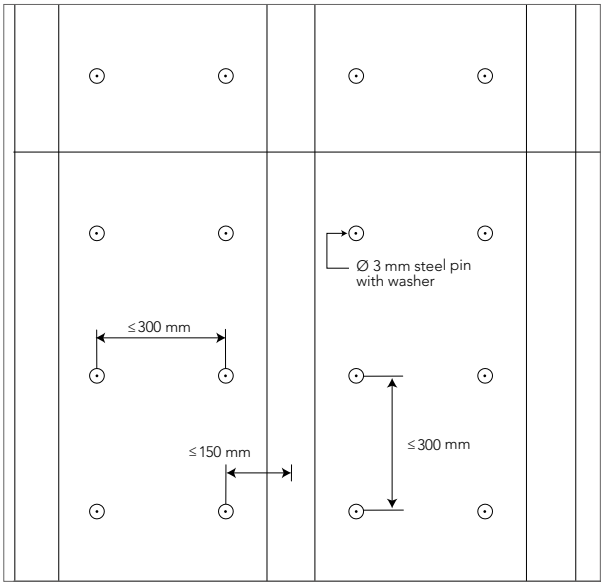


Insulation with slabs on stiffener

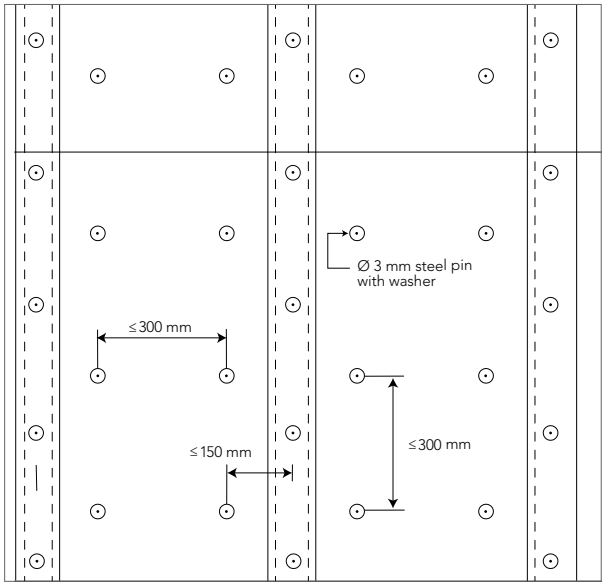


Option B: Square pattern

No insulation on stiffener or insulation with mats/rolls

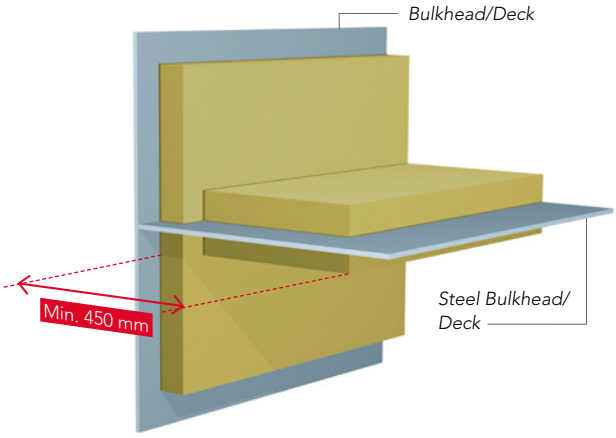


Insulation with slabs on stiffener



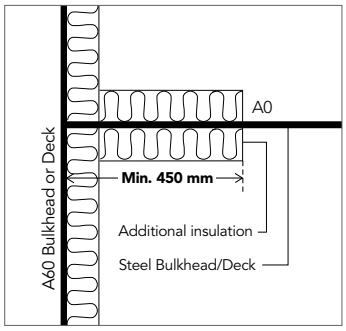
Bulkhead and deck connections

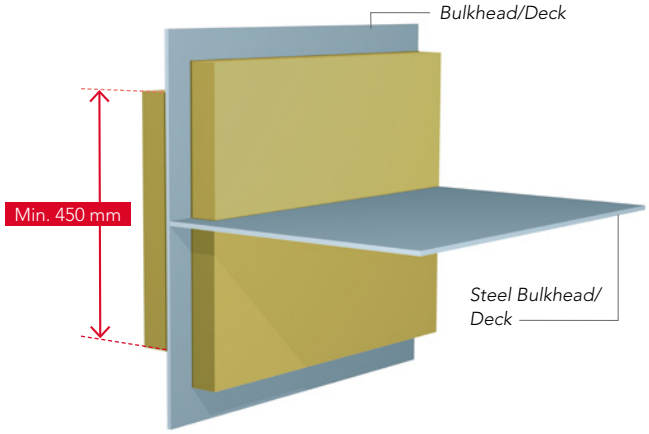
When two plates are connected in a corner, the heat bridge/thermal transmission should always be kept in mind when insulating. The structure must have insulation so that heat cannot be transferred from one uninsulated and fire exposed surface through the structure to another uninsulated A-class rated surface. The heat must always go at least 450 mm below the insulation before reaching an uninsulated A-class rated surface surface (acc. to SOLAS MSC/circ. 1120 annex reg. 9.3.4).



Deck and bulkhead connection 1

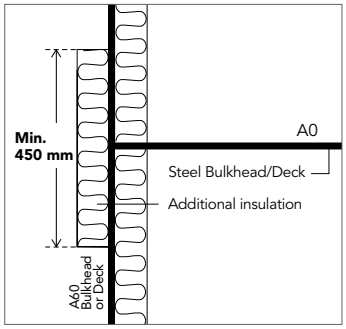
Connections between A-60 and A-0 constructions should be insulated by adding a layer of A-60 insulation to the A-0 construction in a minimum width of 450 mm. This minimises the effect of the heat bridge.



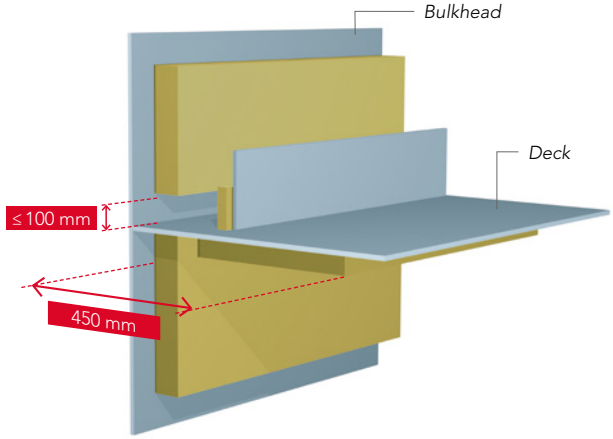


Deck and bulkhead connection 2

Another alternative way to insulate the heat bridge is to install at least 450 mm* of insulation on the other side of the construction. This will reduce the transferred heat and so minimise the risk of self-ignition inside the connecting room.

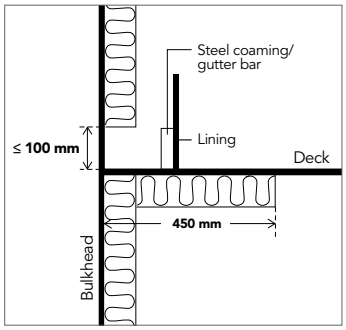


** ROCKWOOL recommends 900 mm to secure that the heat always goes min. 450 mm below the insulation before reaching an unexposed surface.*



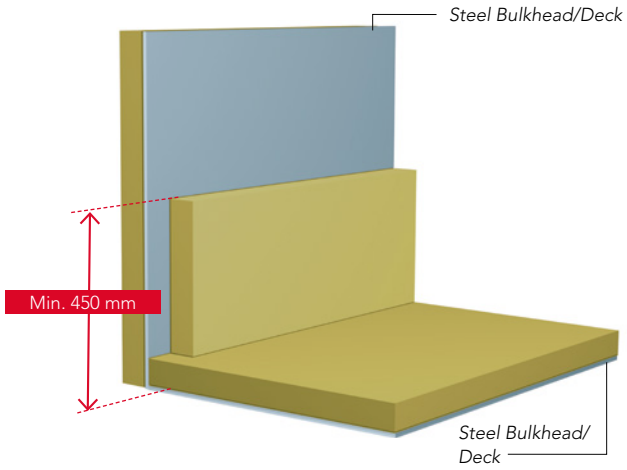
Floor connection

This floor connection is relevant in relation to the A-class insulation of a cold (outer) bulkhead, where water vapour may condense on the interior cold steel in case of defects in the vapour barrier. The water can be collected and either drained or evaporate from the gutter. (Ref. IMO MSC.1/ Circ.1510)



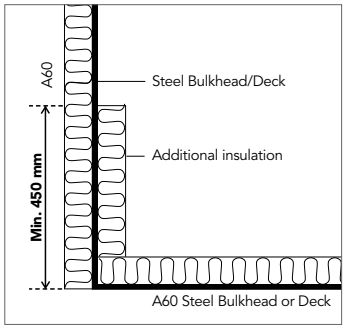
In relation to MSC.1/Circ. 1510, the following floor connection is clarified. Lining and steel coaming/gutter bar are for accommodation spaces only. Only for steel constructions.

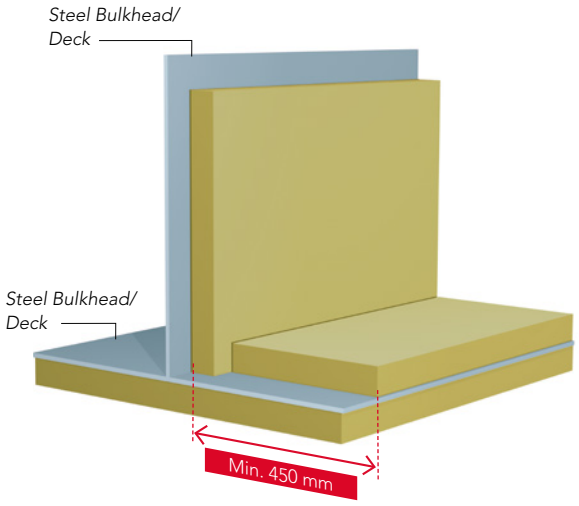
In connection with insulation, it is important to pay special attention to the details related to junctions, corners etc. in order to avoid potential heat bridges. Examples of construction details are provided below:



Corner example

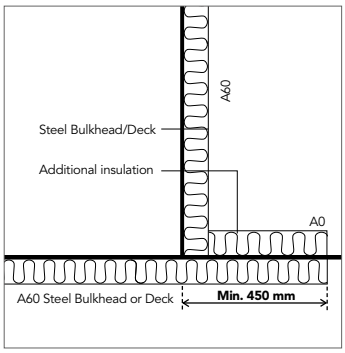
Insulation on either side of Bulkhead/Deck

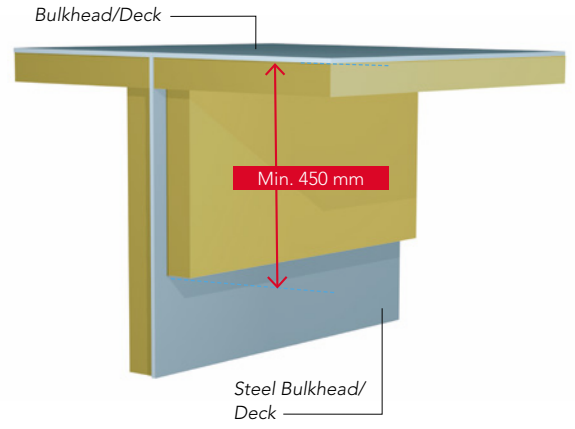




Junction example 1

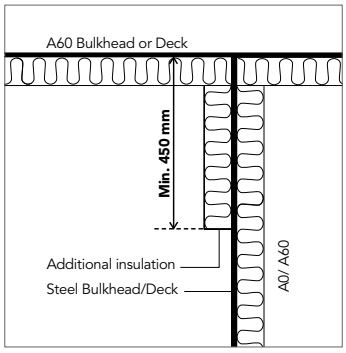
Insulation on the outside of Bulkhead/Deck





Junction example 2

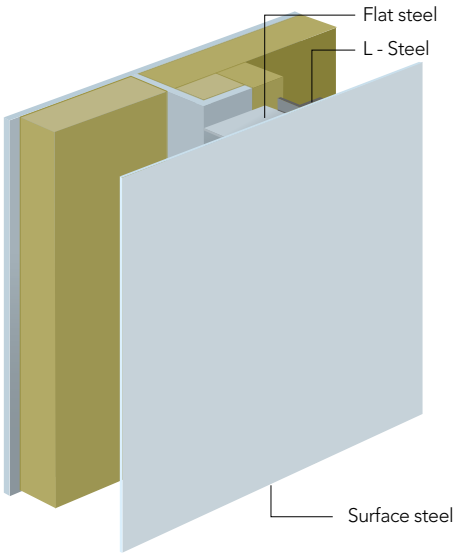
Insulation on the inside of Bulkhead/Deck

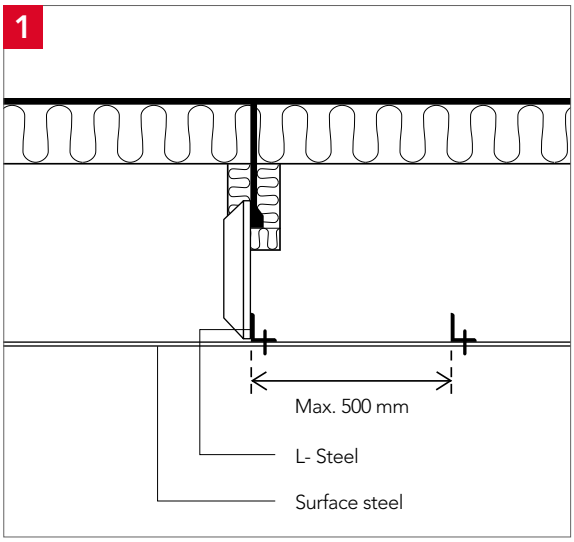


Installation of surface steel plate

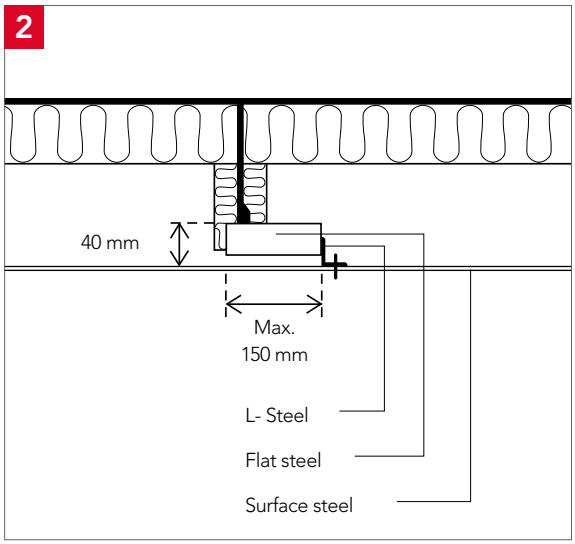
A surface protection of sheet metal can be installed in different ways, depending on the layout of the stiffeners and the amount of insulation.

It is important to fix it in a way that minimises heat bridges and structural noise transmission from the hull.

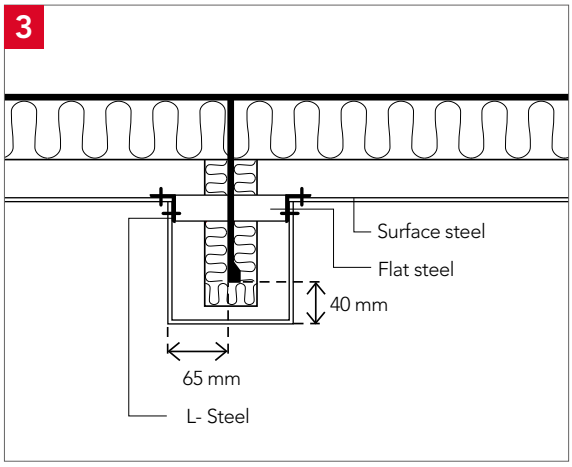




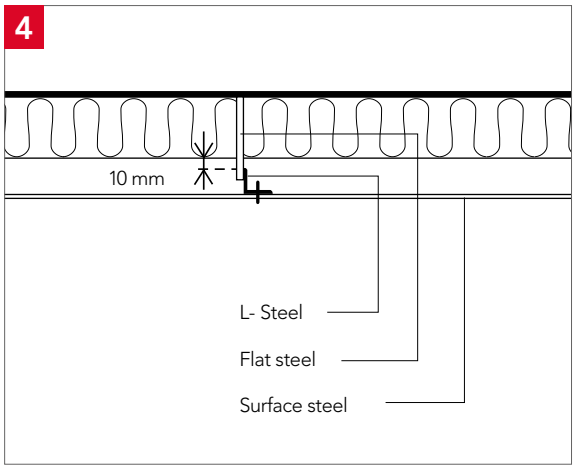
Fixing of surface steel where space is needed for pipes etc.



Fixing of surface steel as close to the steel plate as possible.



Fixing of surface steel taking large stiffeners into consideration.



Fixing of surface with no stiffeners or stiffeners on the other side of steel plate.

Draught stops

Draught stops are divisions installed between ceilings or linings and the ship's structure. The purpose of draught stops is to prevent the spread of smoke and flames in concealed spaces.

SOLAS chapter II, Part C, regulation 8 (control of smoke spread) states that: "air spaces enclosed behind ceilings, panelling or linings shall be divided by close-fitting draught stops spaced not more than 14 m apart. In the vertical direction, such enclosed air spaces, including those behind linings of stairways, trunks, etc., shall be closed at each deck".

MSC/Circ. 1120, 2004 explains the construction and location in more detail and, among other things, recommends the use of non-combustible mineral wool insulation, not less than 20 mm in thickness, faced on each side with expanded metal mesh, the mesh on one side being attached to the ship's structure. Alternatively, expanded metal mesh may be fitted on one side and non-combustible cloth (glass cloth) on the other side of mineral wool insulation.

Other equivalent arrangements may be accepted. ROCKWOOL's range of SeaRox slabs or wired mats may be perfectly suited for this application, depending on the preferred draught stop installation method of the shipyard.

Occasionally, there will be a requirement that the draught stop or panel extension is also of B-0 class.

The ROCKWOOL recommendation for a class B-0 draught stop, based on the IMO rules, is as follows:

Construction

- SeaRox WM 640, min. 50 mm, with reinforced alu. foil
  or
- SeaRox SL 620, min. 50 mm, with reinforced alu. foil.

Insulation fixed with Ø 3 mm pins and secured with Ø 38 mm washers. If SeaRox SL 620 is used, it should be fitted with wire mesh on one side – the side where the washers are applied and the insulation is fixed.

This installation method can also be used for draught stops that are not B-class rated, in this case, also other ROCKWOOL SeaRox wired mats or slabs and thicknesses can be used.

Penetrations (B-0 division)

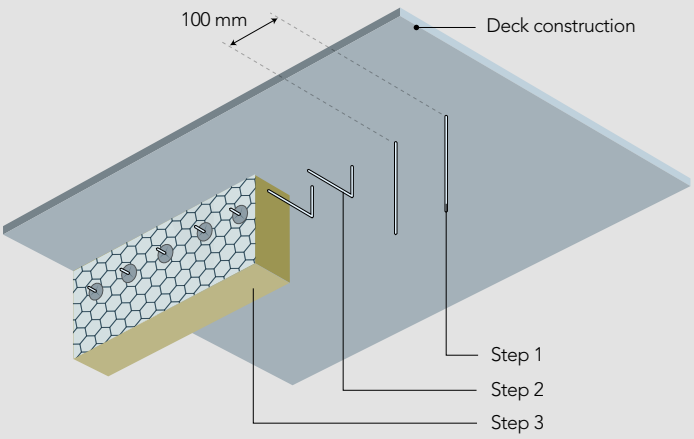
Penetrations other than steel or copper pipes, for the passage of electric cables, pipes, trunks, ducts etc., must be protected by a fire tested penetration device or a steel sleeve not less than 1.8 mm thick and not less than 900 mm long for pipe diameters of at least 150 mm and not less than 600 mm long for pipe diameters of less than 150 mm (preferably equally divided on each side of the division). The pipe should be connected to the ends of the sleeve by flanges or couplings; or the clearance between the sleeve and the pipe should not exceed 2.5 mm; or any clearance between pipe and sleeve should be tightened by means of non-combustible or other suitable material. Uninsulated metallic pipes penetrating a B class division should be in materials with a melting temperature greater than 850°C for a B-0 class division.

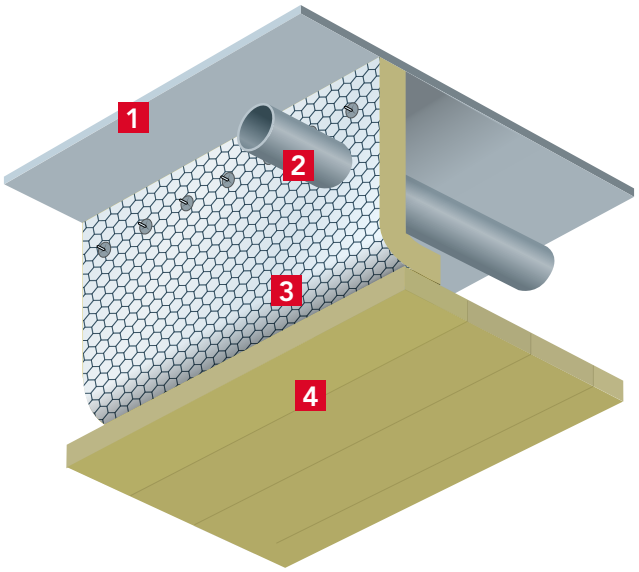
Installation

Step 1 Pins are welded vertically to the underside of the deck in alignment with the required position of the draught stop – with a distance of approx.100 mm between the pins.

Step 2 The pins are then bent 90° in a staggered pattern as on the drawing to the left.

Step 3 The ROCKWOOL product (and for SeaRox SL 620 additional wire mesh) is then pushed over the pins so that they protrude at least 25 mm. The insulation is secured by spring steel washers. The insulation against the lining/ceiling is bent back approx. 100 mm, (for SeaRox SL 620, a 40 mm V-cut is made on the compression side to facilitate bending).

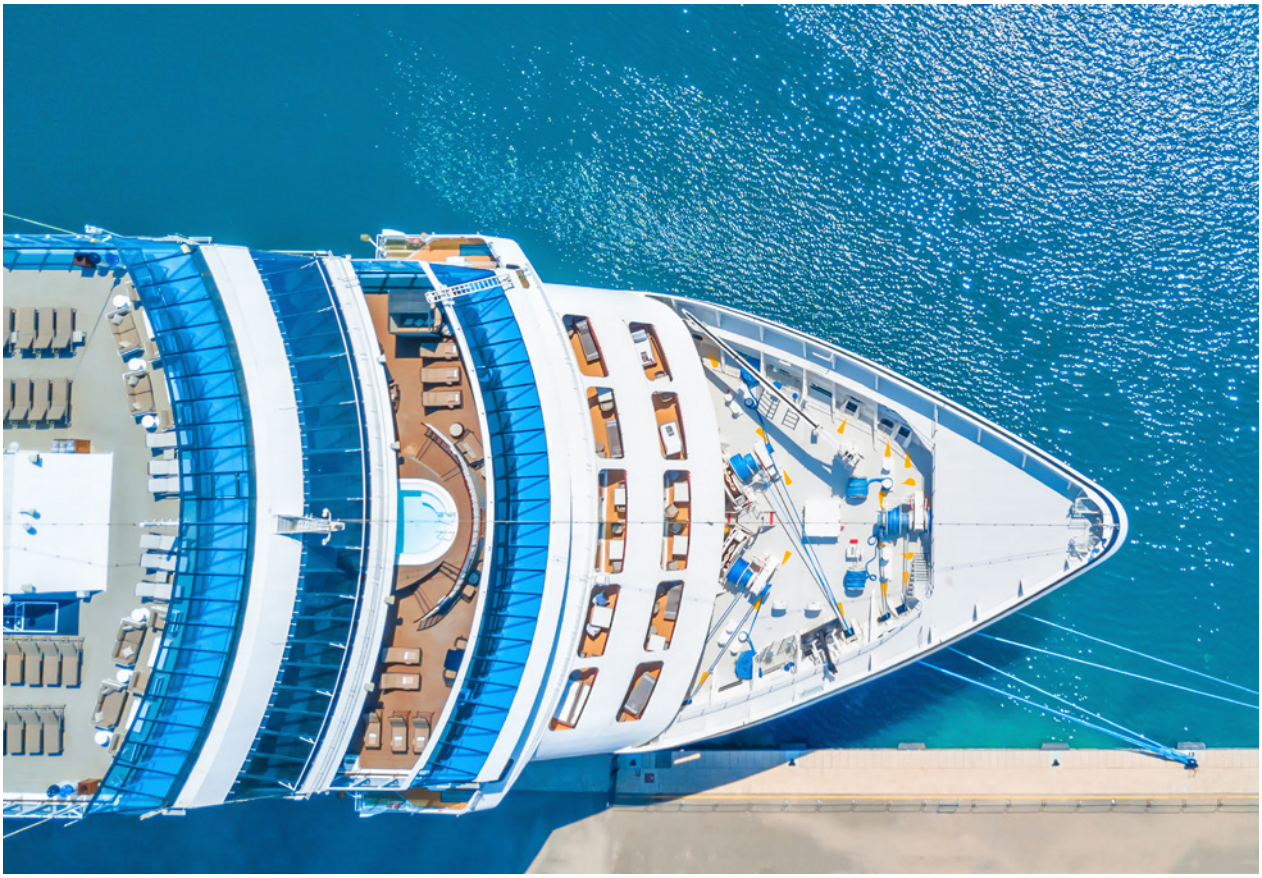




MSC/Circ.1120, 2004 explains the construction and location in more detail:

Construction of extended bulkhead behind continuous ceilings or linings. The extension of the bulkhead should be made of non-combustible material and the construction of the extension should correspond to the fire class of the extended bulkhead. If the extended bulkhead is B-0, then the extension may be made of thin steel plates of 1mm thickness and tightened (for example, with mineral wool). Alternatively, B-0 class extensions may be constructed of a suitably supported mineral wool (density at least 100 kg/m^3, thickness at least 50 mm).

1. Deck construction
2. Service penetration
3. Cut around penetration and wire mesh stitched together along joint
4. Suspended ceiling



Ventilation ducts and steel pipes insulated to A-60

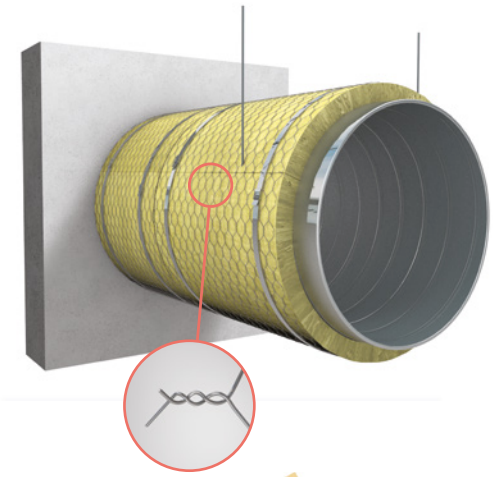
Ventilation ducts and steel pipes including sprinkler pipes may in some cases need to be insulated "with A-60 standard" insulation for fire protection. In accordance with IMO MSC 1/Circ. 1369, this can be done as follows:

Pipes and circular ducts

System

- SeaRox WM 620, min. 45 mm (restricted application only)
- SeaRox WM 640, min. 75 mm (unrestricted application)

The insulation should be fixed by twisting together the wire mesh at joints and additionally secured with steel bands or galvanised steel wires (Ø min. 0.7 mm) should be fitted circumferentially to the system - at least 3 per running meter of insulation to keep all joints and grooves tightly closed.

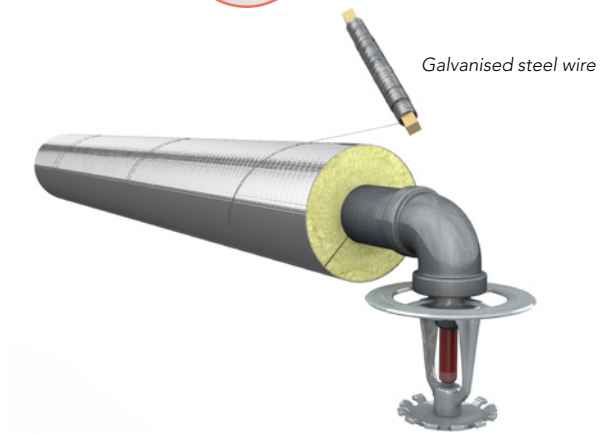


Sprinklers pipes

System

- ProRox PS 960, min. 50 mm (restricted application only)

The pipe section with or without aluminum foil surface should be fixed with steel bands or galvanised steel wires (Ø min. 0.7 mm) should be fitted circumferentially to the system - at least 3 per running meter of insulation to keep all joints and grooves tightly closed.



Rectangular ducts

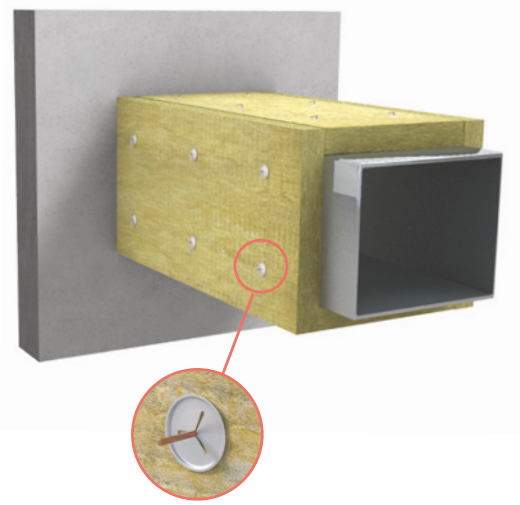
System

- SeaRox SL 620, min. 40 mm (restricted application only)
- SeaRox SL 620, min. 60 mm (unrestricted application)

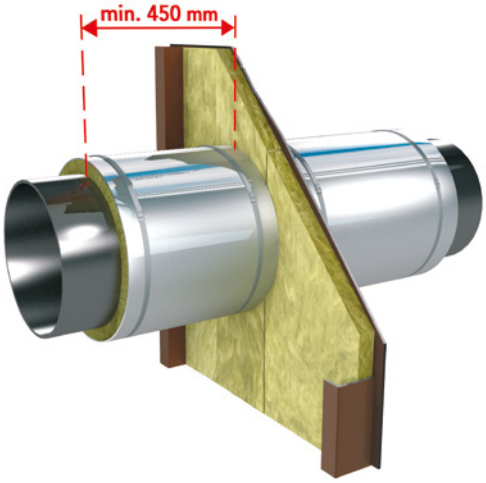
The insulation should be attached by welded steel pins and washers with slab joints butted together.

Welded pins are generally spaced at 350 mm maximum centres along the length of the duct and at 500 mm maximum centres across the width and depth of the duct.

Pins are required on all four sides of vertical ducts, but may be omitted from the top face of horisontal ducts if they are substituted by pigtail screws at 250 mm maximum centres (screw length twice the slab thickness), fixing the side wall to the overlap top slabs. Side wall slabs must overlap top and bottom slabs.



Penetrations of A-class fire divisions



When pipes, ducts etc. go through a bulkhead or deck, it is a penetration. To ensure that the penetration does not compromise the fire division, the penetration shall be protected by a penetration device tested in accordance with the IMO 2010 FTP code. If the pipe penetration is made of steel with a thickness of 3 mm or greater and a length of not less than 900 mm (preferably 450 mm on each side of the division), with no openings (meaning the pipe needs to be welded to the steel bulkhead/deck plate), then testing is not required. Such penetrations should be suitably insulated by extending the insulation at the same level of the division.

ROCKWOOL recommends following "A-60" SeaRox insulation solutions for pipe penetrations made of steel with no openings:

Construction

- SeaRox WM 620, min. 45 mm, the wire mesh to be twisted together at joints.
- SeaRox FM 6040 ALU, min. 50 mm, temporarily fixed by aluminium tape.
- SeaRox WM 640, 75 mm, min. 75 mm the wire mesh to be twisted together at joints.

Steel bands or galvanised steel wires (Ø min. 0.7 mm) must be fitted circumferentially to the system – at least 2 per 450 mm insulation to keep all joints and grooves tightly closed.

§

SOLAS, Chapter II-2part C, Regulation 9, sec 3:

"where a pipe penetration is made of steel or equivalent material having a thickness of 3 mm or greater and a length of not less than 900 mm (preferably 450 mm on each side of the division), and no openings, testing is not required. Such penetrations shall be suitably insulated by extension of the insulation at the same level of the division".

(L1 + L2 = 900 mm)

4

Comfort, thermal insulation

Thermal and comfort insulation

Energy loss through bulkheads and decks, and thereby also indirectly carbon emissions, can be reduced via the use of insulation on all exterior bulkheads and decks. This is relevant even if the air inside needs heating because the vessel is operating in colder climates, or if the air inside needs cooling due to a warm or even hot external climate.

Proper insulation is important not only to save energy and cost, but also the ensure a comfortable indoor environment for crew and passengers.

Selecting the right insulation product

ROCKWOOL Technical Insulation offers a range of SeaRox® insulation product dedicated to the thermal insulation of bulkheads and decks.

Slabs will generally provide a more uniform and firmer surface, whereas mats are more flexible and efficient for installation over stiffeners and other irregularities, the surface appearance of mats will be more uneven.

Within the different product categories, cost and weight are main selection criteria, and SeaRox SL 740 is often selected where a more firm and uniform appearance is required.

The thickness will be determined based on the U or R value requirement from the project. See examples of calculations for normal thermal/comfort insulation systems later in this chapter.

All ROCKWOOL SeaRox insulation products provide thermal insulation, if a deck or bulkhead is already insulated for fire or acoustic purposes, it is possible that the fire/acoustic insulation will also provide sufficient thermal insulation in the specified or a slightly increased thickness, if not, the fire/acoustic insulation can be complemented with a layer of thermal insulation.

Product	Type	Density (kg/m^3)	Flexibility	Installation efficiency	U-value at 100 mm (W/m^2K)	R-value at 100 mm (m^2K/W)
SeaRox SL 720	Slab	32	Medium	Medium	0,35	2.9
SeaRox SL 740	Slab	45	Low	Medium	0,35	2.9
SeaRox MA 720	Mat	32	High	High	0,35	2.9
SeaRox MA 740	Mat	45	High	High	0,35	2.9
SeaRox MA 7000	Mat	26	High	High	0,37	2.7

SeaRox® MA 7000 ALU, the lightweight solution for thermal insulation

Following the success of our lightweight range for fire rated applications, we have introduced a new lightweight product for the thermal insulation of bulkheads, decks and outer bulkheads, SeaRox MA 7000 ALU.

The product is delivered as a highly compressed, compact roll (in 26 kg/m^3) and comes as standard with reinforced aluminium on one side.

The lower weight contributes to an overall weight saving, which increases energy efficiency, lowers costs and reduces CO_2 emissions.

The product combines low weight, high thermal performance, excellent acoustic properties and lowest water absorption.

The low density combined with the generic stone wool characteristics ensures easy installation and a high end-result.

Thermal insulation in combination with fire and sound protection

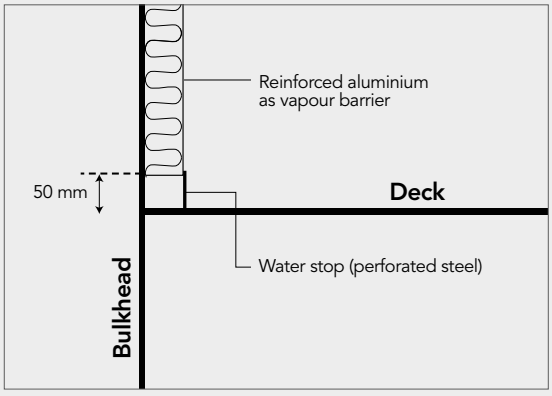
1: Thermal (or comfort) insulation can be used on its own – applied to the deck or bulkhead.

2: Thermal insulation can also be used in combination with fire insulation or sound insulation.

When the minimum insulation thickness has been found for protecting against sound or fire, the thermal transmission (U-value) of this material can be calculated from the thermal conductivity of the product. If a higher thermal insulation level is required, the construction can be improved by adding an extra layer of a lower density product.

In all cases of insulating towards cold temperatures the wool must always be covered by a water vapour barrier. This surface can be aluminium foil or another kind of vapour barrier. The gaps should be tightly sealed with aluminium tape.

Note that combining an A-class fire rated insulation system with additional insulation for added thermal or acoustic performance may require approval from the local surveyor.



Floor connection

When making a surface towards the exterior, it may be necessary to end the insulation 50 mm above the floor. This ensures that any condensate from the bulkhead can be drained away.

A piece of flat iron can be fit in front of the gab to guide the condensate to a drain.

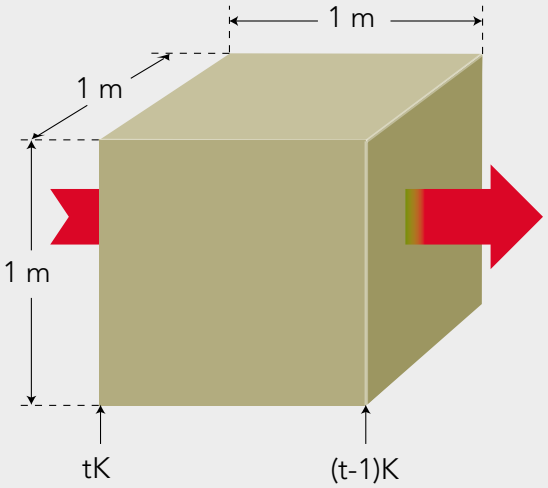
ROCKWOOL SeaRox® products fulfil the IMO non-combustibility and low-frame spread rules

They also have excellent water repellent properties, which are important as thermal insulation is often placed directly up against the outer construction where condensation may occur.

Thermal calculations

Lambda value/ thermal conductivity (λ)

The lambda (λ) value, also referred to as thermal conductivity, is a value indicating how well a material conducts heat. It indicates the quantity of heat (W), which is conducted through a 1 m^2 wall, in a thickness of 1 m, when the difference in temperature between the opposing surfaces of this wall equals 1 K (or 1°C). In practice, λ is a numerical value expressed in terms of W/(mK). The lower the λ value, the better the insulation property of the material.

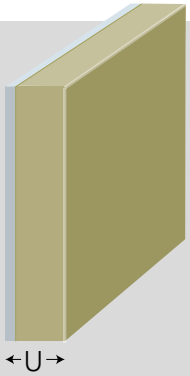


Examples at 10°C

Steel	λ = 50	W/mK
Concrete	λ = 1.6	W/mK
Glass	λ = 1.1	W/mK
Wood	λ = 0.12	W/mK
ROCKWOOL	λ = 0.035	W/mK

Most materials will increase in λ when temperatures rise.

λ = W/mK



U = W/m²K

$$U = \frac{\lambda}{\text{Thickness}}$$

U value

The transport of thermal energy through a structure is expressed by a coefficient, U (Thermal transmittance coefficient). It represents the flow of heat (in W) through 1 m^2 of a structure, when the difference between the two surrounding temperatures is 1 K (or 1°C). The thermal transmittance coefficient is expressed in W/(m^2K). The lower the coefficient, the better the structure insulates.

$$R = \frac{1}{U} \quad \text{or} \quad R = \frac{\text{Thickness(m)}}{\text{(W/mK)}}$$

R value

Thermal resistance, R, is a measure used in a construction. The R value is the reciprocal U value. Increasing the thickness of an insulating layer increases the R value.

Examples

The steel plate is not taken into consideration due to the low added value.

SeaRox SL 740, 50 mm (λ(10°C) = 0.035 W/mK)
R = 0.05/0.035 = 1.43[m^2K/W] U = 0.70[W/m^2K]

SeaRox SL 740, 100 mm (λ(10°C) = 0.035 W/mK)
R = 0.1/0.035 = 2.86[m^2K/W] U= 0.35[W/m^2K]

SeaRox SL 620, 60 mm (λ(10°C) = 0.035 W/mK)
R = 0.06/0.035 = 1.714[m^2K/W] U = 0.57[W/m^2K]

SeaRox SL 620, 60 mm + SeaRox SL 740, 50 mm (λ(10°C) = 0.035 W/mK (λ(10°C) = 0.035 W/mK)
R = (0.06/0.035) + (0.05/0.035) = 3.14[m^2K/W] U = 0.32[W/m^2K]

SeaRox SL 620, 60 mm + SeaRox SL 740, 100 mm (λ(10°C) = 0.035 W/mK (λ(10°C) = 0.035 W/mK)
R = (0.06/0.035) + (0.1/0.035) = 4.57[m^2K/W] U = 0.22[W/m^2K]

5

Sound reduction

General information on sound reduction

Rules and regulations

When people are exposed to consistent elevated noise levels, their health may be affected. Elevated workplace or environmental noise can cause hearing impairment, hypertension, heart diseases, annoyance, and sleep disturbance. Beyond these effects, elevated noise levels can create stress and increase workplace accident rates.

To improve safety on board ships, the IMO noise code – resolution MSC.337(91) (implemented 2014) introduced new mandatory requirements with regard to noise-reduction measures on ships covering design, documentation and performance, as well as actual noise levels on-board.

These requirements must be complied along with any additional comfort class requirements or requirements imposed by the flag state.

The noise code

On 30 November 2012, the IMO Maritime Safety Committee adopted resolution MSC.337(91), the code on noise levels on board ships, also known as the "noise code".

The new rules relate to new ships. The flag administration may also decide to enforce the rules on existing vessels, in relation to major repairs, refurbishments etc. The new noise code is mandatory and replaced the voluntary 1981 noise code A.468(XII).

The code applies to passenger and cargo ships with a gross tonnage of 1600 or higher.

The intention of the code is to provide standards to prevent potentially hazardous noise levels on board ships and an acceptable environment for seafarers:

- To provide safe working conditions (to enable speech communication, hearing of audible alarms and an environment where clear-headed decisions can be made in control stations, navigation, radio spaces and manned machinery spaces).
- To protect seafarers from noise levels that may give rise to noise-induced hearing loss; and
- To provide the seafarer with an acceptable degree of comfort in rest, recreation and other spaces.

The principle is that the ships should be designed and constructed in a way that noise threshold levels specified in the code are followed for all relevant areas. Key is that actual noise levels should be measured and reported during a sea trial. The noise reports will be part of the documentation for the ship.

High R =
■ good sound reduction

New noise levels limits (maximum levels):

Designation of rooms and spaces	Ship size	
	1600 up to 10000 GT	≥ 10000 GT
Work spaces		
Machinery spaces	110	110
Machinery control rooms	75	75
Workshops other than those forming part of machinery spaces	85	85
Non-specified work spaces (other work areas)	85	85
Navigation spaces		
Navigating bridge and chartrooms	65	65
Look-out posts, incl. navigating bridge wings and windows	70	70
Radio rooms (with radio equipment operating but not producing audio signals)	60	60
Radar rooms	65	65
Accommodation spaces		
Cabin and hospitals	60	55
Messrooms	65	60
Recreation rooms	65	60
Open recreation areas (external recreation areas)	75	75
Offices	65	60

The noise code also includes a requirement with regard to the sound reduction index (R_w) for bulkheads and decks between cabins, between cabins and mess room etc., as follows.

The airborne sound reduction properties for bulkheads and decks within the accommodation shall comply at least with the following weighted sound reduction index (R_w) according to ISO Standard 717-1:1996 as amended (1:2006), part 1.

Designation of division between rooms and spaces	Weighted sound reduction index (Rw)
Cabin to cabin	35 dB
Messrooms, recreation rooms, public spaces and entertainment areas to cabins and hospitals	45 dB
Corridor to cabin	30 dB
Cabin to cabin with communication door	30 dB

The airborne sound insulation properties shall be determined by laboratory tests in accordance with ISO 10140-2:2010.

The code additionally includes requirements for the use of hearing protectors in areas with high noise levels as well as daily time limit restrictions for people working in high noise areas. It also contains appendixes with formats for noise reports, guidance for the inclusion of noise issues in safety management systems, the suggested method for attenuating (reducing) noise and simplified procedures for determining noise exposure.

The new noise code introduces a set of mandatory minimum requirements. Actual comfort class or flag state requirements may, however, be stricter and must also be complied with.

Noise mitigation

Noise can be reduced by replacing equipment with lower noise-emitting equipment, resilient mounting of machinery, resilient connections between construction elements, silencers in ventilation ducts etc.

But noise can also be reduced with the use of insulation, to create sound absorbing surfaces, improve sound reduction of walls and ceilings or in floating floor constructions. Acoustic insulation is used to reduce the amount of reflected noise within an enclosure (absorption), as well as to reduce the noise passing through a division (reduction).

In the following pages an overview of sound absorption and sound reduction of ROCKWOOL Technical Insulation products and systems are provided.

Acoustic foil

The insulation in engine rooms is traditionally protected against absorption of oil and oil vapours by reinforced aluminium foil or by steel plates when stronger mechanical solutions are required. However, the challenge has been that aluminium foil, and in particular steel plate, significantly decreases the noise absorption properties of the insulation.

Engine rooms, which are a high risk area in relation to oil contamination of surfaces, are also one of the areas on a vessel with the highest sound levels, and solutions are needed to improve sound absorption without compromising fire safety. This is exactly what the SeaRox acoustic foil system provides.

By using this foil system, the noise absorption properties of the SeaRox material will remain, maintaining mechanical integrity and preventing oil absorption of the insulation.

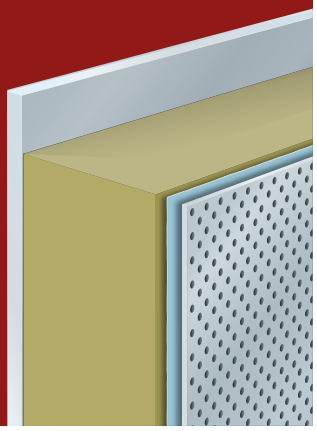
SeaRox acoustic foil is a very strong, thin and durable polymer film that is highly resistant to oil mist compared to the common reinforced aluminium foil solution on the market (measured according to modified version of ASTM E96).

The system – SeaRox insulation + SeaRox acoustic foil + 1 mm perforated steel or aluminium plate – passes the low surface flammability requirements of IMO FTP code part 5 and is certified by recognised classification societies and under the MED scheme.

SeaRox® acoustic foil system especially designed for sound absorption in engine rooms

- Optimal sound properties
- Resistant to oil/oil mist
- Tested and approved
- Easy installation

- *Steel plate*
- *SeaRox insulation*
- *SeaRox acoustic foil*
- *Perforated steel or aluminium plate*



To obtain the optimal sound properties the film must be fitted loosely with a small gap between the foil and the insulation, the perforated steel plate should be installed as close to the foil as possible, with due consideration for a minimum distance of 5 mm and a maximum distance of 50 mm.

Documented sound properties

The system has also been tested for sound absorption, proving its unique acoustic performance.

Easy installation

SeaRox acoustic foil must not be fixed directly to the insulation. It is essential that the film is fitted loosely, with a small gap between the insulation and the film. This is done either by wrapping it around the slab or by utilising the welding pins required to secure the wool to the substrate.

The film should be overlapped by at least 100 mm. Although the film is very strong, in some cases it may be necessary to reinforce any penetration (from pins etc.) with self-adhesive transparent tape. SeaRox acoustic foil can be combined with any approved SeaRox fire protection solution or with any SeaRox thermal/acoustic insulation product.

We supply the insulation and the acoustic foil. The remaining parts of the system – perforated steel plate and fitting system – should be acquired locally from the regular metal supplier of the yard or contractor.

§

SOLAS, Chapter II-2, part B, Regulation 4, sec 3:

Insulation surfaces protected against oil penetration

"In spaces where penetration of oil products is possible, the surface of insulation shall be impervious to oil or oil vapours".

Sound absorption

Stone wool has good sound absorption because of the porosity and the fibre structure.

The sound is absorbed by the porous fibrous material. When a sound wave enters the absorptive material, the acoustic energy of the air is reduced due to friction against the surface of the fibers and the energy is converted into heat.

Absorption will depend on the actual product and is generally improved by increased thickness. Absorption may be reduced when the insulation has a facing – in particular an aluminum foil facing reduces the absorption properties of the stone wool.

Protection of the insulation by a cover plate is possible without changing the absorption, provided the plate is perforated with a sufficient number of openings. A perforation grade of at least 25 % is sufficient for a 1 mm thick cover plate of steel. Thicker cover plates require a higher perforation grade.

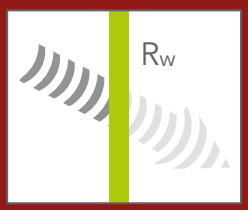
Sound absorption

Sound absorption is a material property that describes how well sound waves are absorbed by a material.

Sound reduction

Like for absorption, part of the acoustic energy is converted into heat by friction, but the interaction between the different layers (insulation/structural metal) also significantly reduces the sound passing the division.

Sound reduction is improved if both layers (insulation/structural metal) have high mass. Sound reduction performance is therefore improved by insulation thickness, density and metal wall thickness. Adding extra mass layers can also improve sound reduction performance.



Sound reduction is an impression rating the reduction of sound through a wall or a building element from one room to the other.

Overview – absorption measurements

No	Products	Weighted absorption αw
1	SeaRox FB 6020, 70 mm	0.95
2	SeaRox FB 6040, 70 mm	0.90
3	SeaRox FB 6050, 30 mm	0.55
4	SeaRox SL 620, 40 mm	0.80
5	SeaRox SL 620, 40 mm + alu foil	0.50
6	SeaRox SL 620, 60 mm incl. pin's and washer	0.90
7	SeaRox SL 620, 60 mm incl. pin's and washer, covered by 19 µm acoustic foil	0.90
8	SeaRox SL 320, 50 mm	0.85
9	SeaRox SL 340, 50 mm	0.90
10	SeaRox SL 740, 50 mm	0.75
11	SeaRox SL 340, 2 x 50 mm	0.95
12	SeaRox SL 740, 50 mm + alu foil	0.65
13	SeaRox SL 436, 50 mm	0.85
14	SeaRox SL 440, 50 mm	0.75
15	SeaRox SL 480, 50 mm	0.75
16	SeaRox SL 480, 2 x 30 mm	0.80
17	SeaRox SL 640, 30 mm	0.70
18	SeaRox SL 640, 2 x 30 mm	0.90
19	SeaRox SL 660, 2 x 50 mm	0.90
20	SeaRox WM 950, 50 mm	0.90
21	SeaRox WM 950 ALU, 50 mm	0.75
22	SeaRox WM 950, 100 mm	0.95
23	SeaRox WM 950 ALU, 100 mm	0.75
24	SeaRox WM 620, 45 mm	0.90
25	SeaRox WM 620, 45 mm + SeaRox acoustic foil (19 µ) + perf. steel plate (suspended)	0.90
26	SeaRox WM 620, 2 x 45 mm	0.95
27	SeaRox WM 640, 30 mm	0.80
28	SeaRox WM 640, 75 mm	0.90
29	SeaRox WM 640, 100 mm	0.90

Sound reduction

Determined by laboratory tests in accordance with ISO 10140-2:2010.

Overview – Reduction measurements

No	Construction	Substrate	Thickness	Products	Weighted reduction Rw
1	A-15 steel deck	Steel	5 mm	SeaRox FB 6020, 70 mm (no insulation on stiffeners)	45 dB
2	A-15 steel deck and bulkhead	Steel	6 mm	SeaRox FB 6040, 35 mm (no insulation on stiffeners)	45 dB
3	A-15 steel deck and bulkhead	Steel	6 mm	SeaRox SL 620, 50 mm (no insulation on stiffeners)	46 dB
4	A-30 steel bulkhead	Steel	6 mm	SeaRox FB 6020, 70 mm / SeaRox FB 6050, 30 mm	46 dB
5	A-30 steel bulkhead + thermal	Steel	6 mm	SeaRox FB 6020, 70 mm / SeaRox FB 6050, 30 mm and 50 mm SeaRox MA 720 ALU	49 dB
6	A-30 steel bulkhead	Steel	6 mm	SeaRox FB 6020, 70 mm / SeaRox FM 6030 ALU, 30 mm	46 dB
7	A-30 steel deck	Steel	6 mm	SeaRox FB 6050, 30 mm / SeaRox FM 6050, 30 mm	45 dB
8	A-30 steel deck	Steel	6 mm	SeaRox FM 6030 ALU, 30 mm / SeaRox FM 6030 ALU, 30 mm	46 dB
9	A-30 steel bulkhead restr./ deck + thermal	Steel	6 mm	SeaRox SL 620, 40 mm / 25 mm and 50 mm SeaRox MA 720 ALU	50 dB
10	A-30 steel deck	Steel	6 mm	SeaRox SL 620, 25 mm / 25 mm	47 dB
11	A-60 steel bulkhead	Steel	6 mm	Searox FB 6040, 70 mm / SeaRox FB 6050, 30 mm	48 dB
12	A-60 steel bulkhead	Steel	6 mm	Searox FB 6040, 70 mm / SeaRox FM 6040, 35 mm	48 dB
13	A-60 steel bulkhead	Steel	6 mm	SeaRox SL 620, 60 mm / 25 mm	48 dB
14	A-60 steel bulkhead + thermal	Steel	6 mm	SeaRox SL 620, 60 mm / 25 mm and 50 mm SeaRox MA 720 ALU	49 dB
15	A-60 steel bulkhead + thermal	Steel	6 mm	SeaRox FB 6040, 70 mm / SeaRox FB 6050, 30 mm and 50 mm SeaRox MA 720 ALU	50 dB
16	A-60 steel bulkhead restr./deck	Steel	6 mm	SeaRox FB 6020, 70 mm / SeaRox FB 6050, 30 mm	46 dB
17	A-60 steel bulkhead restr./deck	Steel	6 mm	SeaRox FB 6020, 70 mm / SeaRox FM 6040 ALU, 35 mm	46 dB
18	A-60 steel bulkhead restr. + thermal	Steel	6 mm	SeaRox FB 6020, 70 mm / SeaRox FB 6050, 30 mm and 50 mm SeaRox MA 720 ALU	49 dB
19	A-60 steel deck	Steel	6 mm	SeaRox FB 6020, 70 mm / SeaRox FB 6050, 30 mm	46 dB
20	A-60 steel deck	Steel	6 mm	SeaRox FM 6040 ALU, 50 mm / SeaRox FM 6040 ALU, 50 mm	47 dB
21	A-60 steel deck	Steel	6 mm	SeaRox FB 6020, 70 mm / SeaRox FM 6040 ALU, 35 mm	46 dB
22	A-60 floating floor	Steel	6 mm	SeaRox SL 436, 60 mm/2x1.5 mm steel surface plates	55 dB
23	A-60 floating floor	Steel	6 mm	SeaRox SL 480, 2x30mm/2x1.5 mm steel surface plates	54 dB
24	A-60 steel bulkhead restr./deck	Steel	6 mm	SeaRox SL 620, 40 mm / 25 mm	48 dB
25	A-60 aluminium bulkhead	Aluminium	6 mm	SeaRox SL 620, 2 x 30 mm / 2 x 30 mm (on both sides)	40 dB
26	A-60 aluminium bulkhead restr./deck	Aluminium	6 mm	SeaRox SL 620, 2 x 30 mm / 2 x 30 mm	40 dB
27	A-60 aluminium bulkhead	Aluminium	6 mm	SeaRox FM 6040 ALU, 2 x 35 mm / 2 x 35 mm (on both sides)	46 dB
28	A-60 aluminium bulkhead restr./deck	Aluminium	6 mm	SeaRox FM 6040 ALU, 2 x 35 mm / 2 x 35 mm	43 dB
29	A-60 aluminium bulkhead	Aluminium	4 mm	SeaRox FB/FM 6050, 75 mm /75 mm (on both sides)	41 dB
30	A-60 aluminium bulkhead restr./deck	Aluminium	4 mm	SeaRox FB/FM 6050, 75 mm /75 mm	39 dB
31	Thermal insulation	Steel	6 mm	SeaRox MA 7000 ALU, 50 mm / 50 mm	48 dB
32	Thermal insulation	Steel	6 mm	SeaRox MA 7000 ALU, 100 mm / 50 mm	49 dB
33	Thermal insulation	Steel	6 mm	SeaRox MA 7000 ALU, 100 mm /100 mm	50 dB
34	Acoustic insulation	Steel	6 mm	SeaRox FM 6020 ALU, 90 mm (no insulation on stiffeners)	49 dB
35	Acoustic insulation	Steel	6 mm	SeaRox SL 340, 50 mm (no insulation on stiffeners)	47 dB

For further details, contact ROCKWOOL Technical Insulation

Impact sound reduction

The principles of absorption and reduction work also here, but in floating floor constructions, it is possible to enhance the general sound reduction and also impact noise reduction with a mass-spring-mass effect. The insulation is positioned between two mass layers (top steel plate(s) and the steel deck) and the elasticity of the insulation material functions like a spring, dissipating sound energy and thus reducing the noise transmitted through the construction.

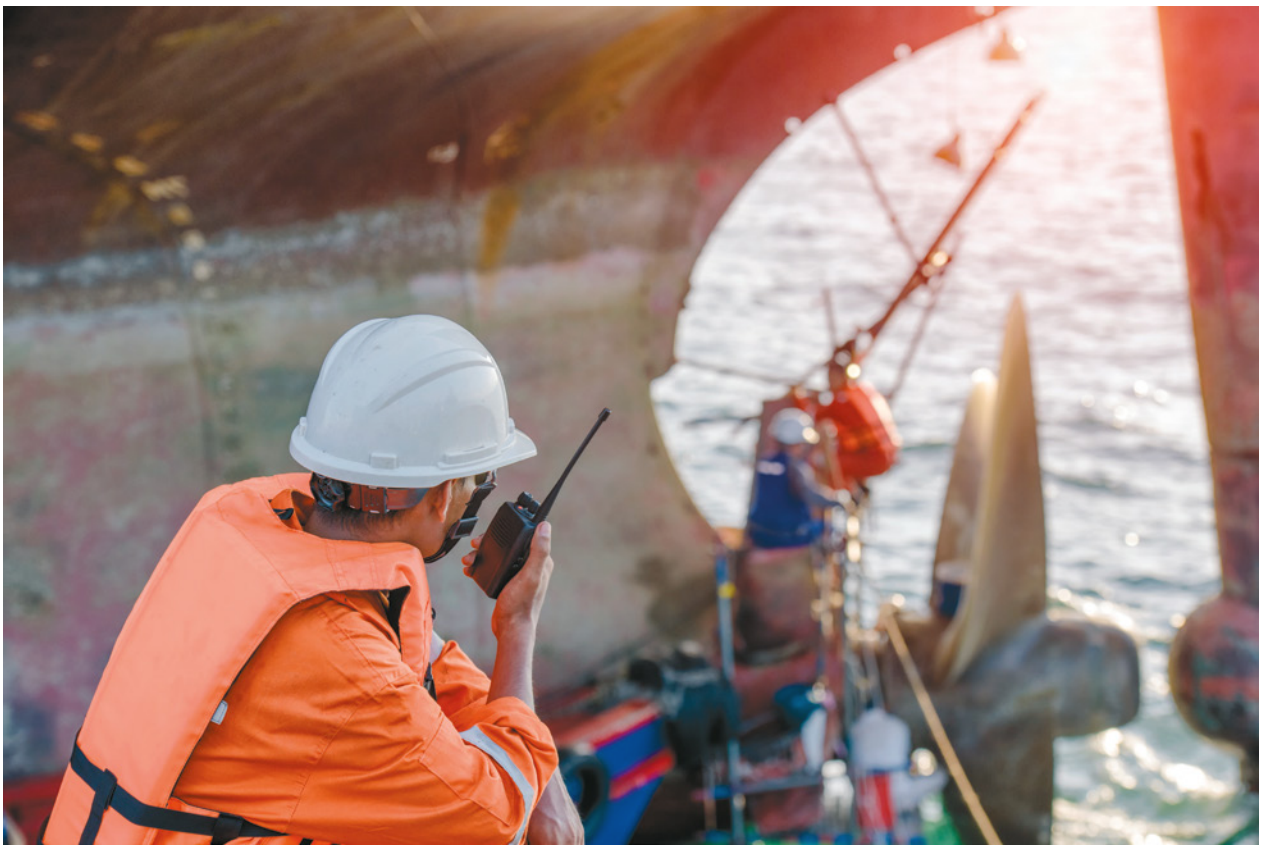
For floating floors, the insulation must have the right balance between compression resistance and dynamic stiffness for optimum acoustic performance. Higher insulation thickness improves the sound reduction.

The dynamic stiffness is an important parameter when optimising floating floors. This is true with respect to air- and structure-borne noise and impact noise.

In principle, the dynamic stiffness should be as low as possible in order to obtain a low natural frequency of the floating floor. On the other hand, the load-bearing capacity and the possible unfavourable experience of walking on a floor that is too soft may set a lower limit for the stiffness.

SeaRox SL 436 is the most common product used for floating floors. This product has been optimised for dynamic stiffness.

Read more about SeaRox SL 436 and floating floors on page 82.



6

Outfitting insulation

Floating floor constructions, including class A-60

Floating floors are used for optimal airborne and structural noise reduction, including impact noise via the deck.

The design of the floating floor will depend on the actual requirements and often with the involvement of acoustic engineers and/or dedicated flooring companies.

Non combustible stone wool insulation is used as the core material in such constructions due to the superior acoustic properties, but also due to a good balance between dynamic stiffness and compression resistance.

ROCKWOOL offers three main products for floating floor constructions:

SeaRox SL 436 is used for normal accommodation load flooring systems, with an optimised dynamic stiffness to achieve the highest reduction of noise and vibrations. SeaRox SL 436 is also capable of absorbing smaller imperfections in the deck. SeaRox SL 480 and the lighter weight SeaRox SL 440 are aimed for general purpose flooring systems with normal to high load capacity.

When a floating floor is made, it is very important that the top layer has no rigid connection with the steel structure to avoid flanking transmission. For inspiration in terms of the general construction of a floating floor – see overleaf descriptions of the ROCKWOOL A-60 fire rated floating floor construction:

ROCKWOOL Technical Insulation is the preferred supplier for many marine flooring companies. These companies integrate ROCKWOOL products into their most advanced solutions.

ROCKWOOL SeaRox® A-60 type approved floating floor construction:

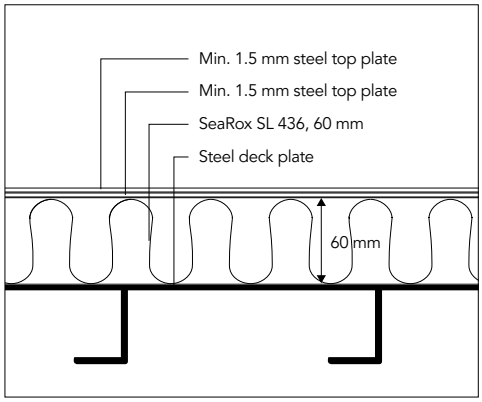
This solution consists of one or two layers (of equal thickness and with staggered joints) with a total insulation thickness of 60-100 mm. The insulation is covered by two layers of 1.5 mm thick steel sheets, with staggered joints and glued together. In addition to the excellent fire protection, noise reduction and thermal insulation properties, the construction also reduces structural noise/ vibrations in the steel deck.

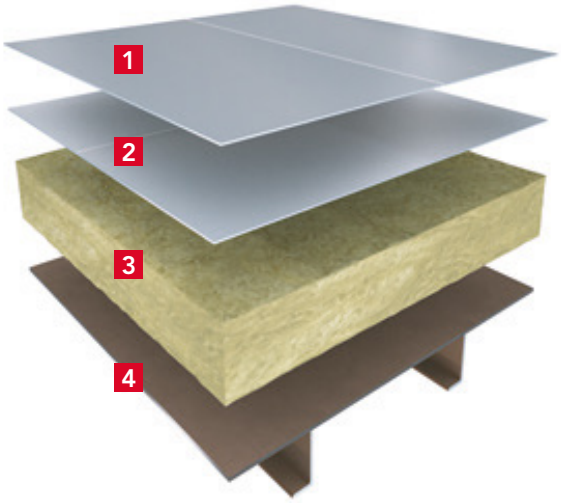
The construction can be made with SeaRox SL 436, 440 or 480 depending on the need for compression resistance.

Any surface material to be applied over the steel plates must be decided based upon requirements for mechanical strength and finish, and if relevant shall be type approved for low flame spread.

The maximum recommended free area is 8 x 8 m. If larger free areas are to be made, division flat bars should be made. This allows the insulation to stay in position without the need for gluing. All joints of the slabs must be tightbutted joints.

Smaller weld marks, dents, etc. of an approximate maximum diameter of 50 mm and height of 10 mm will be absorbed. If the deck undulates, an approved self-levelling compound or floor screed – a fire retardant PE compound, cement based filler or similar – must be used as first layer. If a water-based floor screed or levelling compound is used, it must be given sufficient time to cure before the floating construction is installed. It is very important not to encapsulate water/ moisture, as this will enhance corrosion and limit the expected life of the construction.





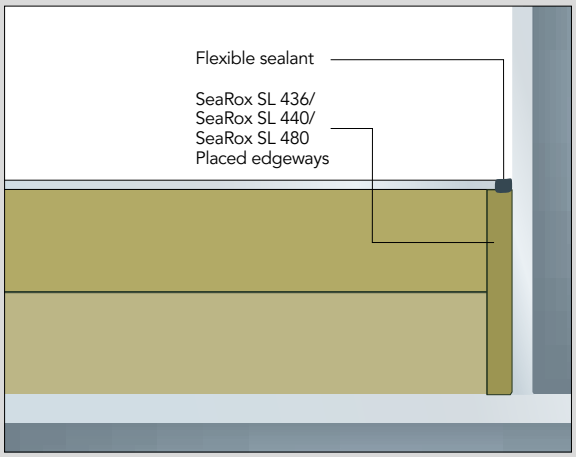
1. *Steel top plate 1.5 mm*
2. *Steel top plate 1.5 mm*
3. *SeaRox SL 436, SL 440 or SL 480 60 mm*
4. *Steel deck plate (Standard FTP code)*

Note: 2 x 1.5 mm steel top plates to be glued together

Enclosing

For the perimeter of the construction it is recommended to finish the insulation with a rigid ROCKWOOL product, such as SeaRox SL 436, SeaRox SL 440 or SeaRox SL 480, placed edgeways and sealed with a flexible sealant. Many of the flooring companies use ROCKWOOL SeaRox slabs in densities of 140-200 kg/m^3, in combination with more complex top layers. The maximum load for the complete flooring construction will depend also on the top layer and the load capacity of the specific construction should be calculated and tested by the flooring company. ROCKWOOL Technical Insulation is the preferred supplier for many dedicated marine flooring companies. These companies use the SeaRox insulation to create more sophisticated solutions for superb noise reduction in both high and low frequency range.

Note: Deviations from the certified A-60 floating floor construction in any form could require new approval by the Class Society or the National Marine Authority.



Sealing of edges to prevent structural noise transmission.

Marine panels, ceilings and fire doors

Within shipbuilding prefabricated products are being used for wall panels, ceilings, fire doors etc. as part of the accommodation area. The requirements are typical a combination of fire protection and noise reduction.

The producers of these products are highly specialised companies with individual solutions which require tailor made insulation products.

The SeaRox® range of slab products in higher densities have a great track record in this specific area. We have worked with major customers to develop a large number of special products with high compressive and delaminating strength as well as great fire resistance and acoustic performance. Solutions which have been approved as non-combustible according to the latest IMO regulations.

ROCKWOOL has a range of SeaRox materials supplied as slabs or cut into lamellars, in the density range 100 to 240 kg/m^3 in the SeaRox SL 400 series that are used for wall and ceiling panels, doors, hatches etc. for A-class, B-class and C-class constructions.

Solutions are developed in close cooperation with each individual customer taking the final design into consideration. Please contact your local ROCKWOOL Technical Insulation sales representative to get the best advice in order to pick the right SeaRox material offering the best combination of fire protection, noise reduction and mechanical properties.

Typical SeaRox products

Marine panels and ceilings

- SeaRox SL 440 (density 150 kg/m^3)
- SeaRox SL 470 (density 180 kg/m^3)
- SeaRox SL 480 (density 200 kg/m^3)

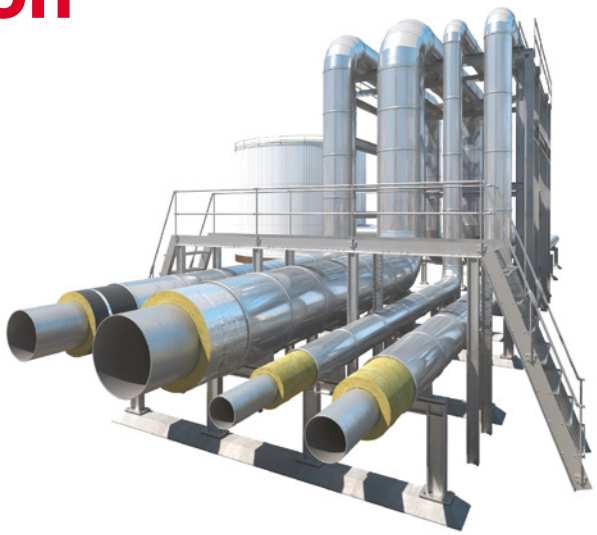
Fire doors

- SeaRox SL 660 (density 150 kg/m^3

7

Technical insulation

General information about technical insulation



HVAC, service water and other technical equipment on board

Heating Ventilation and Air Conditioning (HVAC) systems form an integrated part of modern shipbuilding, designed to provide thermal-comfort and decent air quality.

A large amount of the power produced onboard is consumed by heating, ventilation and air conditioning. Insulation of the ducts is important to ensure that the air has the right temperature where it is needed and that excessive amounts of energy is not lost during the process – it is all about saving energy, reducing carbon emission and ensuring comfortable work, rest and pleasure areas for the crew and passengers.

Service water pipes (hot and cold) needs to be insulated to ensure that the temperature is right where the water is needed and to prevent unnecessary energy loss in the process. For cold water piping, insulation may also delay the heating up of stagnant water, and thus contribute to mitigation of legionella bacteria.

Hot equipment in the engine room or for the handling of cargoes may also need insulation, to reduce energy losses, ensure safe surface temperatures, or in the case of temperature sensitive cargoes to help keeping the correct cargo temperature.

The benefits of correct thermal insulation include:

- Reduction of heat losses
- Cost savings
- Reduction of CO_2 emission
- Frost protection
- Process control: ensuring the stability ofthe process temperature
- Noise reduction
- Condensation prevention
- (Personal) Protection against high temperatures

Ventilation ducts (HVAC)

For thermal insulation ventilation ducts are most often insulated with lamellar mats such as ROCKWOOL SeaRox LM 900 – used for both circular and rectangular ducts, these products ensure an even and compression resistant surface. These products will normally be supplied with an aluminium foil facing that can be used as the final layer. When joints are sealed with aluminium tape, this foil also act as water vapour barrier.

Other products may also be relevant e.g. higher density mats for circular ducts or slabs for rectangular ducts e.g. SeaRox MA 740 ALU or SeaRox SL 740 ALU.

In some cases ventilation ducts also needs to be insulated for fire or acoustics, in the case of A-60 insulation of ducts.

In the case the ducts need to be insulated to reduce sound emission, please contact your ROCKWOOL representative for more detailed advice for your needs.

Service water piping

Service water piping (hot and cold water) is most efficiently insulated with pipe sections, and ROCKWOOL's aluminium foil faced pipe sections. The marine approved ProRox PS 930 ALU and ProRox PS 960 ALU are the ideal choice for this task, covering all the relevant pipe diameters and insulation thicknesses that normally are relevant in this area.

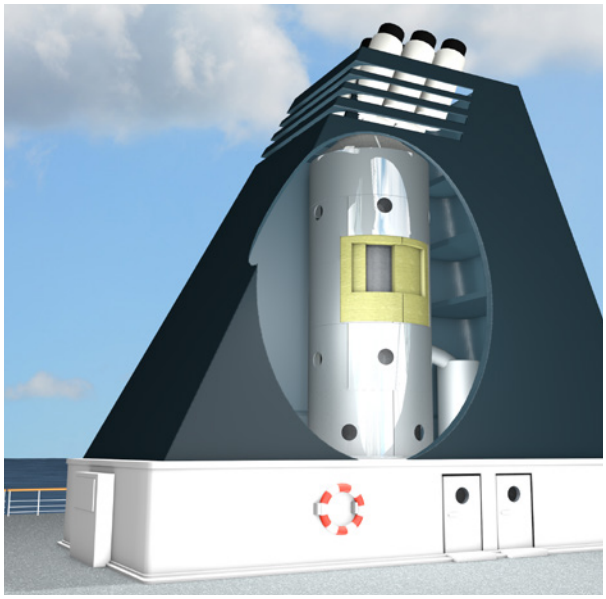
Note that chilled water pipes should be insulated with closed cell insulation materials.

In the case of sprinkler pipes that needs to be insulated to A-60, it is possible to use ProRox PS 960 in a thickness of 50 mm.

Hot piping and equipment

In the engine room or for the handling of cargo, the hot pipes and equipment needs to be insulated, both to save energy by reducing the heat emission from surfaces, and for safety reasons to prevent burns. ROCKWOOL Technical Insulation has a range of products specially developed for this purpose (ProRox series). Relevant products from this range (pipe sections and wired mats) are marine-approved, which means they complement the SeaRox range.

ProRox PS 960 pipe sections with a maximum service temperature of 650˚C are used for hot piping including exhaust pipes, while ProRox WM 950/960 wired mats (MST 640 – 660˚C) are used for equipment, vessels and larger diameter piping. SeaRox SL 740 is the good choice for temperatures up to 250˚C, whereas SeaRox SL 620 slabs developed for fire protection, is perfectly suited also as thermal insulation for hot surfaces operating at temperatures up to 660˚C.



The final choice of product and insulation thickness depends on the geometry of the equipment, process and ambient temperatures, the choice of cladding and, most importantly, the purpose of the insulation.

ROCKWOOL's Rockassist tool, can help calculate the necessary insulation thickness for the job. Rockassist is available via Rockassist.com.

This document does not deal with process insulation used for offshore oil & gas equipment, ask your ROCKWOOL Representative for the ROCKWOOL solutions for the thermal and acoustic insulation solutions for such areas based on the ROCKWOOL WR-Tech technology for CUI mitigation.

Scrubbers

Scrubbers are used to remove particles and harmful components, such as sulphur oxides (SO_X) and nitrogen oxides (NO_X) from the exhaust gasses generated when fuel oil is combusted. The hot flue exhaust gas is passed through a scrubber unit where the gas is cleaned. The exhaust gas is hot and therefore insulation of both gas inlet piping and the actual scrubber unit is necessary.

We offer a range of products that are ideally suited for insulation of hot equipment including scrubbers:

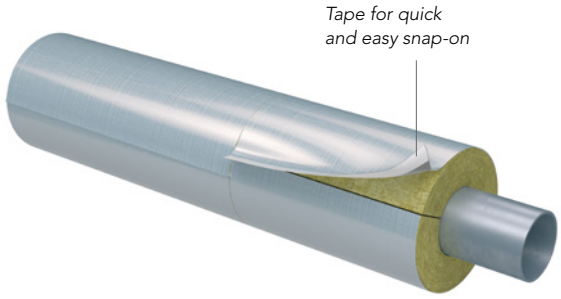
- ProRox PS 960 pipe sections are recommended for smaller diameter pipes.
- ProRox WM 950 or WM 960 wired mats and the metal mesh free alternative SeaRox FM 6040 ALU are recommended for larger diameter piping and the actual scrubber unit.

All products have a low chloride content (< 10 mg/kg) and are thus safe for use directly onto stainless steel.

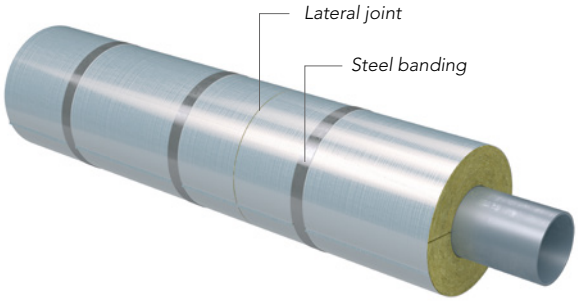
Insulation with ProRox® pipe sections

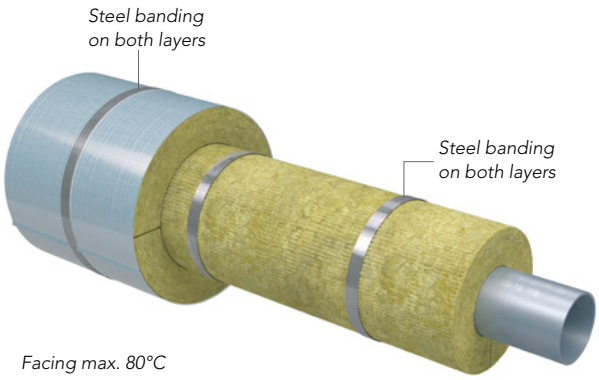
We have a wide selection of marine-approved pipe insulation solutions for large and small pipes that satisfy all requirements. The mandrel wound ProRox pipe sections are made of stone wool. The ProRox pipe sections are available with or without reinforced aluminium foil covering.

The ProRox pipe sections are especially suitable for ambient to very high temperatures, but with a good water vapour barrier they can also be used for chilled media.



At temperatures above 300°C the provisional application of spacers must be determined in each individual case due to the evaporation of the binder.





Facing max. 80°C

ProRox® pipe section

Generally, the best insulation is achieved by using ProRox pipe section. The pipe sections can be used up to service temperatures of 650°C according to EN 14707. Facing up to 80°C. The pipe sections are supplied ready split and hinged for quick and easy snap-on assembly and are suitable for thermal and acoustical insulation of pipe work.

Their excellent fit and high compression resistance mean that pipe sections can be applied in a single layer without any additional spacers. Consequently the number of thermal bridges, which have a negative influence on the insulation, is greatly reduced.

Banding

We recommend that the pipe section be secured to the pipe by applying three steel bands per section length, with the end bands approximately 100 mm from the lateral joints.

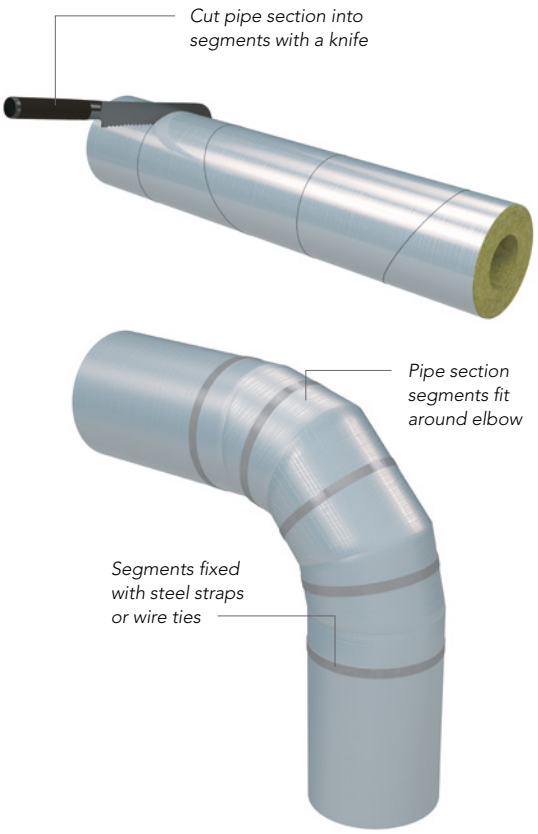
If wire ties or spiral binding are to be used, they should only be considered on pipe sections with an outer surface diameter of 200 mm or less.

In those cases, there should be:

- At least three wire ties per section.
- Spiral binding must be per section (tied off at each end of each pipe section).

Multiple layers

- If more than one layer of pipe section is required, both layers should be banded to ensure a consistently tight fit of the insulation.
- The outer layer(s) of the section should be applied with staggered joints, both laterally and longitudinally.



Elbows/bends

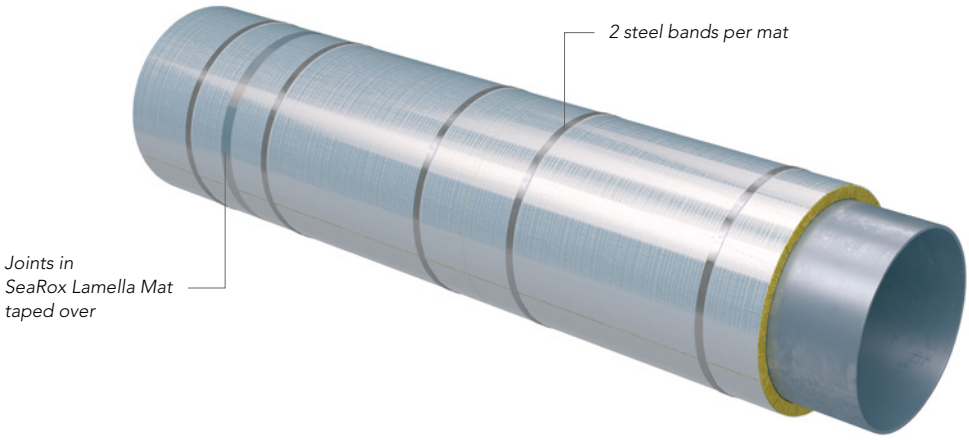
- To form insulated elbows with pipe section, the section is cut at angles to form segments.
- The amount of segments depends on the size of the pipe and the angle of the elbow.
- When the pipe section segments are fit around the pipe, they are secured with steel banding or wire ties per section.
- Any minor gaps between segments can be filled with pieces of ROCKWOOL insulation.

Insulation with SeaRox® lamella mat

- SeaRox LM 900 ALU consists of stone wool lamellas placed edgeways, with the majority of fibres perpendicular to the facing. The SeaRox lamella mat can be used up to service temperatures of 250°C. Facing up to 80°C.
- The surface finish on the SeaRox lamella mat, should be taped at all joints.
- The mats are secured with steel banding.

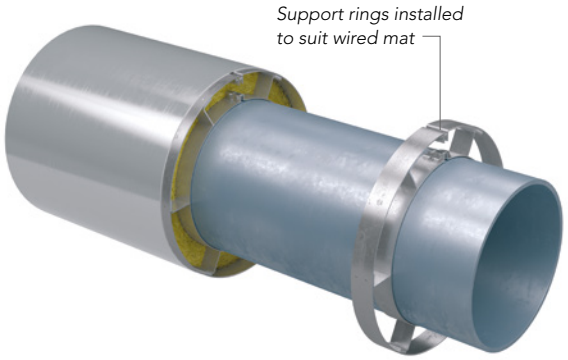
Due to the alignment of the ROCKWOOL fibres, SeaRox® lamella mat is highly resistant to compression. It is suitable for applications requiring:

- Compression resistance.
- Possible mechanical impact.
- Operational vibration loads.



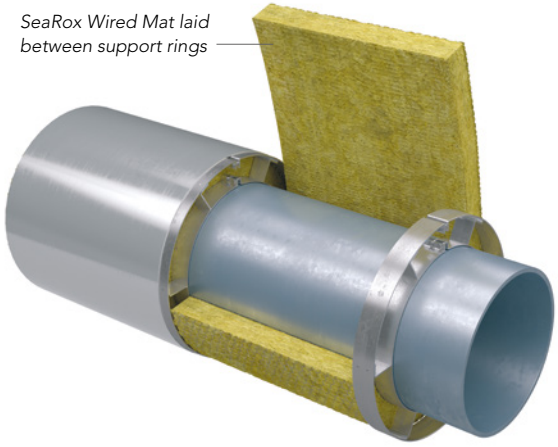
Insulation with SeaRox® and ProRox® wired mats

- SeaRox and ProRox wired mats are lightly bonded stone wool mats faced with a galvanised wire mesh. SeaRox and ProRox WM can (depending on the actual product) be used up to service temperatures of 680°C according to EN 14706.
- Due to their flexibility wired mats can be cut and fixed onto the piping easily.
- SeaRox and ProRox wired mats have relatively low resistance to pressure and from a practical point of view should only be installed in combination with spacers. The heat loss from the heat bridge created by the spacer system may need to be taken into account for the thermal calculation.



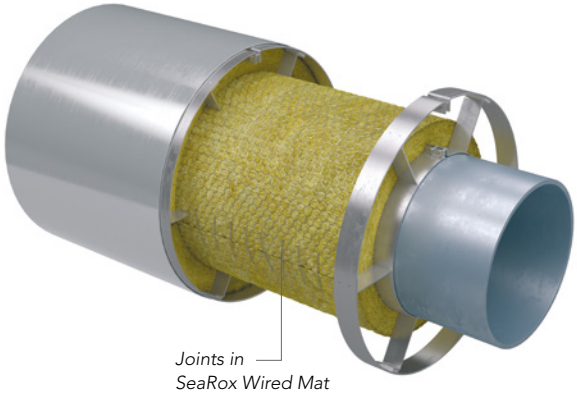
Fixing

- Any gaps created by the type of support ring installed must be filled with loose ROCKWOOL stone wool.
- SeaRox and ProRox wired mats are secured to the pipe by stitching the edges of the wire mesh together with binding wire or by clipping the mesh together with C-hooks.
- On pipes with a diameter greater than 350 mm, steel straps or additional pins and spring washers are applied to the underside of the pipe to prevent sagging.
- On vertical pipes, the wire mesh of each mat must be tied to the support ring above.



Multiple layers

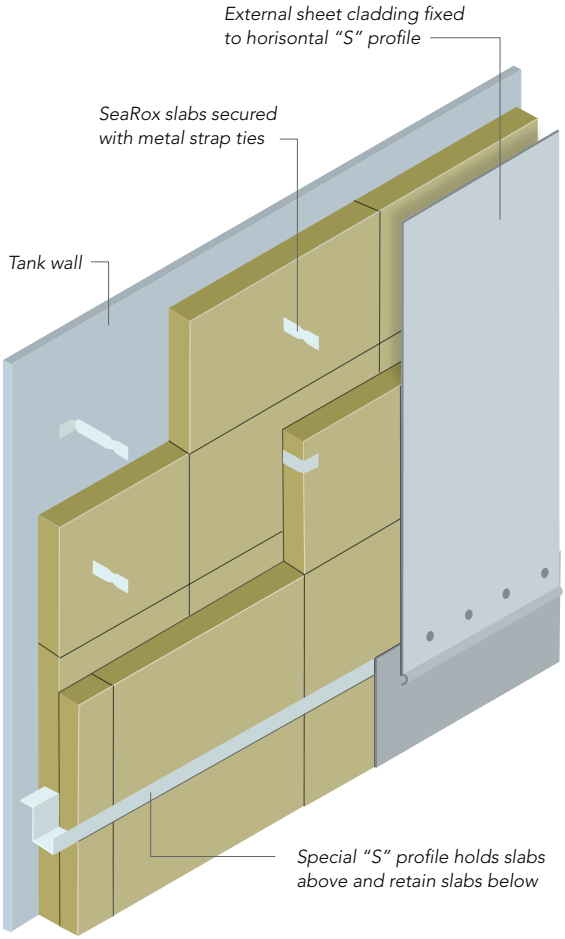
- If more than one layer of wired mat is required, it is recommended that all layers are stitched or clipped to ensure a consistently tight fit of the insulation.
- The outer layer(s) of wired mat should be applied with longitudinally staggered joints and, where applicable, with staggered joints laterally.



These SeaRox® and ProRox® wired mats are ideal where pipe sections are difficult or impossible to use:

- Temperatures above 300°C.
- Pipe diameters ≥ Ø 350 mm.
- Piping with a high number of shaped pieces such as elbows or T-joints.

Insulation with SeaRox® slabs



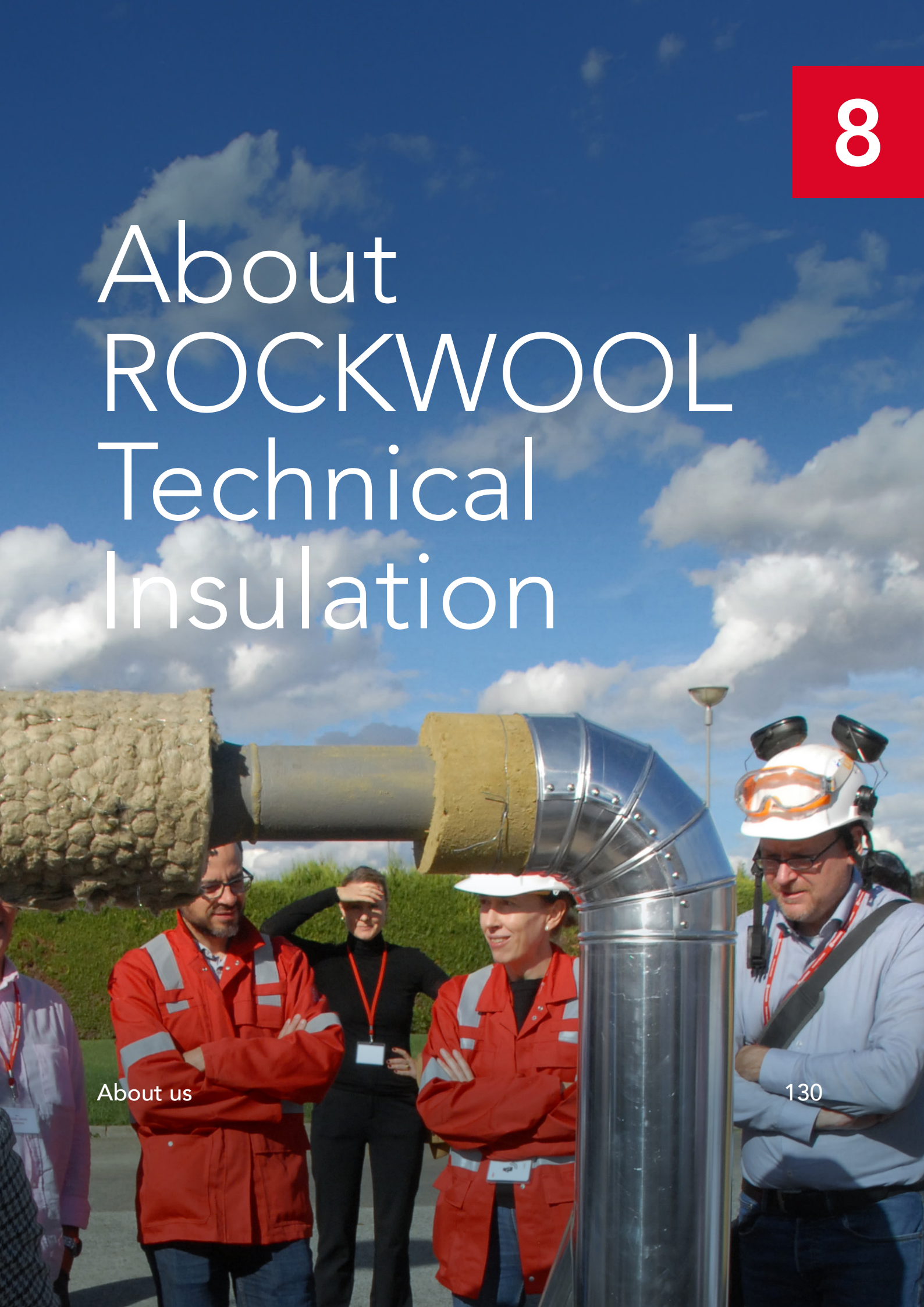
- Tanks and vessels are typically insulated with SeaRox slabs with min. density 45 kg/m^3. The products can be used up to service temperatures of 250°C. For higher temperatures, products with higher maximum service temperature resistance like SeaRox SL 620 can be used.
- The SeaRox slabs are installed and secured with steel pins and washers or over metal strap ties. These ties are bent over the edge of the outer layer of SeaRox slabs to hold them against the tank wall.
- Where the insulation extends more than 4 m in height, intermediate support profiles must be installed on the tank wall. Special "S" profiles can be used to ensure vertically staggered joints, while supporting the SeaRox slabs above and retaining the SeaRox slabs below.
- If more than one layer of SeaRox slabs is required, all joints must be staggered and tightly butted together to avoid thermal bridges.
- The SeaRox slabs must be covered with a flat or profiled external cladding to protect them from the weather and mechanical damage.

Cladding

- Suitable cladding should be applied to protect the insulation from weather influences, mechanical loads and (potentially corrosive) pollution. Selecting the appropriate cladding is based on an evaluation of various factors, such as working loads, wind loads, ambient temperatures and conditions. When selecting the appropriate cladding, take the following points into account:
- As a general rule, galvanised steel is used indoors, due to its mechanical strength, fire resistance and low surface temperature compared to aluminium cladding.
- In corrosive environments, like on deck where salty water leads to corrosion, aluminised steel, stainless steel or glass reinforced polyester (GRP) is used as cladding. Stainless steel is recommended for use in corrosive environments with a fire risk.
- The surface temperature of the cladding is influenced by the material type. As a general rule: The shinier the surface, the higher the surface temperature.
- To exclude the risk of galvanic corrosion, only use combinations of metals that do not accelerate corrosion because of differences in their electrochemical potential.
- For acoustic insulation, a noise-absorbent material (heavy mass layer) could be installed on the insulation or inside the cladding.

8

About ROCKWOOL Technical Insulation



About us

This is ROCKWOOL Technical Insulation

We have been part of the ROCKWOOL Group since 2004, offering advanced technical insulation solutions for the process and marine & offshore industries.

At the ROCKWOOL Group, our expertise lies in stone wool – a versatile and abundant material that forms the basis of all our products. However, our mission extends far beyond this. We believe insulation can play a crucial role in addressing many of today's most pressing challenges, from energy consumption and noise pollution to fire and water resilience – not to mention reducing carbon emissions.

Since stone wool production was laid in 1937, the ROCKWOOL Group has grown to have a global footprint with over 12,000 employees in 40 countries, and a head office near Copenhagen. Our strong market presence in Europe is complemented by our rapidly growing position in North America and facilities in Asia, ensuring we can support customers around the world.

As a global company, we are committed to operating sustainably. While we understand that the manufacture of our products has a negative impact on the environment, we also recognise that our products play an important role in achieving the UN Sustainable Development Goals. Therefore, our sustainability strategy focuses on maximising these benefits – our handprints – while minimising our environmental footprint.

ROCKWOOL Technical Insulation brings this vision to the insulation space within marine & offshore as well as the industrial sector, with a diverse and dedicated team of over 90 colleagues from 17 different countries. We offer products for the process and power generation industry under our ProRox® brand and for the marine and offshore market under our SeaRox® brand. Through these two product lines, our experts deliver a full range of products and systems that guarantee the highest possible thermal, acoustic, and fire-safe insulation performance. We don't just sell products; we supply solutions, adding value at every stage from specifier to installer.

In addition to sustainable products, we offer comprehensive support from documentation to delivery and after-sales service. With our global presence and local expertise in North America, Europe, the Middle East, and Asia, we ensure to meet the highest standards for every project and build strong foundations of trust.

We are committed to operational excellence, making work environments safe for people, better for the environment, and best for business. Our products improve safety for workers, contractors, and visitors through safe material handling and a more comfortable working environment. By transforming natural resources into solutions that benefit future generations, we provide the best overall value in the market, enabling customers to maximise profitability without compromising safety or sustainability.

From our first stone wool production in 1937 to the extensive range of solutions we provide today, ROCKWOOL Group products have continuously evolved to enhance many aspects of modern life.

As ROCKWOOL® has no control over insulation design and workmanship, accessory materials or applications conditions, ROCKWOOL does not warranty the performance or result of any installation containing ROCKWOOL products. ROCKWOOL's overall liability and the remedies available are limited by the general terms and conditions of sale. This warranty in lieu of all other warranties and conditions expressed or implied, including the warranties of merchantability and fitness for a particular purpose. ROCKWOOL Technical Insulation reserves the right to make necessary changes in product or constructions at any time. Technical specifications are thus stated subject to change. For correct use of our products and solutions, always refer to the latest and valid certificate in place.

SeaRox® marine and offshore manual

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ROCKWOOL Technical Insulation is a global business with a local presence, supplying advanced stone wool insulation solutions to the process and marine & offshore industries. Part of the ROCKWOOL Group, with approx. 12,000 passionate colleagues in 40 countries and sales in more than 120, we have manufacturing and service facilities around the world, ensuring we're there when you need us, with the right expertise and products to meet your requirements. See our key ROCKWOOL Technical Insulation locations below.

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ROCKWOOL Group is the world leader in stone wool products, from building insulation to acoustic ceilings, external cladding systems to horticultural solutions, engineered fibres for industrial use to insulation for the process industry and marine & offshore. We are committed to enriching the lives of everyone who experiences our products and services, and to helping customers and communities tackle many of today's biggest sustainability and development challenges including energy consumption, noise pollution, fire resilience, water scarcity, urban flooding and more.

ROCKWOOL®

TECHNICAL INSULATION