Certificate No EUFI29-25001205-C/ EN
Issued 13.11.2025
Updated 30.3.2026

PRODUCT CERTIFICATE

NAME OF PRODUCT

Insulation solutions for ventilation ducts

PAROC Vect Wired Mat BlackCoat EI30
PAROC Vect Slab BlackCoat EI60
PAROC Vect Slab BlackCoat EI30

MANUFACTURER

Paroc Group Oy
P.O. Box 240
FI-00181 Helsinki

PRODUCT DESCRIPTION

PAROC Vect Wired Mat BlackCoat EI30, PAROC Vect Slab BlackCoat EI60 and PAROC Vect Slab BlackCoat EI30 insulation solutions for rectangular ducts consist of stone wool insulating materials manufactured by Paroc Group Oy and specified in this certificate, fastenings and sealants. In this certificate the installation principles and fire resistance capability of the assembled PAROC Vect Wired Mat BlackCoat EI30, PAROC Vect Slab BlackCoat EI60 and PAROC Vect Slab BlackCoat EI30 insulation solutions for rectangular ducts are presented. Suitable insulation solution is selected according to the type of the ventilation duct and required fire resistance class.

PAROC Vect Wired Mat BlackCoat EI30, PAROC Vect Slab BlackCoat EI60 and PAROC Vect Slab BlackCoat EI30 insulation materials are CE-marked according to the product standard EN 14303.

CE-marking according to EN 14303 cannot be used to declare fire resistance.

CERTIFICATION PROCEDURE

This certificate has been issued by Eurofins Expert Services Ltd, which is a certification body (S017) accredited by FINAS.

This certificate is based on an initial type testing of the product, an initial inspection of the factory and the factory production control according to the certification criteria SERT R045 and section 3. The general certification procedures are based on the certification system of Eurofins Expert Services Oy.

The conditions of validity of this certificate are described in section 10.

TABLE OF CONTENTS

REGULATIONS, STANDARDS AND INSTRUCTIONS

1 Regulations and product requirement standards

In the opinion of Eurofins Expert Services Oy, PAROC Vect Wired Mat BlackCoat EI30, PAROC Vect Slab BlackCoat EI60 and PAROC Vect Slab BlackCoat EI30 insulation solutions, if used in accordance with the provisions of this certificate, will contribute to meet the relevant requirements of the Finnish building legislation as stated in the following:

848/2017 — *Decree on the fire safety of buildings,* in accordance with section 7 of this certificate.

927/2020 — *Change of the Decree of the Ministry of the Environment on the Fire safety of Buildings.*

2 Other standards and instructions

Other instructions and requirements applicable to the product:

EN 14303 — *Thermal insulation for building equipment and industrial installations – Factory made mineral wool (MW) products – Specification.*

Eurofins Expert Services Oy certification rules SERT R045, based on tests according to EN 1366-1 and partly applying EXAP EN 15882-1:2011.

Ilmanvaihtolaitosten paloturvallisuus -opas, www.talotekniikkainfo.fi (manual for fire safety of ventilation plants, available in Finnish only).

Design and Installation guide (March 2026)

- *PAROC® VECT WIRED MAT BLACKCOAT EI30 RECTANGULAR EI 30 / E 60*
- *PAROC® VECT SLAB BLACKCOAT EI30 RECTANGULAR EI 30 S / E 60 S*
- *PAROC® VECT SLAB BLACKCOAT EI60 RECTANGULAR EI 60 S.*

PRODUCT INFORMATION

3 Product description, marking and quality control

Products used in the PAROC Vect Wired Mat BlackCoat EI30, PAROC Vect Slab BlackCoat EI60 and PAROC Vect Slab BlackCoat EI30 insulation solutions are presented in Table 1.

Table 1. Used materials in PAROC Vect Wired Mat BlackCoat EI30-insulation solution.

Stone wool mats	PAROC Vect Wired Mat BlackCoat EI30
Stone wool slabs	PAROC Vect Slab BlackCoat EI60
	PAROC Vect Slab BlackCoat EI30
Sealing products for penetrations	PAROC FireSeal
Fastenings	As defined in the installation guide and Annex A2

The nominal densities and thicknesses required from the insulating materials in the fire insulation solutions are presented for each fire resistance class in section 7 of this certificate.

Essential characteristics according to standard EN 14303 are declared by the manufacturer in the declarations of performance, available from the manufacturer.

The insulation materials are identified by the markings on the packages, which include product name, dimensions, manufacturer's name, production time and other product information.

The manufacturer performs factory production control of the insulating materials according to the standard EN 14303.

The procedures to ensure the functionality of the fire insulation solutions are the following:

- The manufacturer ensures that the installation instruction and this certificate are made readily available.
- No changes to the fire insulation solutions or products are made before Eurofins Expert Services Oy has evaluated the effect of the changes to the fire resistance given in this certificate.
- Insulating materials used in the fire insulation solutions are clearly and unambiguously marked with product label.
- The manufacturer ensures that the installation companies have been instructed to document the installation using the installation report according to Annex A1.
- The manufacturer ensures that the installation companies have been instructed to deliver a copy of the installation report together with the copy of this certificate for filing in the construction documentation.
- The installed fire insulations are identifiable.

The assessment of conformity of the installed fire insulation system is not covered by this certificate.

4 Delivery and storage on site

The insulating materials are packed into plastic or cardboard packages and delivered to sites in a pallet protected with plastic film.

The insulating materials are delivered and stored according to the manufacturer's instructions to prevent them from getting wet, dirty or damaged.

DESIGN INFORMATION

5 General

The design information given in this certificate is based on the assumption that the structural solutions, fastening methods and other initial data are accordant to this certificate and the given requirements, instructions and standards are followed.

6 Installation

The products are installed according to the manufacturer´s installation guide. Figures concerning the installation principles of stone wool mats and duct sections as well as penetrations of rectangular ducts are presented in Annex A2. A template of the installation report that the installation company shall prepare is presented in Annex A1.

7 Fire Safety

The requirements for the fire safety of buildings and building products used in them are given in the *National Building Code of Finland 848/2017, Decree on the fire safety of buildings and 927/2020 Change of the Decree on the fire safety of buildings.*

In the declarations of performance the manufacturer has declared the reaction to fire classes shown in Table 2. The nominal density and the facing material of the product are also shown in Table 2.

Table 2. Reaction to fire class, nominal density and facing of PAROC Vect Wired Mat BlackCoat EI30, PAROC Vect Slab BlackCoat EI60 and PAROC Vect Slab BlackCoat EI30 insulating material.

Product	Reaction to fire class	Nominal density	Facing
PAROC Vect Wired Mat BlackCoat EI30	A2-s1, d0	80 kg/m^3	Aluminium laminate and galvanized steel mesh
PAROC Vect Slab BlackCoat EI60	A2-s1, d0	120 kg/m^3	Aluminium laminate

PAROC Vect Slab BlackCoat EI30	A2-s1, d0	80 kg/m^3	Aluminium laminate

The fire resistance of insulated rectangular spiral ducts made of galvanized steel for internal and external fire exposure in horizontal and vertical duct orientations are presented in Table 3. Table 3 presents also the minimum insulation thickness and nominal density of insulating material and the maximum cross section dimensions of the ventilation ducts.

Table 3. The maximum cross section dimensions of ducts and the minimum insulation thickness and density of PAROC Vect Wired Mat BlackCoat EI30, PAROC Vect Slab BlackCoat EI60 and PAROC Vect Slab BlackCoat EI30 insulating material required for rectangular ducts.

Product	**Fire resistance class**	**Insulation thickness**	**Nominal density**
Rectangular duct, maximum width 1250 mm and height 1000 mm			
PAROC Vect Wired Mat BlackCoat EI30	EI 30 (ve ho o↔i)	60 mm	80 kg/m^3
PAROC Vect Slab BlackCoat EI60	EI 60 (ve ho o↔i)	70 mm	120 kg/m^3
PAROC Vect Slab BlackCoat EI30	EI 30 (ve ho o↔i)	50 mm	80 kg/m^3

The minimum steel thickness of the ventilation duct in relation to the cross-section dimensions of duct shall be as given in Table 4. In addition, the leakage class shall be as defined in Table 4 and the stiffness of the duct system shall be as of the tested or better.

Table 4. Minimum steel thickness of the ventilation duct to be insulated and minimum duct leakage class.

Duct type	**Cross section dimensions of the duct**	**Steel thickness**	**Duct leakage class, minimum**
Rectangular	Longer side edge ≤ 300 mm	min. 0,5 mm	C
	Longer side edge > 300 – 800 mm	min. 0,7 mm	
	Longer side edge > 800 – 1250 mm	min. 0,9 mm	

The fire resistance of the fire compartment shall be equal to or higher than the fire resistance of the insulated duct. The rigid fire compartment shall have density of at least 575 kg/m^3. The minimum thickness of rigid fire compartment wall shall be 70 mm in fire resistance class EI 30 and 95 mm in fire resistance class EI 60. The thickness of the rigid fire compartment slab shall be at least 100 mm in fire resistance class EI 30 and EI 60.

The stresses in suspension devices of horizontal ducts caused by supported load shall not exceed the values presented in Table 5.

Table 5. Maximum values of stresses in suspension devices depending on fire resistance time.

Type of load	Maximum stresses
	Fire resistance time ≤ 60 min
Tensile stress in all vertically orientated components	9 N/mm^2
Shearing stress in screws [1)]	15 N/mm^2

1) Screws of class 4.6 according to standard EN ISO 898-1.

Installation of insulation system is mounted tightly around the rectangular duct as well as tightly towards the fire compartment according to the manufacturer instructions and drawings presented in Annex 2. The penetrations of the rectangular ducts are sealed according to the drawings presented in Annex A2.

INSTRUCTIONS FOR INSTALLATION AND USE

8 Manufacturer’s instructions

Installation of the fire insulation solution shall be made according to the manufacturer’s instructions (March 2026)

PAROC Vect Wired Mat BlackCoat EI30: 2403-04-61:1…4, 2403-04-62:1…5, 2403-04-62-6…9
PAROC Vect Slab BlackCoat EI30: 2405-01-61:1…4, 2405-01-62:1…4, 2405-01-62-5…7
PAROC Vect Slab BlackCoat EI60: 2406-01-61:1…4, 2406-01-62:1…4, 2406-01-62-5…7

Installation company prepares an installation report according to the Annex A1.

Safety data sheet of the insulating materials is available from the manufacturer.

VALIDITY OF THE CERTIFICATE

9 Validity period of the certificate

This certificate is valid until April 11, 2030.

The validity of the certificate will be ended, if the product falls into the scope of CE-marking.

The validity of the certificate may be confirmed at Eurofins Expert Services Oy web pages.

10 Conditions of validity

The certificate is valid assuming that no fundamental changes are made to the product, and that the manufacturer has a valid contract on certification.

11 Other conditions

The references made in this certificate to standards and instructions are valid in the format used at the time the certificate was signed.

The recommendations in this certificate concerning the safe use of this product are minimum requirements that shall be satisfied when using the product. The certificate does not override current or future requirements imposed by laws and statutes. In addition to the issues presented in this certificate, design, manufacturing and use shall follow appropriate construction methods.

The manufacturer is in charge of the product's quality and factory production control. In awarding this certificate, Eurofins Expert Services Oy does not bind itself to indemnification liability concerning personal injury or other damage that may directly or indirectly result from using the product described in this certificate.

This certificate EUFI29-25001205-C/ EN has been issued as described above to Paroc Group Oy.

On behalf of Eurofins Expert Services Oy on March 30, 2026

Katja Vahtikari
Manager, Construction Certification

Heli Välimäki
Senior Expert

This document has been signed electronically

This certificate is the English version of the original certificate no. EUFI29-25001205-C, signed March 30, 2026. In case of dispute the Finnish original certificate is valid.

APPENDIX A1: INSTALLATION REPORT

CERTIFICATE NO. EUFI29-25001205-C

Products installed:		Rectangular duct	Fire resistance class	Insulation thickness
PAROC Vect Wired Mat BlackCoat EI30	☐	☐	EI ____	
PAROC Vect Slab BlackCoat EI60	☐	☐	EI ____	
PAROC Vect Slab BlackCoat EI30	☐	☐	EI ____	
Insulation of the penetration:				
Sealing products:				

Installation site:

Site identification	
Address	
Installation site specifications (building part, floor, rooms)	
Installation time	
Additional information	

Installation company:

Name	
Address	
Name of the installer	
Contact information (phone and e-mail)	

Products have been installed according to the manufacturer's installation instructions ☐

Place and date: _____, ___.___.20____

Signature:_____

Clarification of signature:_____

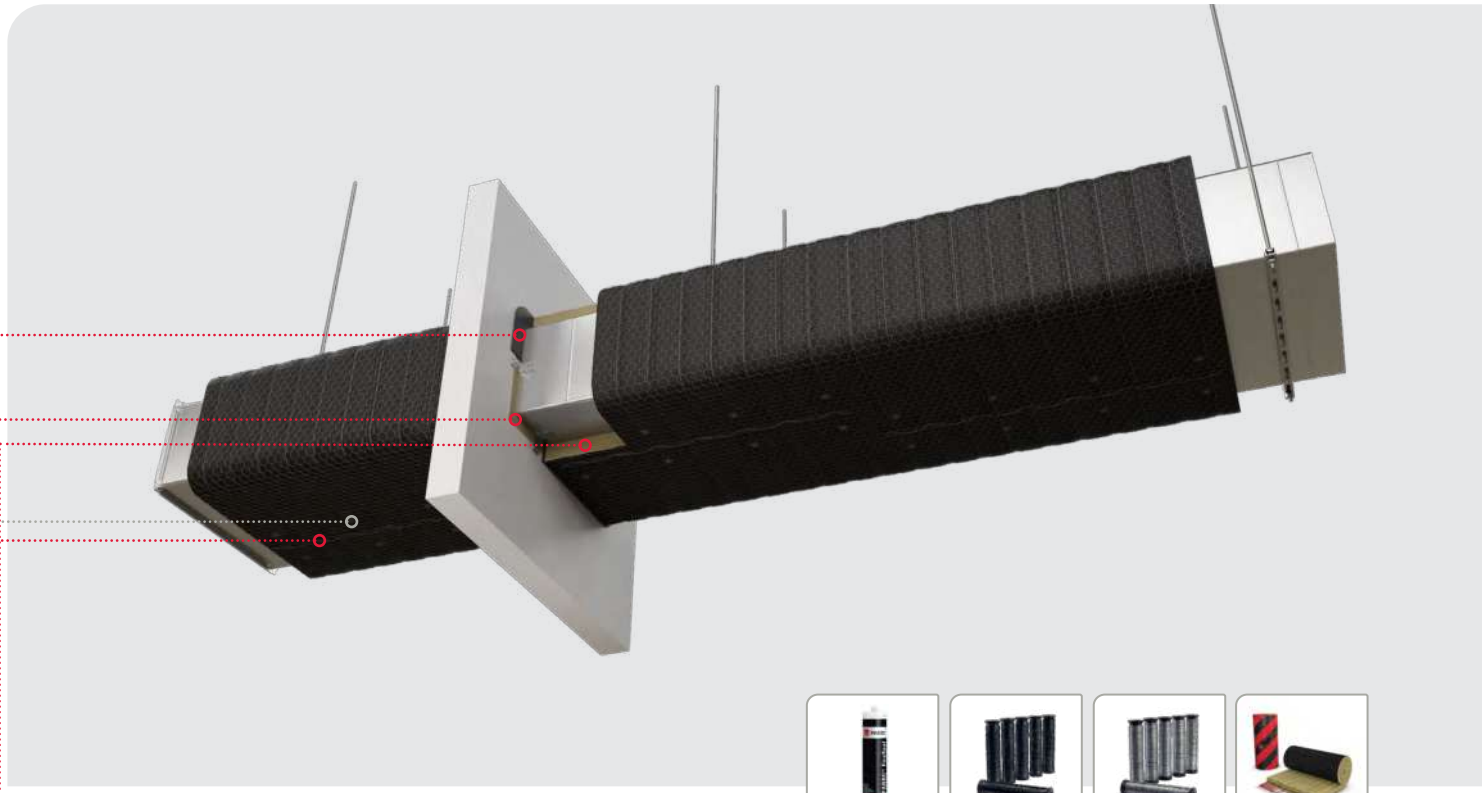
DESIGN AND INSTALLATION GUIDE

PAROC® VECT WIRED MAT BLACKCOAT EI30
RECTANGULAR EI 30 / E 60

OWENS CORNING® PAROC®

SYSTEM DEFINITION

System for fire protection of steel ventilation ducts assembled on-site






SYSTEM PARTS

PART NAME	PART DESIGNATION	TECHNICAL SPECIFICATION
Duct insulation	**PAROC® Vect Wired Mat BlackCoat EI30**	EN 14303; PAROC Declaration of Performance; maximum width 1000 mm
Penetration seal gap filler	**PAROC® Stonewool**	Any unfaced PAROC® Stonewool, minimum density 60 kg/m³, reaction-to-fire class A2-s1,d0 or better, EN 14303 or EN 13162
Fire Sealant	**PAROC® FireSeal**	PAROC Technical Datasheet*
Wire	**Steel wire**	Steel wire; minimum thickness 0,7 mm; galvanized, oxidized, stainless steel or coated
Clips	**C-clips or netting clips**	Steel/netting clips; minimum thickness 0,7 mm; galvanized, oxidized, stainless steel or coated
Welding pins	**Cuphead welding pins CD (capacitor discharge)**	Shaft: Ø2,7 mm copper-coated mild steel, insulated with plastic sleeve under the head Shaft tip sharpness: any flattening or radius of the tip cannot exceed 0,5 mm Cuphead: Ø30 mm zinc-coated mild steel, optionally insulated from the shaft side with paper washer

**System components are specified in detail in PAROC Technical Data Sheets.*

The system declared performance only applies if the specified components are used, the system is installed in accordance with the PAROC Installation Guide, and all the conditions of the the PAROC Design Guide are met regarding specification of the ductwork to be insulated and wall/floor structures that the ductwork is penetrating. Parts, structural elements, and installation operations that are not specified in the PAROC documentation are assumed to follow manufacturers standards and standard practices. Installation operations shall be carried out by installers with an appropriate level of knowledge and experience in the field of insulating steel air ductwork using the technologies: taping, wire and steel mesh binding, capacitor discharge welding.

DESIGN RULES

This fire protection duct system is designed for rectangular ducts, horizontal and vertical, standard sizes to EN 1366-1, tested at standard conditions for fire inside the duct (3 m/s air flow rate) and -500 Pa for fire outside the duct.

THE FIRE PROTECTION SYSTEM CAN BE APPLIED TO RECTANGULAR DUCTS THAT COMPLY WITH THE FOLLOWING PARAMETERS

- Tightness class C or higher according to EN 1507 and maximum 500 Pa overpressure and underpressure.
- The duct cross-section shall have a maximum width of 1250 mm and a maximum height of 1000 mm.
- The duct sections are made tight with a polymeric rubber gasket 5 x 15 mm used between the duct sections (flanges).
- Flanges: 20 mm to 30 mm height, joined with four bolts and nuts placed in the flange corners.
- The flanges are held together by C-profiles on all duct sides.
- Connection of flange to sheet steel: integrated, spot welded, screwed, riveted, or cold-pressed.

- The duct sections can be equipped with stiffeners. The stiffeners consist of:
  - steel pipes with a minimum external diameter of 16 mm and a minimum wall thickness of 2 mm;
  - washers with a diameter of minimum 70 mm on one or both sides of the steel sheet;
  - threaded rods with nuts at both ends of the pipe, minimum size M8; or steel dowels (anchors) and screws at both ends of the pipe, minimum size M8.
- Stiffener positions: as recommended by the duct manufacturers.
- Horizontal ducts are suspended on supporting profiles and pairs of steel threaded-rod hangers, with the two rods of each pair placed on the opposite sides of the duct. The tension in the hangers in cold conditions must not exceed 9 N/mm². The threaded rods are attached to the ceiling by anchoring elements with the proven loadbearing capacity to carry the insulated ductwork for the same or higher fire resistance time than the duct system in standard fire conditions (ISO 834 / EN 1363-1 standard fire curve).

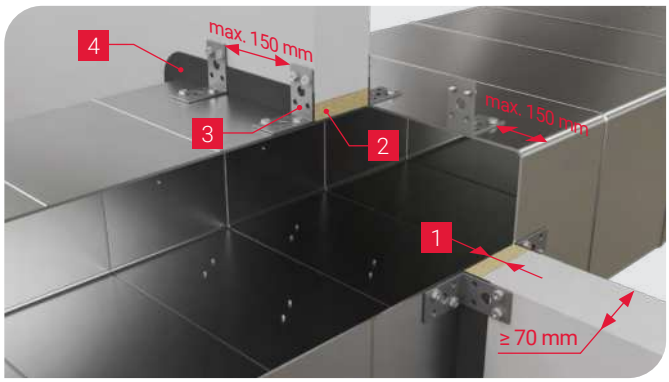
- The maximum length of the duct sections is 1500 mm.
- Horizontal installation: The maximum distance between hangers is 1500 mm.
- Position of hangers and insulation joints relative to duct joints: any.
- Suspension profile: Steel L-profile 30 x 30 x 3 mm.
- Vertical installation: The distance between floor levels / duct supports shall not exceed eight times the duct the smallest side of the duct, with a maximum of 5 m.

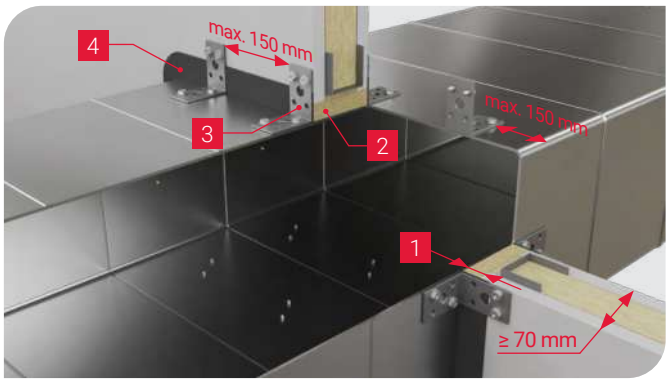
THE DUCTS MAY PENETRATE

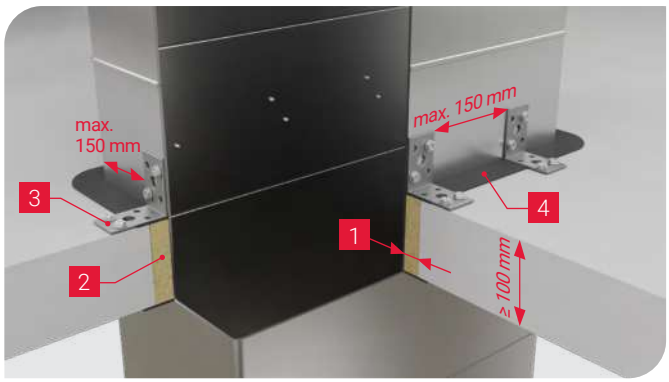
- Walls – flexible wall construction of plasterboard faced steel stud partition containing mineral wool insulation in the void, fire rated at a minimum of the same as or higher than the duct system, minimum thickness 70 mm. Reinforcing steel studs shall be applied in horizontal and vertical direction at all edges of the aperture.
- Other types of walls – light aerated concrete, concrete, masonry, all with a minimum fire resistance rating the same as or higher than that of the duct system, minimum thickness 70 mm.
- Floors – light aerated concrete with a minimum fire resistance rating the same as or higher than that of the duct system, minimum floor thickness 100 mm.
- Other types of floors – concrete, masonry, all with a minimum fire resistance rating the same as or higher than that of the duct system, minimum floor thickness 100 mm.

PENETRATION SEAL THROUGH WALLS/FLOORS – GAP FILLED WITH PAROC® STONEWOOL

- The maximum gap between the duct and the wall/floor is 30 mm.
- The duct is attached to the wall/floor using steel L-angles, minimum size 50 x 50 x 35 x 2 mm and maximum size 105 x 60 x 90 x 2 mm (oriented so that the L-angle will not extend further than the insulation thickness).
- In the wall, the L-angles are positioned on each side of the wall with the spacing of a maximum of 150 mm, and with the distances between the L-angles and the duct edges of a maximum of 150 mm.
- On the floor, the L-angles are positioned on top floor surface only, with the spacing of a maximum of 150 mm, and with the distances between the L-angles and the duct edges of a maximum of 150 mm.
- Each steel L-angle is screwed to the duct by two self-drilling screws with a minimum size of 4,2 mm, placed diagonally across the L-angle.
- The design of the penetration seal system is otherwise identical for all types of walls/floors.
- Gap filler: any unfaced PAROC® Stonewool, minimum uncompressed density 60 kg/m³, reaction-to-fire class A2-s1,d0 or better, tightly stuffed in the cavity to fill it completely and flush with wall/floor/ceiling surfaces.
- The stone wool filler is covered by a layer of fire sealant 3–5 mm thick that may extend to the adjacent surfaces of the wall/floor/ceiling. An additional layer of the fire sealant approximately 1 mm thick is applied to the interface between the stone wool insulation and the wall/floor/ceiling surface if the insulation is applied after the first layer of the fire sealant has dried out.







1. Max. gap 30 mm
2. Gap filler, PAROC® Stonewool
3. Steel L-angles, min. size 50 x 50 x 35 x 2 mm
4. PAROC® FireSeal

PENETRATION SEAL THROUGH FLOORS – ZERO DISTANCE BETWEEN THE CAST-IN CONCRETE AND THE STEEL DUCT

If the gap between the uninsulated steel duct and the edges of the opening in a floor is larger than 30 mm, it can be cast with concrete. The thickness of the concrete layer is a minimum of 100 mm.

The concrete is cast on a board supporting the concrete from the bottom side of the floor. The supporting board may be

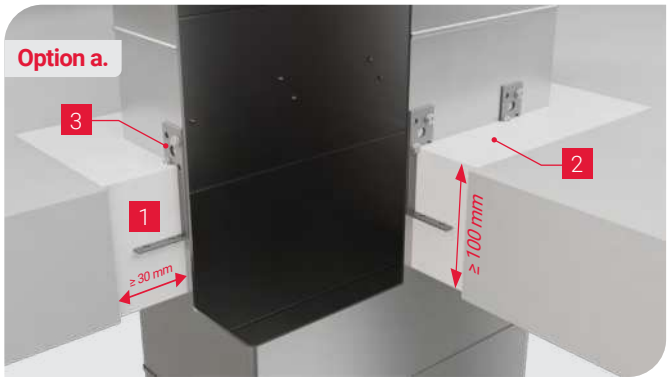
a. Used as temporary formwork and removed after the cast-in portion of the floor is completed – in that case, the reaction-to-fire class of the board is irrelevant.
b. Left in place as a permanent part of the floor – in that case, its reaction-to-fire class shall be A1 or A2-s1,d0.

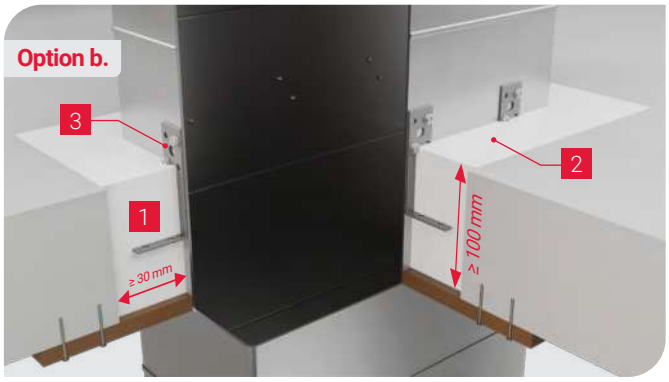
The penetration seal of ducts passing through hollow concrete floors can be made only if the gap between the duct surface and the edge of the opening is a minimum of 100 mm. In this case, the thickness of the concrete layer is the same as that of the surrounding floor.

Use of reinforcements within the floor opening is optional. PAROC takes no responsibility for loadbearing properties of the floor.

The duct is attached to the floor using steel L-angles, which are positioned approximately at the mid-depth of the floor.

- The minimum sizes of the L-angles: width 35 mm, thickness 2 mm, depth 30 mm, height 50 mm. The height may extend above the floor; it is useful if there is no access to screw the L-angle to the duct inside the floor opening.
- Each steel L-angle is screwed to the duct by two self-drilling screws with a minimum size of 4,2 mm, placed diagonally across the L-angle.
- The duct dimensions shall comply with the following limits: the maximum side length shall not exceed 1000 mm, and the maximum perimeter shall not exceed 2500 mm.
- The L-angles are positioned approximately at the mid-thickness of the floor, oriented upward, with a maximum spacing of 150 mm between the L-angles and from the edges of the duct.
- A layer of the fire sealant approximately 1 mm thick is applied to the interface between the stone wool insulation and the floor/ceiling.





1. Min. gap 30 mm
2. Cast-in concrete
3. Steel L-angles, min. size 35 x 50 x 30 x 2 mm

INSULATING LAYER ON THE DUCT SURFACES

- Insulation product PAROC® Vect Wired Mat BlackCoat EI30, nominal thickness 60 mm.
- Offset of longitudinal joints by a minimum of 100 mm.
- Fixing the insulation to the duct – four optional methods of connecting the wire mesh joints:
  1. The wire mesh is twisted approximately each 150 mm.
  2. The wire mesh is sewn by wire with a minimum thickness of 0,7 mm.
  3. The wire mesh is connected with clips, approximately each 150 mm.
  4. The wire mesh is stitched by small steel wire loops with a minimum thickness of 0,7 mm, approximately each 150 mm.

The longitudinal joints of the wire mesh shall be connected using any of the methods described above. Connecting the transverse joints is optional. If the transverse joints are twisted (method 1), the mesh wires may be twisted; the perimeter wire shall not be twisted.

Material of the wire mesh and wires: steel with any surface finishing or stainless steel.

Additionally, the insulation is attached to the bottom side of horizontal duct by welding pins. The maximum distance between welding pins is 300 mm along the duct axis, maximum 250 mm from the duct edge, and the pins are to be positioned within 50 to 150 mm from the edges of the mats. Additional welding pins may be placed on the bottom and on other duct surfaces.

INSTALLATION PROCEDURE

Before starting the installation, ensure that the wall or floor openings are clean and comply with the design rules in this document.

INSTALLATION OF THE PENETRATION – GAP FILLED WITH PAROC® STONEWOOL

1. Fill the gap tightly and completely with unfaced PAROC® Stonewool. The resulting surface of stone wool filling must be flush with both surfaces of the wall/floor.
2. Prime the surface of the stone wool filling and surrounding wall/floor surfaces with clean water.
3. Apply a continuous layer of fire sealant on both sides of the stone wool filler compressed in the gap, thickness 3 to 5 mm; this may extend to adjacent surfaces of wall/floor.
4. Make the fire sealant surface even and smooth using a wet brush or spatula.
5. Stabilize the duct by attaching steel L-angles (if not installed already).

Screws used to fix the L-angles to the wall/floor shall be made of steel and shall be of a type appropriate for the wall/floor material. Two screws shall be used to attach each L-angle to the wall/floor. The minimum size is 5 mm for aerated concrete, and 3,5 mm for lightweight partitions – screwed to the steel structure of the drywalls. They may include dowels or other type of anchors suitable for fire resistance of the duct.

INSTALLATION OF THE PENETRATION – ZERO DISTANCE BETWEEN THE CAST-IN CONCRETE AND THE STEEL DUCT USING A SUPPORTING BOARD AS TEMPORARY FORMWORK

1. Install the board that supports the concrete on the bottom surface of the floor.
2. Attach the steel L-angles to the duct.
3. Pour the concrete into the gap between the floor and the steel duct and let it dry out and harden.
4. Remove the supporting board.

INSTALLATION OF THE PENETRATION – ZERO DISTANCE BETWEEN THE CAST-IN CONCRETE AND THE STEEL DUCT USING A NON-COMBUSTIBLE SUPPORTING BOARD AS A PERMANENT PART OF THE FLOOR

1. Install the board that supports the concrete on the bottom surface of the floor.
2. Attach the steel L-angles to the duct.
3. Pour the concrete into the gap between the floor and the steel duct and let it dry out and harden.

BASIC RULES FOR HANDLING THE INSULATION MATS

- The mats must be handled with care to avoid damage to the insulation or facing.
- Unpack and unfold the mat on a flat surface, remove the plastic foil and shake the mat gently and let it rest for a minimum of 10 minutes, until it regains its original thickness and releases any tension due to packing compression.
- The insulation layer must have a uniform thickness; therefore, avoid too much stress or pinching fingers during product handling and installation.

The insulation material compensates surface irregularities of the duct through its material properties. Therefore, cuts for L-angles or flanges are not required. Bends and T-joints can be insulated by cutting segments of the insulation material.

INSTALLATION OF THE MATS ON THE DUCT

Before installing the insulating layer, ensure that:
- The ductwork fulfils air tightness criteria.
- The ductwork is assembled according to design, with proper quality, without visible holes or gaps or mechanical damage.
- The duct joints are tight and properly fit together.
- All the sizes and components comply with this guide.
- The penetration seal is installed in compliance with this guide.

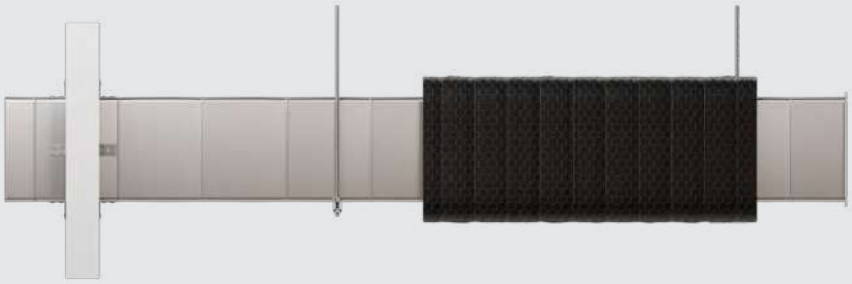
The mat length is calculated as: 2 x (steel duct width + height) + 8 x insulation thickness + addition for mat compression). The addition for mat compression is approximately 20 mm or a minimum 2% of the mat length. If the mat is too short to wrap the duct in a single piece, the correct final length can be made by connecting several pieces of mat by wired mesh (see below for connecting options for wired mat joints). The minimum size of any single piece of mat in any direction is 200 mm.

INSTALLATION OF THE MATS ON A HORIZONTAL DUCT

1. Cut the mat to the correct length corresponding to the perimeter of the duct, leaving a minimum of 100 mm extra facing and mesh for overlapping.

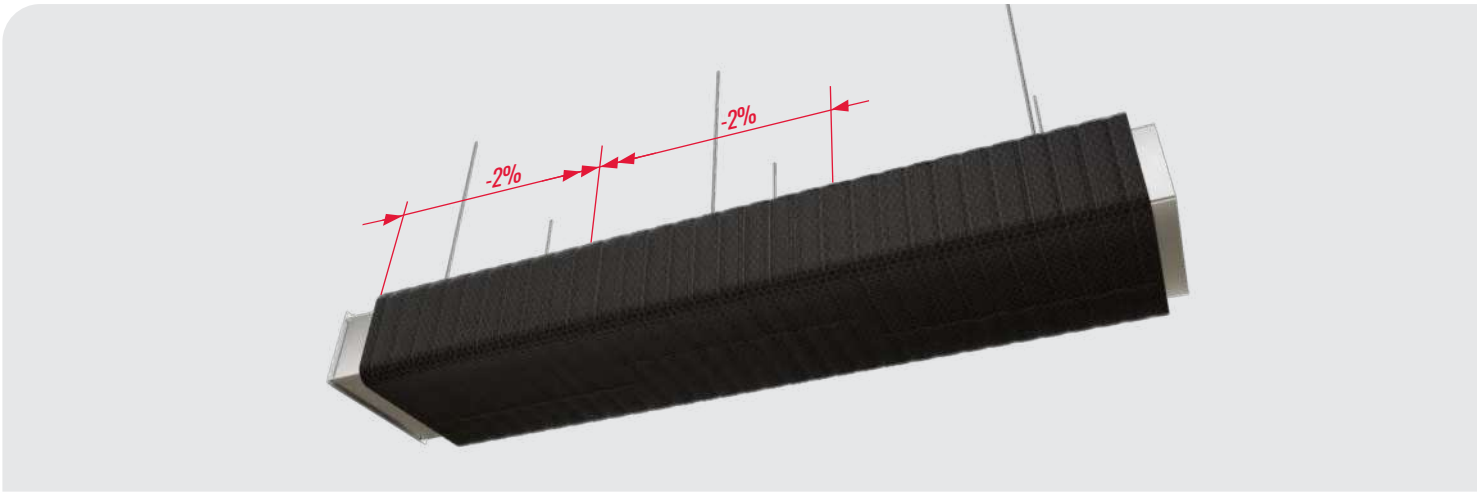
2. Wrap the insulation around the duct tightly, so that no gaps occur at the insulation joints.

3. First install the second mat, leaving the space on the duct between the second mat layer and the wall -30 mm or a minimum 2% of actual size of the gap, to allow the first mat to be adequately compressed against the wall.



4. Install and stabilize the first mat adjacent to the wall. Unless the fire sealant is still wet, the wall surface must be primed with clean water and another layer of fire sealant applied where the edge of the insulation is in contact with the wall. Spread the fire sealant with a wet brush or spatula to make a soft layer approximately 1 mm thick. Immediately after, while the fire sealant is still wet, compress the insulation against the wall.

5. Place the following mats on the duct after one another compressing all the mats to the final installed width of 20 mm or a minimum of 2% less than the original mat width.



6. Place the remaining mats on the duct. The longitudinal joints of the adjacent mats are to be offset by a minimum of 100 mm. The last mat must be compressed against the wall with the fire sealant following the principles of 4.

7. Where suspension rods penetrate the insulation, make a cut in the insulation up to the point where the suspension rod will be placed; a new joint will be created this way.

8. If there are any visible gaps between the mats and the walls, apply an appropriate amount of fire sealant therein so that the insulation edge is compressed against the wall on all its edge area. Excess fire sealant needs to be removed.

INSTALLATION OF THE MATS ON A VERTICAL DUCT

1. Cut the mat to the correct length corresponding to the perimeter of the duct, leaving a minimum of 100 mm extra facing and mesh for overlapping.

2. Wrap the insulation around the duct tightly, so that no gaps occur at the joints.

3. Install the first mat adjacent to the floor/ceiling. Unless the fire sealant is still wet, the floor/ceiling surface must be primed with clean water and another layer of fire sealant applied where the edge of the insulation is in contact with the wall. Spread the fire sealant with a wet brush or spatula to make a soft layer approximately 1 mm thick. Immediately after, while the fire sealant is still wet, compress the insulation against the floor/ceiling.

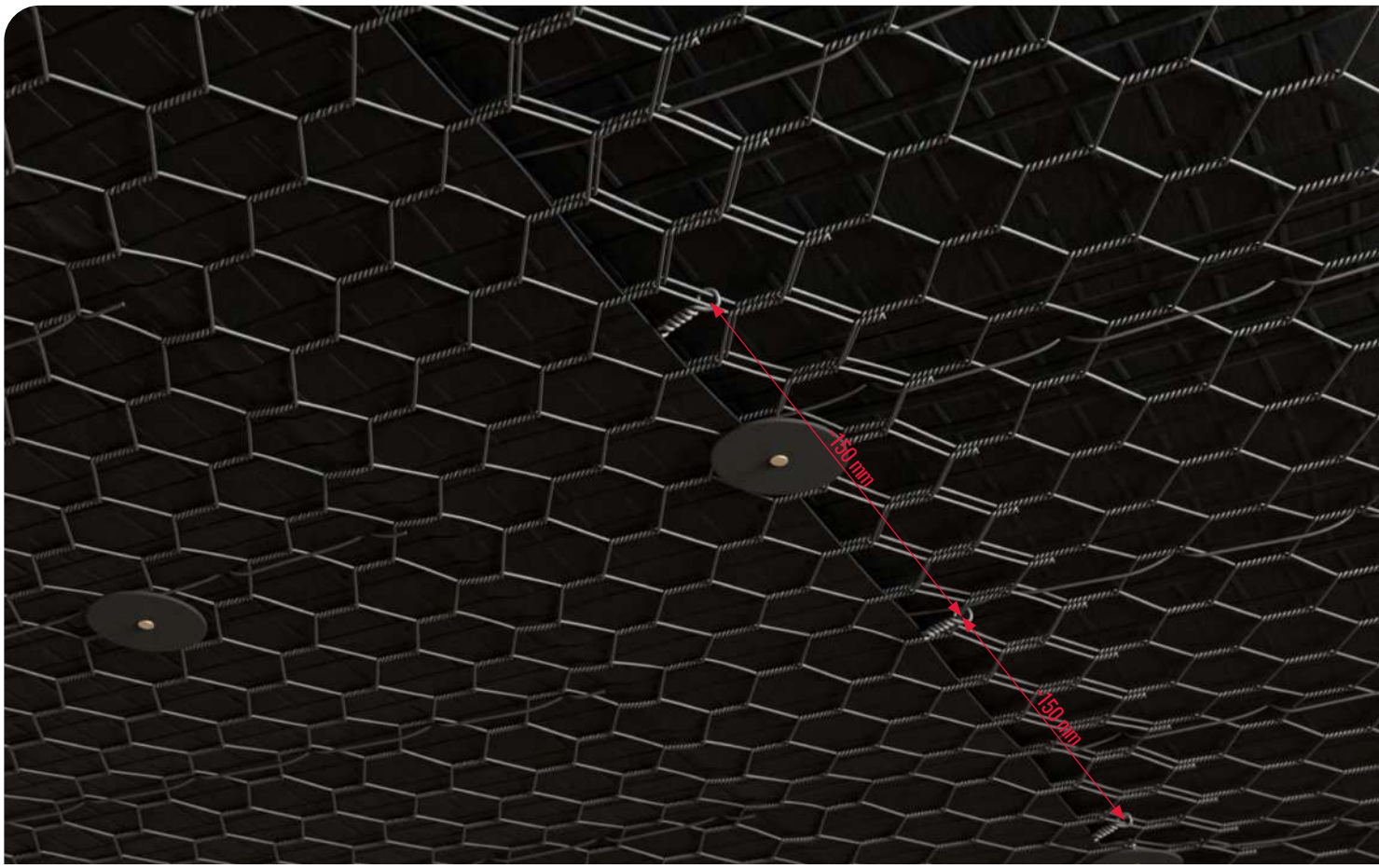
4. Place the remaining mats on the duct after one another compressing all the mats to the final installed width 20 mm or a minimum of 2% less than the original mat width. The longitudinal joints of the adjacent mats are to be offset by a minimum of 100 mm. The last top/bottom mat must be compressed against the ceiling/floor with the fire sealant following the principles of 3.

5. If there are any visible gaps between the mats and the floor/ceiling, apply an appropriate amount of fire sealant therein so that the insulation edge is compressed against the floor/ceiling on all its edge area. Excess fire sealant needs to be removed.

SECURING THE INSULATION LAYER ON THE DUCTWORK

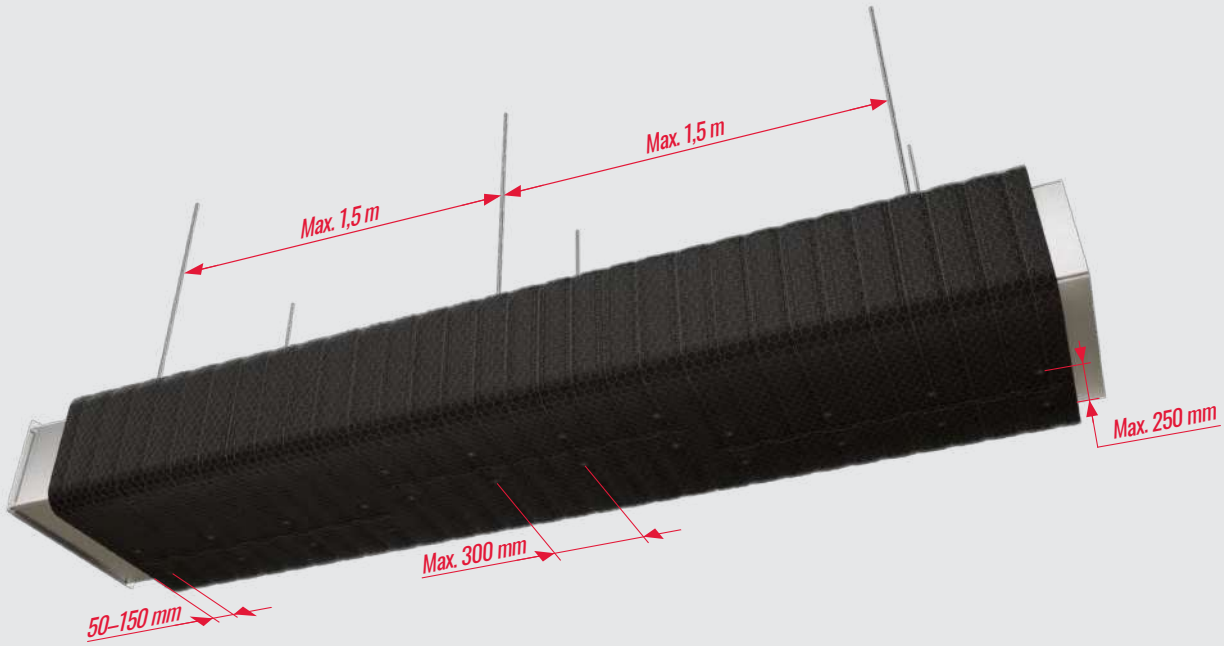
Fixing the insulation to the duct – four optional methods of connecting the wire mesh joints:

1. Twist the wires in the longitudinal joints approximately each 150 mm. Connecting the transverse joints is optional. If the transverse joints are twisted, the mesh wires may be twisted; the perimeter wire shall not be twisted.
2. Sew the longitudinal (optionally also transverse) joints by wire with a minimum thickness of 0,7 mm.
3. Connect the longitudinal (optionally also transverse) joints with clips, approximately each 150 mm.
4. Stitch the longitudinal (optionally also transverse) joints by small steel wire loops with a minimum thickness of 0,7 mm, approximately each 150 mm.



Attach the insulation to the bottom side of a horizontal duct by welding pins with a minimum diameter of 2,7 mm, with a minimum head/ washer diameter of 30 mm, and of appropriate length (depending on the real insulation thickness and duct surface geometry) to create a safe and tight connection of insulation to the duct, not causing compression of stone wool in excess of 10%.

The maximum distance between welding pins is 300 mm along the duct axis, maximum 250 mm from the duct edge, and the pins are to be positioned within 50 to 150 mm from the edges of the mats. Additional welding pins may be placed on the bottom and on other duct surfaces.



GUIDANCE ON CUP HEAD PIN WELDING

To deliver the required fire performance of insulated duct systems, the quality of components and capacitor discharge welding process are crucial. The following parameters are critical to deliver the required weld quality. Good weld quality must be tested prior to attaching insulation on the duct.

Test of the weld quality

- Weld a minimum of five pins to the same material, steel thickness, and surface as those of the insulated duct.
- Visually inspect the weld. The pin tip should be properly melted with the steel sheet, without any visible reduction of pin diameter at the weld or radial burn patterns from the weld.
- Bend the pin using a pair of pliers until the pin breaks. The pin must not detach from the steel sheet at the weld, but from slightly above. The weld must be stronger than the pin shaft.
- Repeat the test whenever the weld parameters change (pin type, steel thickness) or whenever there is a doubt about the weld quality based on sensory perceptions during welding.

NOTE: As certain conditions to achieve good weld are affected by the insulation product (points 4 and 5 below), it is recommended to perform this test with the insulation product and remove it before testing the weld quality by bending of pins.

Conditions to achieve good weld quality

1. Sharp tip of the pin; any flattening or radius of the tip must not exceed 0,5 mm.
2. Optimal setting of the welding machine
   - Voltage
   - Spring tension in the hand tool
3. Avoiding excess manual force on the pin during welding. There must be only light touch of the pin to the steel duct surface, and when the hand tool is triggered, the pin must only be pushed against the steel duct surface by the spring force in the hand tool.
4. Sufficient pin length so that there is minimum 3 mm clearance between the insulation surface and the pin head before welding.
5. Avoiding any stray currents and additional electrical resistance for the current flowing between the pin and the steel duct surface during the welding.
   - Place the negative electrode on the same duct segment where welding is performed.
   - Keep both electrodes clean and make sure there is good contact between the pin and the hand tool, and between the negative electrode clip and the duct surface.

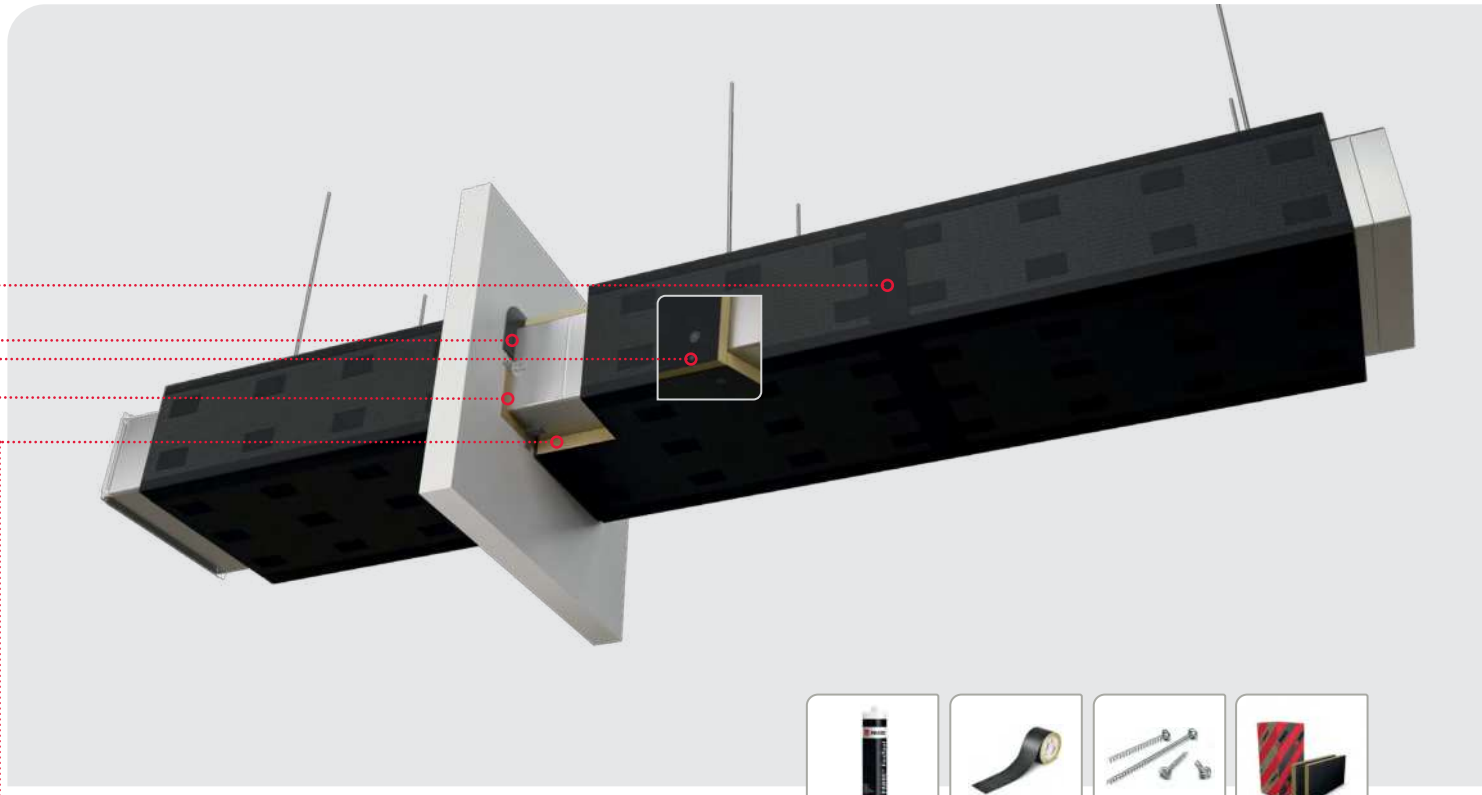
DESIGN AND INSTALLATION GUIDE

PAROC® VECT SLAB BLACKCOAT EI60 RECTANGULAR EI 60 S

OWENS CORNING® PAROC®

SYSTEM DEFINITION

System for fire protection of steel ventilation ducts assembled on-site






SYSTEM PARTS

PART NAME	PART DESIGNATION	TECHNICAL SPECIFICATION
Duct insulation	**PAROC® Vect Slab BlackCoat EI60**	EN 14303; PAROC Declaration of Performance; maximum slab size 1200 mm x 600 mm
Penetration seal gap filler	**PAROC® Stonewool**	Any PAROC® Stonewool, unfaced, minimum density 60 kg/m^3, reaction-to-fire class A2-s1,d0 or better, EN 14303 or EN 13162
Fire Sealant	**PAROC® FireSeal**	PAROC Technical Datasheet*
Adhesive tape	**PAROC® BlackCoat Tape**	PAROC Technical Datasheet*
Fire springs	**PAROC® Fire Spring**	PAROC Technical Datasheet* Minimum length 140 mm.
Welding pins	**Cuphead welding pins CD (capacitor discharge)**	Shaft: Ø2,7 mm copper-coated mild steel, insulated with plastic sleeve under the head Shaft tip sharpness: any flattening or radius of the tip cannot exceed 0,5 mm Cuphead: Ø30 mm mild steel

**System components are specified in detail in the PAROC Technical Datasheets.*

The system declared performance only applies if the specified components are used, the system is installed in accordance with the PAROC Installation Guide, and all the conditions of the PAROC Design Guide are met regarding specification of the ductwork to be insulated and wall/floor structures that the ductwork is penetrating. Parts, structural elements, and installation operations that are not specified in the PAROC documentation are assumed to follow manufacturers standards and standard practices. Installation operations shall be carried out by installers with an appropriate level of knowledge and experience in the field of insulating steel air ductwork using the technologies: taping, wire and steel mesh binding, capacitor discharge welding.

DESIGN RULES

This fire protection duct system is designed for rectangular ducts, horizontal and vertical, standard sizes to EN 1366-1, tested at standard conditions for fire inside the duct (3 m/s air flow rate) and -500 Pa for fire outside the duct.

THE FIRE PROTECTION SYSTEM CAN BE APPLIED TO RECTANGULAR DUCTS THAT COMPLY WITH THE FOLLOWING PARAMETERS

- Tightness class C or higher according to EN 1507 and maximum 500 Pa overpressure and underpressure.
- The duct cross-section shall have a maximum width of 1250 mm and a maximum height of 1000 mm.
- The duct sections are made tight with a polymeric rubber gasket 5 x 15 mm used between the duct sections (flanges).
- Flanges: 20 mm height, joined with four bolts and nuts placed in the flange corners.
- The flanges are held together by C-profiles on all duct sides.
- Connection of flange to sheet steel: integrated, spot welded, screwed, riveted, or cold-pressed.

- The duct sections can be equipped with stiffeners. The stiffeners consist of:
  - steel pipes with a minimum external diameter of 16 mm and a minimum wall thickness of 2 mm;
  - washers with a diameter of minimum 70 mm on one or both sides of the steel sheet;
  - threaded rods with nuts at both ends of the pipe, minimum size M8; or steel dowels (anchors) and screws at both ends of the pipe, minimum size M8.
- Stiffener positions: as recommended by the duct manufacturers.
- Horizontal ducts are suspended on supporting profiles and pairs of steel threaded-rod hangers, with the two rods of each pair placed on the opposite sides of the duct. The tension in the hangers in cold conditions must not exceed 9 N/mm². The threaded rods are attached to the ceiling by anchoring elements with the proven loadbearing capacity to carry the insulated ductwork for the same or higher fire resistance time than the duct system in standard fire conditions (ISO 834 / EN 1363-1 standard fire curve).

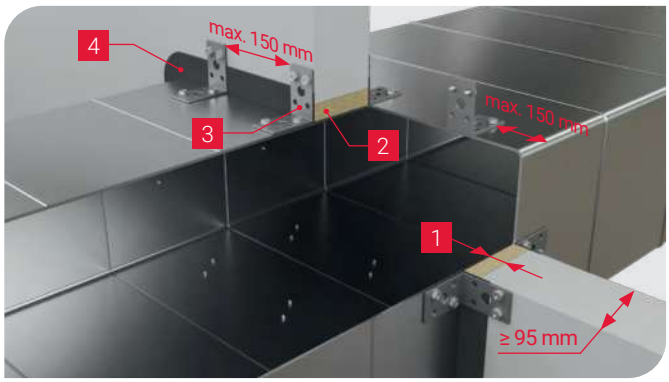
- The maximum length of the duct segments is 1500 mm.
- Horizontal installation: The maximum distance between hangers is 1500 mm.
- Position of hangers relative to duct joints: 0–200 mm.
- Position of insulation slab joints relative to duct joints and hangers: any.
- Suspension profile: steel L-profile 30 x 30 x 3 mm.
- Vertical installation: The distance between floor levels / duct supports shall not exceed eight times the smallest side of the duct, with a maximum of 5 m.

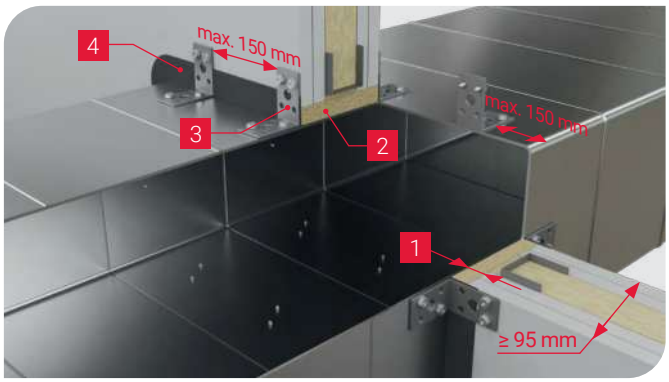
THE DUCTS MAY PENETRATE

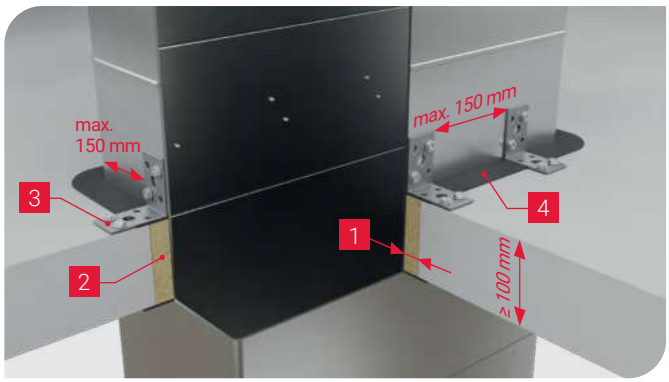
- Walls – flexible wall construction of plasterboard faced steel stud partition containing mineral wool insulation in the void, fire rated at a minimum of the same as or higher than the duct system, minimum thickness 95 mm. Reinforcing steel studs shall be applied in horizontal and vertical direction at all edges of the aperture.
- Other types of walls – light aerated concrete, concrete, masonry, all with a minimum fire resistance rating the same as or higher than that of the duct system, minimum thickness 95 mm.
- Floors – light aerated concrete with a minimum fire resistance rating the same as or higher than that of the duct system, minimum floor thickness 100 mm.
- Other types of floors – concrete, masonry, all with a minimum fire resistance rating the same as or higher than that of the duct system, minimum floor thickness 100 mm.

PENETRATION SEAL THROUGH WALLS/FLOORS – GAP FILLED WITH PAROC® STONEWOOL

- The maximum gap between the duct and the wall/floor is 30 mm.
- The duct is attached to the wall/floor using steel L-angles, minimum size 50 x 50 x 35 x 2 mm and maximum size 105 x 70 x 90 x 2 mm (oriented so that the L-angle will not extend further than the insulation thickness).
- In the wall, the L-angles are positioned on each side of the wall with the spacing of a maximum of 150 mm, and with the distances between the L-angles and the duct edges of a maximum of 150 mm.
- On the floor, the L-angles are positioned on top floor surface only, with the spacing of a maximum of 150 mm, and with the distances between the L-angles and the duct edges of a maximum of 150 mm.
- Each steel L-angle is screwed to the duct by two self-drilling screws with a minimum size of 4,2 mm, placed diagonally across the L-angle.
- The design of the penetration seal system is otherwise identical for all types of walls/floors.
- Gap filler: any unfaced PAROC® Stonewool, minimum uncompressed density 60 kg/m³, reaction-to-fire class A2-s1,d0 or better, tightly stuffed in the cavity to fill it completely and flush with wall/floor/ceiling surfaces.
- The stone wool filler is covered by a layer of fire sealant 3–5 mm thick that may extend to the adjacent surfaces of the wall/floor/ceiling. An additional layer of the fire sealant approximately 1 mm thick is applied to the interface between the stone wool insulation and the wall/floor/ceiling if the insulation is applied after the first layer of the fire sealant has dried out.







1. Max. gap 30 mm
2. Gap filler, PAROC® Stonewool
3. Steel L-angles, min. size 50 x 50 x 35 x 2 mm
4. PAROC® FireSeal

PENETRATION SEAL THROUGH FLOORS – ZERO DISTANCE BETWEEN THE CAST-IN CONCRETE AND THE STEEL DUCT

If the gap between the uninsulated steel duct and the edges of the opening in a floor is larger than 30 mm, it can be cast with concrete. The thickness of the concrete layer is a minimum of 100 mm.

The concrete is cast on a board supporting the concrete from the bottom side of the floor. The supporting board may be

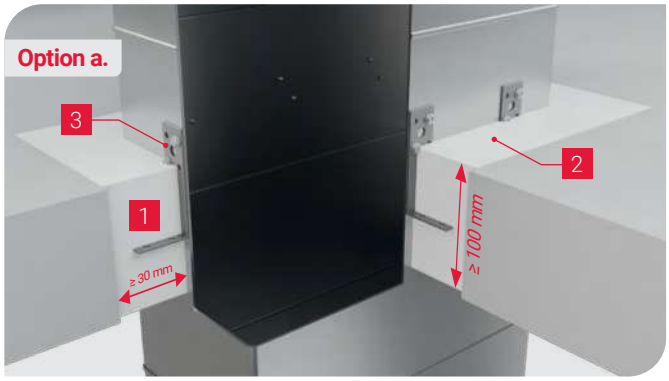
a. Used as temporary formwork and removed after the cast-in portion of the floor is completed – in that case, the reaction-to-fire class of the board is irrelevant.
b. Left in place as a permanent part of the floor – in that case, its reaction-to-fire class shall be A1 or A2-s1,d0.

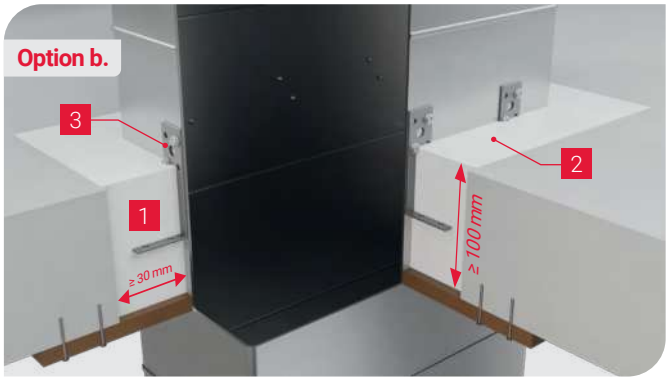
The penetration seal of ducts passing through hollow concrete floors can be made only if the gap between the duct surface and the edge of the opening is a minimum of 100 mm. In this case, the thickness of the concrete layer is the same as that of the surrounding floor.

Use of reinforcements within the floor opening is optional. PAROC takes no responsibility for loadbearing properties of the floor.

The duct is attached to the floor using steel L-angles, which are positioned approximately at the mid-depth of the floor.

- The minimum sizes of the L-angles: width 35 mm, thickness 2 mm, depth 30 mm, height 50 mm. The height may extend above the floor; it is useful if there is no access to screw the L-angle to the duct inside the floor opening.
- Each steel L-angle is screwed to the duct by two self-drilling screws with a minimum size of 4,2 mm, placed diagonally across the L-angle.
- The duct dimensions shall comply with the following limits: the maximum side length shall not exceed 1000 mm, and the maximum perimeter shall not exceed 2500 mm.
- The L-angles are positioned approximately at the mid-thickness of the floor, oriented upward, with a maximum spacing of 150 mm between the L-angles and from the edges of the duct.
- A layer of the fire sealant approximately 1 mm thick is applied to the interface between the stone wool insulation and the floor/ceiling.





1. Min. gap 30 mm
2. Cast-in concrete
3. Steel L-angles, min. size 35 x 50 x 30 x 2 mm

INSULATING LAYER ON THE DUCT SURFACES

- Insulation product PAROC® Vect Slab BlackCoat EI60, nominal thickness 70 mm.
- Optionally, the slab joints (including any pinching of insulation, welding pin cupheads, and penetrations) may be taped, to provide a diffusion-resistant surface, using self-adhesive PAROC® BlackCoat Tape with a maximum width of 110 mm.

The insulation is attached to all vertical surfaces of the ducts and on the bottom horizontal or inclined surfaces with welding pins with a minimum diameter of 2,7 mm, a minimum head/washer diameter of 30 mm, and of appropriate length (depending on the real insulation thickness and duct surface geometry) to create a tight connection of insulation to the duct, not causing compression of stone wool in excess of 10%. For the top horizontal and inclined surfaces, welding pins are optional. The maximum distance between the welding pins is 350 mm in any direction. The distance between the welding pins and the slab edges is 50 mm to 100 mm. The maximum distance between the welding pins and the duct edges is 50 mm.

The corner joints of the insulation slabs are secured with fire springs with a minimum length of 140 mm. The maximum distance between the fire springs is 350 mm. The distance between the fire springs and the slab edges is 50 mm to 100 mm. The fire springs are positioned approximately at the mid-thickness of the slab (35 mm from the slab surface).

INSTALLATION PROCEDURE

Before starting the installation, ensure that the wall or floor openings are clean and comply with the design rules in this document.

INSTALLATION OF THE PENETRATION – GAP FILLED WITH PAROC® STONEWOOL

1. Fill the gap tightly and completely with unfaced PAROC® Stonewool. The resulting surface of stone wool filling must be flush with both surfaces of the wall/floor.
2. Prime the surface of the stone wool filling and surrounding wall/floor surfaces with clean water.
3. Apply a continuous layer of fire sealant on both sides of the stone wool filler compressed in the gap, thickness 3 to 5 mm; this may extend to adjacent surfaces of wall/floor.
4. Make the fire sealant surface even and smooth using a wet brush or spatula.
5. Stabilize the duct by attaching steel L-angles (if not installed already).

Screws used to fix the L-angles to the wall/floor shall be made of steel and be of a type appropriate for the wall/floor material. Two screws shall be used to attach each L-angle to the wall/floor. The minimum size is 5 mm for aerated concrete, and 3,5 mm for lightweight partitions – screwed to the steel structure of the drywalls. They may include dowels or other type of anchors suitable for fire resistance of the duct.

INSTALLATION OF THE PENETRATION – ZERO DISTANCE BETWEEN THE CAST-IN CONCRETE FLOOR AND THE STEEL DUCT USING A SUPPORTING BOARD AS TEMPORARY FORMWORK

1. Install the board that supports the concrete on the bottom surface of the floor.
2. Attach the steel L-angles to the duct.
3. Pour the concrete into the gap between the floor and the steel duct and let it dry out and harden.
4. Remove the supporting board.

INSTALLATION OF THE PENETRATION – ZERO DISTANCE BETWEEN THE CAST-IN CONCRETE FLOOR AND THE STEEL DUCT USING A NON-COMBUSTIBLE SUPPORTING BOARD AS A PERMANENT PART OF THE FLOOR

1. Install the board that supports the concrete on the bottom surface of the floor.
2. Attach the steel L-angles to the duct.

BASIC RULES FOR HANDLING THE INSULATION SLABS

- The slabs must be handled with care to avoid damage to insulation or facing.
- The insulation layer must have a uniform thickness; therefore, avoid too much stress or pinching fingers during product handling and installation.

Cuts for brackets or flanges must be done with due care and precision, in order not to remove more insulation material from the grooves and cut-outs than necessary. Bends and T-joints can be insulated by cutting segments of the insulation material.

INSTALLATION OF THE SLABS ON THE DUCT

Before installing the insulating layer, ensure that:

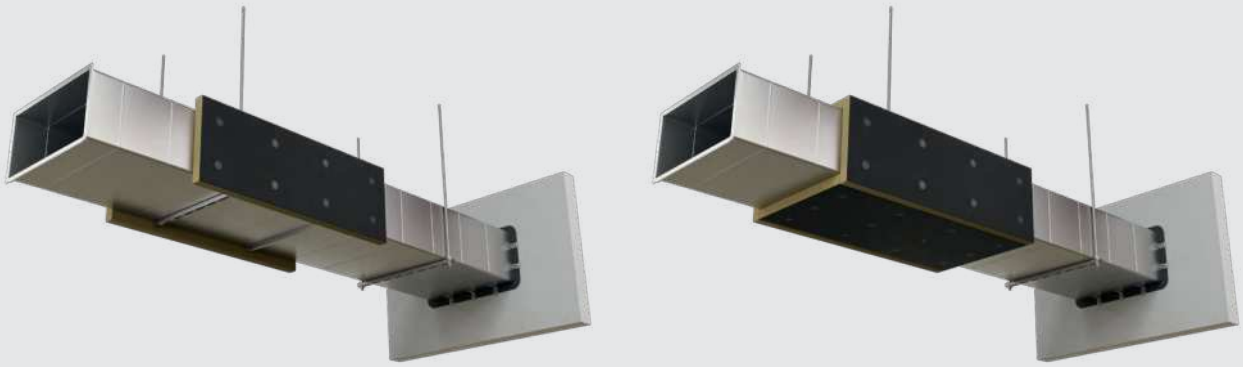
- The ductwork fulfils air tightness criteria.
- the ductwork is assembled according to design, with proper quality, without visible holes or gaps or mechanical damage.
- The duct joints are tight and properly fit together.
- All the sizes and components comply with this guide.
- The penetration seal is installed in compliance with this guide.

The minimum size of any single slab in any direction is 200 mm.

INSTALLATION OF THE SLABS ON A HORIZONTAL DUCT

1. Cut the slabs to the correct sizes.

2. First install the second slab on vertical duct sides, leaving the space on the duct between the second slab and the wall, to allow the first set of slabs to be adequately compressed against the wall. Following the same principle, install the second set of slabs on the bottom and top sides of the duct.

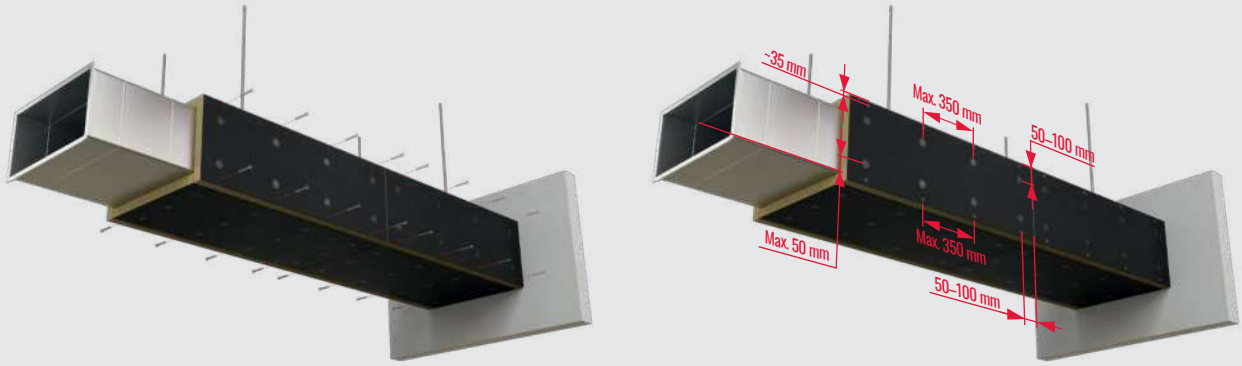


3. Install the first set of slabs adjacent to the wall in the same order: vertical sides, bottom, and top of the duct. Unless the fire sealant is still wet, the wall surface must be primed with clean water and another layer of fire sealant applied where the edge of the insulation will touch the wall: spread the fire sealant with a wet brush or spatula to make a soft layer approximately 1 mm thick. Immediately after, while the fire sealant is still wet, compress the insulation against the wall.

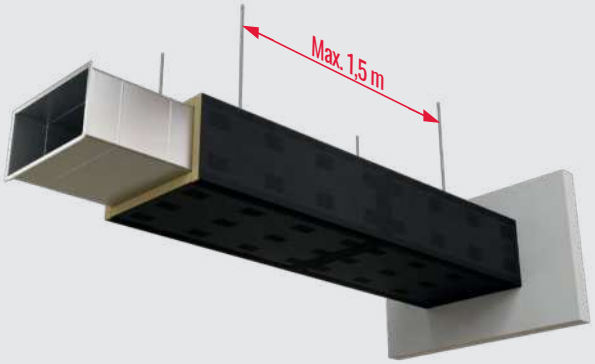
4. Place the following sets of slabs on the duct after one another. The last set of slabs must be compressed against the wall with the fire sealant applied following the principles of 3.

5. Where suspension rods or flanges penetrate the insulation, cut grooves or rabbets with maximum depth of 20 mm into the insulation prior to installing.

6. Check if all welding pins have been attached correctly, and install fire springs to reinforce the corner joints of the slabs.



7. To reduce the risk of condensation (optional): carefully tape all joints, head pins, and fire springs with PAROC® BlackCoat Tape; pay attention to centrally positioning the tape in all directions.



8. If there are any visible gaps between the slabs and the walls, apply an appropriate amount of fire sealant therein. Excess fire sealant needs to be removed.

INSTALLATION OF THE SLABS ON A VERTICAL DUCT

1. Cut the slabs to the correct sizes.

2. Install the first set of slabs adjacent to the floor/ceiling. Unless the fire sealant is still wet, the floor/ceiling surface must be primed with clean water and another layer of fire sealant applied applied where the edge of the insulation will touch the floor/ceiling: spread the fire sealant with a wet brush or spatula to make a soft layer approximately 1 mm thick. Immediately after, while the fire sealant is still wet, compress the insulation against the floor/ceiling.

3. Place the following sets of slabs on the duct after one another. The last top/bottom set of slabs must be compressed against the ceiling/floor with the fire sealant applied following the principles of 2.

4. Where flanges penetrate the insulation, cut grooves or rabbets with maximum depth of 20 mm into the insulation prior to installing.

5. Check if all welding pins have been attached correctly, and install fire springs to reinforce the corner joints of the slabs.

6. To reduce the risk of condensation (optional): carefully tape all joints, head pins, and fire springs with PAROC® BlackCoat Tape; pay attention to centrally positioning the tape in all directions.

7. If there are any visible gaps between the slabs and the floor/ceiling, apply an appropriate amount of fire sealant therein. Excess fire sealant needs to be removed.

GUIDANCE ON CUP HEAD PIN WELDING

To deliver the required fire performance of insulated duct systems, the quality of components and capacitor discharge welding process are crucial. The following parameters are critical to deliver the required weld quality. Good weld quality must be tested prior to attaching insulation on the duct.

Test of the weld quality

- Weld a minimum of five pins to the same material, steel thickness, and surface as those of the insulated duct.
- Visually inspect the weld. The pin tip should be properly melted with the steel sheet, without any visible reduction of pin diameter at the weld or radial burn patterns from the weld.
- Bend the pin using a pair of pliers until the pin breaks. The pin must not detach from the steel sheet at the weld, but from slightly above. The weld must be stronger than the pin shaft.
- Repeat the test whenever the weld parameters change (pin type, steel thickness) or whenever there is a doubt about the weld quality based on sensory perceptions during welding.

NOTE: As certain conditions to achieve good weld are affected by the insulation product (points 4 and 5 below), it is recommended to perform this test with the insulation product and remove it before testing the weld quality by bending of pins.

Conditions to achieve good weld quality

1. Sharp tip of the pin; any flattening or radius of the tip must not exceed 0,5 mm.
2. Optimal setting of the welding machine
   - Voltage
   - Spring tension in the hand tool
3. Avoiding excess manual force on the pin during welding. There must be only light touch of the pin to the steel duct surface, and when the hand tool is triggered, the pin must only be pushed against the steel duct surface by the spring force in the hand tool.
4. Sufficient pin length so that there is minimum 3 mm clearance between the insulation surface and the pin head before welding.
5. Avoiding any stray currents and additional electrical resistance for the current flowing between the pin and the steel duct surface during the welding.
   - Place the negative electrode on the same duct segment where welding is performed.
   - Keep both electrodes clean and make sure there is good contact between the pin and the hand tool, and between the negative electrode clip and the duct surface.

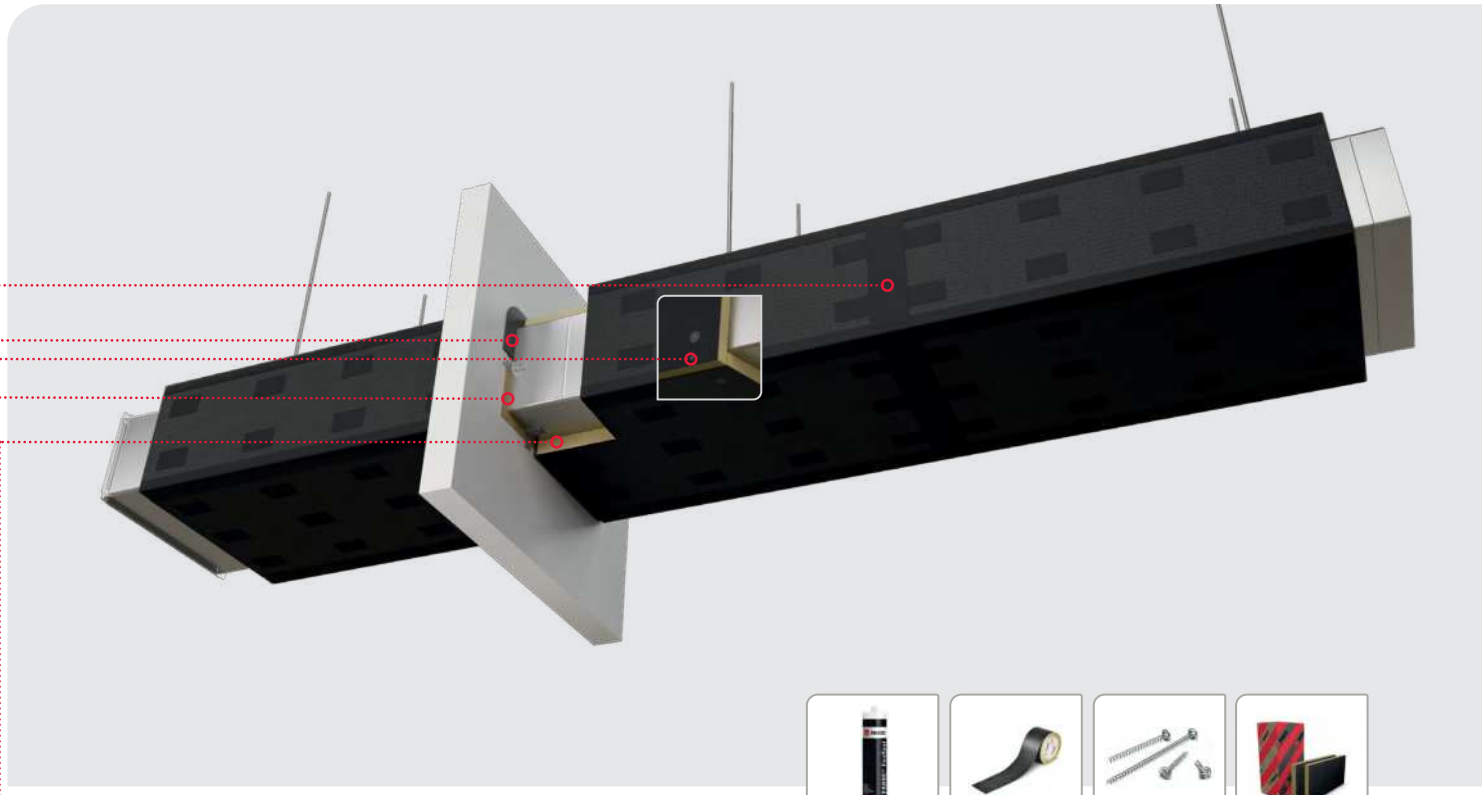
DESIGN AND INSTALLATION GUIDE

PAROC® VECT SLAB BLACKCOAT EI30
RECTANGULAR EI 30 S / E 60 S

OWENS CORNING® PAROC®

SYSTEM DEFINITION

System for fire protection of steel ventilation ducts assembled on-site






SYSTEM PARTS

PART NAME	PART DESIGNATION	TECHNICAL SPECIFICATION
Duct insulation	**PAROC® Vect Slab BlackCoat EI30**	EN 14303; PAROC Declaration of Performance; maximum slab size 1200 mm x 600 mm
Penetration seal gap filler	**PAROC® Stonewool**	Any PAROC® Stonewool, unfaced, minimum density 60 kg/m³, reaction-to-fire class A2-s1,d0 or better, EN 14303 or EN 13162
Fire Sealant	**PAROC® FireSeal**	PAROC Technical Datasheet*
Adhesive tape	**PAROC® BlackCoat Tape**	PAROC Technical Datasheet*
Fire springs	**PAROC® Fire Spring**	PAROC Technical Datasheet* Minimum length 100 mm.
Welding pins	**Cuphead welding pins CD (capacitor discharge)**	Shaft: minimum Ø2,7 mm copper-coated mild steel, insulated with plastic sleeve under the head Shaft tip sharpness: any flattening or radius of the tip cannot exceed 0,5 mm Cuphead: minimum Ø30 mm mild steel

**System components are specified in detail in the PAROC Technical Datasheets.*

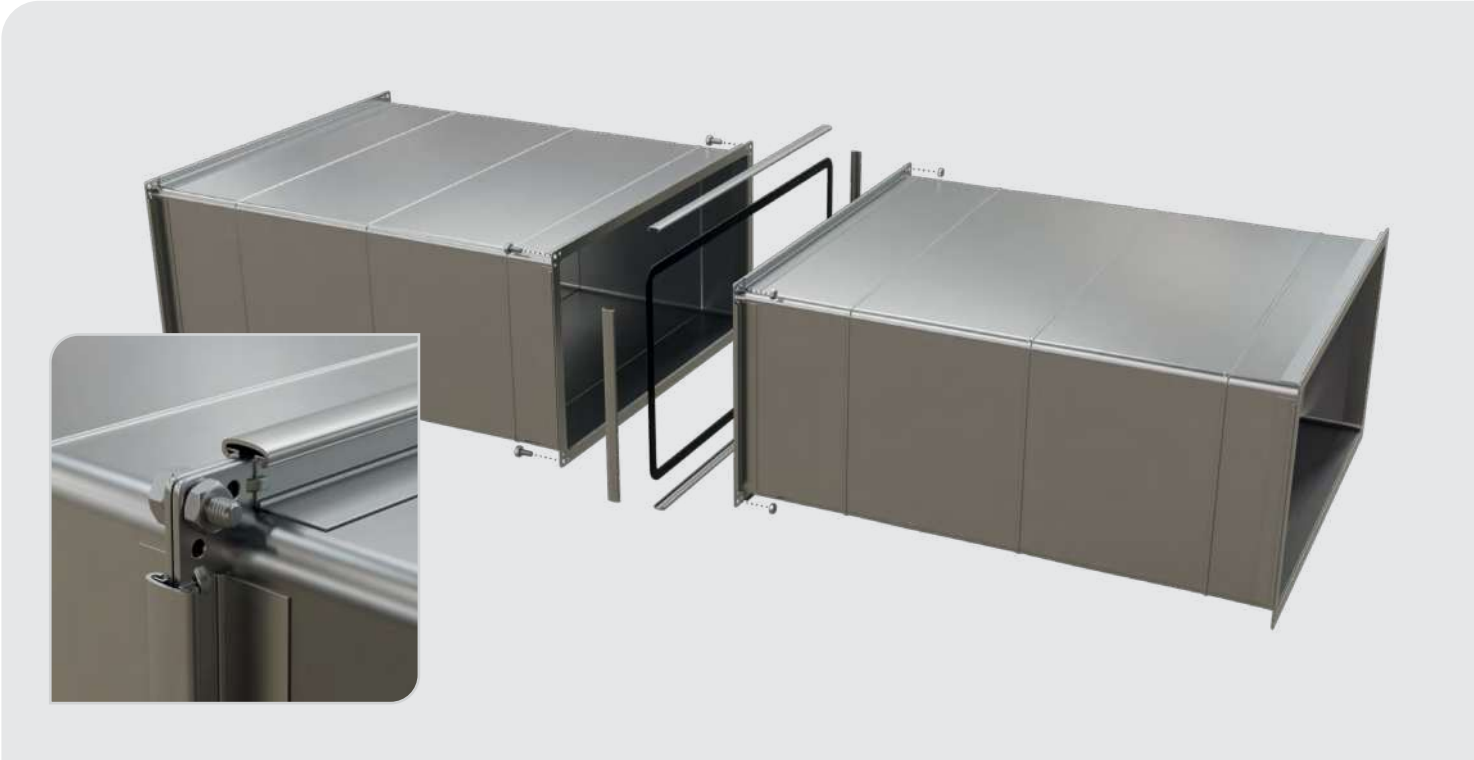
The system declared performance only applies if the specified components are used, the system is installed in accordance with the PAROC Installation Guide, and all the conditions of the PAROC Design Guide are met regarding specification of the ductwork to be insulated and wall/floor structures that the ductwork is penetrating. Parts, structural elements, and installation operations that are not specified in the PAROC documentation are assumed to follow manufacturers standards and standard practices. Installation operations shall be carried out by installers with an appropriate level of knowledge and experience in the field of insulating steel air ductwork using the technologies: taping, wire and steel mesh binding, capacitor discharge welding.

DESIGN RULES

This fire protection duct system is designed for rectangular ducts, horizontal and vertical, standard sizes to EN 1366-1, tested at standard conditions for fire inside the duct (3 m/s air flow rate) and -500 Pa for fire outside the duct.

THE FIRE PROTECTION SYSTEM CAN BE APPLIED TO RECTANGULAR DUCTS THAT COMPLY WITH THE FOLLOWING PARAMETERS

- Tightness class C or higher according to EN 1507 and maximum 500 Pa overpressure and underpressure.
- The duct cross-section shall have a maximum width of 1250 mm and a maximum height of 1000 mm.
- The duct sections are made tight with a polymeric rubber gasket 5 x 15 mm used between the duct sections (flanges).
- Flanges: 20 mm height, joined with four bolts and nuts placed in the flange corners.
- The flanges are held together by C-profiles on all duct sides.
- Connection of flange to sheet steel: integrated, spot welded, screwed, riveted, or cold-pressed.



- The duct sections can be equipped with stiffeners. The stiffeners consist of:
  - steel pipes with a minimum external diameter of 16 mm and a minimum wall thickness of 2 mm;
  - washers with a diameter of minimum 70 mm on one or both sides of the steel sheet;
  - threaded rods with nuts at both ends of the pipe, minimum size M8; or steel dowels (anchors) and screws at both ends of the pipe, minimum size M8.
- Stiffener positions: as recommended by the duct manufacturers.
- Horizontal ducts are suspended on supporting profiles and pairs of steel threaded-rod hangers, with the two rods of each pair placed on the opposite sides of the duct. The tension in the hangers in cold conditions must not exceed 9 N/mm². The threaded rods are attached to the ceiling by anchoring elements with the proven loadbearing capacity to carry the insulated ductwork for the same or higher fire resistance time than the duct system in standard fire conditions (ISO 834 / EN 1363-1 standard fire curve).

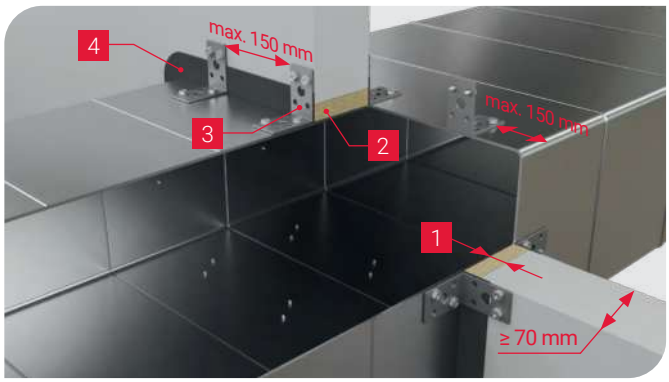
- The maximum length of the duct segments is 1500 mm.
- Horizontal installation: The maximum distance between hangers is 1500 mm.
- Position of hangers relative to duct joints: 0–200 mm.
- Position of insulation slab joints relative to duct joints and hangers: any.
- Suspension profile: steel L-profile 30 x 30 x 3 mm.
- Vertical installation: The distance between floor levels / duct supports shall not exceed eight times the smallest side of the duct, with a maximum of 5 m.

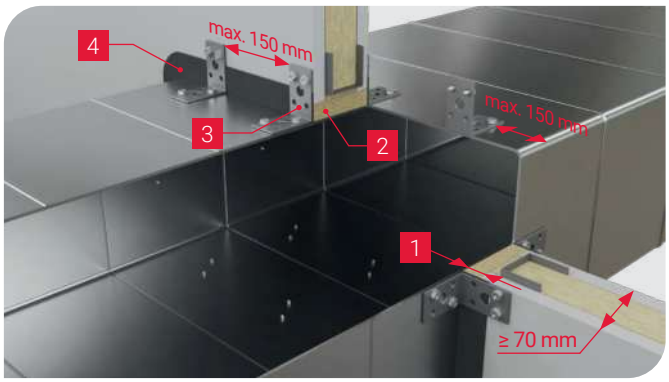
THE DUCTS MAY PENETRATE

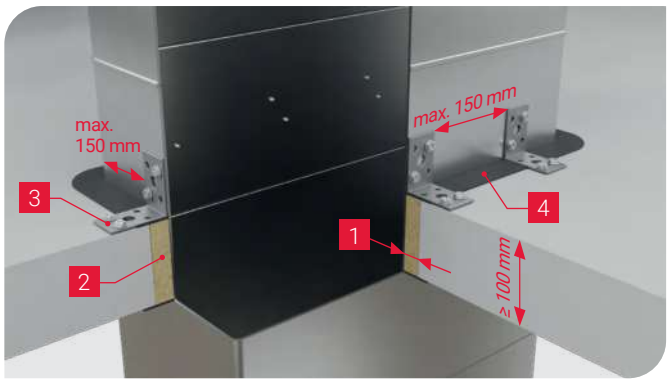
- Walls – flexible wall construction of plasterboard faced steel stud partition containing mineral wool insulation in the void, fire rated at a minimum of the same as or higher than the duct system, minimum thickness 70 mm. Reinforcing steel studs shall be applied in horizontal and vertical direction at all edges of the aperture.
- Other types of walls – light aerated concrete, concrete, masonry, all with a minimum fire resistance rating the same as or higher than that of the duct system, minimum thickness 70 mm.
- Floors – light aerated concrete with a minimum fire resistance rating the same as or higher than that of the duct system, minimum floor thickness 100 mm.
- Other types of floors – concrete, masonry, all with a minimum fire resistance rating the same as or higher than that of the duct system, minimum floor thickness 100 mm.

PENETRATION SEAL THROUGH WALLS/FLOORS – GAP FILLED WITH PAROC® STONEWOOL

- The maximum gap between the duct and the wall/floor is 30 mm.
- The duct is attached to the wall/floor using steel L-angles, minimum size 50 x 50 x 35 x 2 mm and maximum size 105 x 50 x 90 x 2 mm (oriented so that the L-angle will not extend further than the insulation thickness).
- In the wall, the L-angles are positioned on each side of the wall with the spacing of a maximum of 150 mm, and with the distances between the L-angles and the duct edges of a maximum of 150 mm.
- On the floor, the L-angles are positioned on top floor surface only, with the spacing of a maximum of 150 mm, and with the distances between the L-angles and the duct edges of a maximum of 150 mm.
- Each steel L-angle is screwed to the duct by two self-drilling screws with a minimum size of 4,2 mm, placed diagonally across the L-angle.
- The design of the penetration seal system is otherwise identical for all types of walls/floors.
- Gap filler: any unfaced PAROC® Stonewool, minimum uncompressed density 60 kg/m³, reaction-to-fire class A2-s1,d0 or better, tightly stuffed in the cavity to fill it completely and flush with the wall/floor surfaces.
- The stone wool filler is covered by a layer of fire sealant 3–5 mm thick that may extend to the adjacent surfaces of the wall/floor/ceiling. An additional layer of the fire sealant approximately 1 mm thick is applied to the interface between the stone wool insulation and the wall/floor/ceiling if the insulation is applied after the first layer of the fire sealant has dried out.







1. Max. gap 30 mm
2. Gap filler, PAROC® Stonewool
3. Steel L-angles, min. size 50 x 50 x 35 x 2 mm
4. PAROC® FireSeal

PENETRATION SEAL THROUGH FLOORS – ZERO DISTANCE BETWEEN THE CAST-IN CONCRETE AND THE STEEL DUCT

If the gap between the uninsulated steel duct and the edges of the opening in a floor is larger than 30 mm, it can be cast with concrete. The thickness of the concrete layer is a minimum of 100 mm.

The concrete is cast on a board supporting the concrete from the bottom side of the floor. The supporting board may be

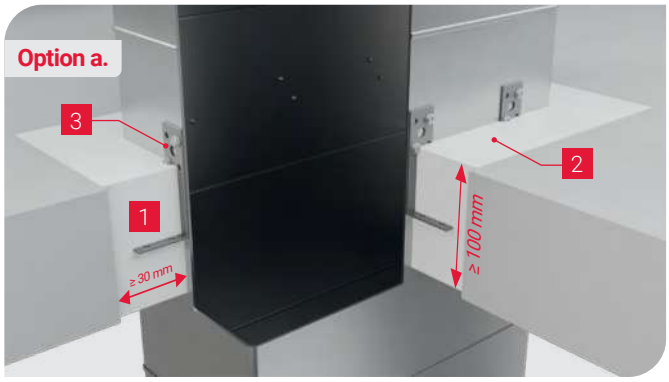
a. Used as temporary formwork and removed after the cast-in portion of the floor is completed – in that case, the reaction-to-fire class of the board is irrelevant.
b. Left in place as a permanent part of the floor – in that case, its reaction-to-fire class shall be A1 or A2-s1,d0.

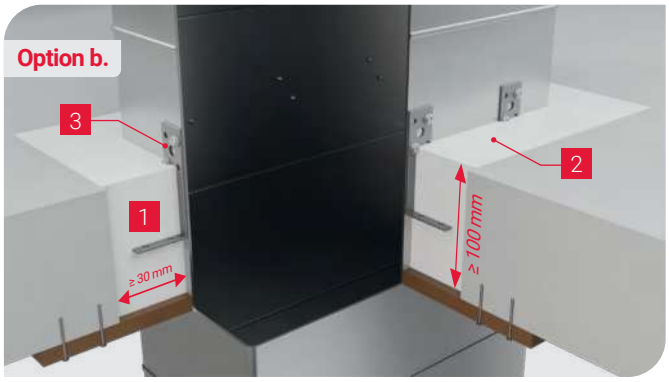
The penetration seal of ducts passing through hollow concrete floors can be made only if the gap between the duct surface and the edge of the opening is a minimum of 100 mm. In this case, the thickness of the concrete layer is the same as that of the surrounding floor.

Use of reinforcements within the floor opening is optional. PAROC takes no responsibility for loadbearing properties of the floor.

The duct is attached to the floor using steel L-angles, which are positioned approximately at the mid-depth of the floor.

- The minimum sizes of the L-angles: width 35 mm, thickness 2 mm, depth 30 mm, height 50 mm. The height may extend above the floor; it is useful if there is no access to screw the L-angle to the duct inside the floor opening.
- Each steel L-angle is screwed to the duct by two self-drilling screws with a minimum size of 4,2 mm, placed diagonally across the L-angle.
- The duct dimensions shall comply with the following limits: the maximum side length shall not exceed 1000 mm, and the maximum perimeter shall not exceed 2500 mm.
- The L-angles are positioned approximately at the mid-thickness of the floor, oriented upward, with a maximum spacing of 150 mm between the L-angles and from the edges of the duct.
- A layer of the fire sealant approximately 1 mm thick is applied to the interface between the stone wool insulation and the floor/ceiling.





1. Min. gap 30 mm
2. Cast-in concrete
3. Steel L-angles, min. size 35 x 50 x 30 x 2 mm

INSULATING LAYER ON THE DUCT SURFACES

- Insulation product PAROC® Vect Slab BlackCoat EI30, nominal thickness 50 mm.
- Optionally, the slab joints (including any pinching of insulation, welding pin cupheads, and penetrations) may be taped, to provide a diffusion-resistant surface, using self-adhesive PAROC® BlackCoat Tape with a maximum width of 110 mm.

The insulation is attached to all vertical surfaces of the ducts and on the bottom horizontal or inclined surfaces with welding pins with a minimum diameter of 2,7 mm, a minimum head/washer diameter of 30 mm, and of appropriate length (depending on the real insulation thickness and duct surface geometry) to create a tight connection of insulation to the duct, not causing compression of stone wool in excess of 10%. For the top horizontal and inclined surfaces, welding pins are optional. The maximum distance between the welding pins is 350 mm in any direction. The distance between the welding pins and the slab edges is 50 mm to 100 mm. The maximum distance between the welding pins and the duct edges is 50 mm.

The corner joints of the insulation slabs are secured with fire springs with a minimum length of 100 mm. The maximum distance between the fire springs is 350 mm. The distance between the fire springs and the slab edges is 50 mm to 100 mm. The fire springs are positioned approximately at the mid-thickness of the slab (25 mm from the slab surface).

INSTALLATION PROCEDURE

Before starting the installation, ensure that the wall or floor openings are clean and comply with the design rules in this document.

INSTALLATION OF THE PENETRATION – GAP FILLED WITH PAROC® STONEWOOL

1. Fill the gap tightly and completely with unfaced PAROC® Stonewool. The resulting surface of stone wool filling must be flush with both surfaces of the wall/floor.
2. Prime the surface of the stone wool filling and surrounding wall/floor surfaces with clean water.
3. Apply a continuous layer of fire sealant on both sides of the stone wool filler compressed in the gap, thickness 3 to 5 mm; this may extend to adjacent surfaces of wall/floor.
4. Make the fire sealant surface even and smooth using a wet brush or spatula.
5. Stabilize the duct by attaching steel L-angles (if not installed already).

Screws used to fix the L-angles to the wall/floor shall be made of steel and be of a type appropriate for the wall/floor material. Two screws shall be used to attach each L-angle to the wall/floor. The minimum size is 5 mm for aerated concrete, and 3,5 mm for lightweight partitions – screwed to the steel structure of the drywalls. They may include dowels or other type of anchors suitable for fire resistance of the duct.

INSTALLATION OF THE PENETRATION – ZERO DISTANCE BETWEEN THE CAST-IN CONCRETE AND THE STEEL DUCT USING A SUPPORTING BOARD AS TEMPORARY FORMWORK

1. Install the board that supports the concrete on the bottom surface of the floor.
2. Attach the steel L-angles to the duct.
3. Pour the concrete into the gap between the floor and the steel duct and let it dry out and harden.
4. Remove the supporting board.

INSTALLATION OF THE PENETRATION – ZERO DISTANCE BETWEEN THE CAST-IN CONCRETE AND THE STEEL DUCT USING A NON-COMBUSTIBLE SUPPORTING BOARD AS A PERMANENT PART OF THE FLOOR

1. Install the board that supports the concrete on the bottom surface of the floor.
2. Attach the steel L-angles to the duct.
3. Pour the concrete into the gap between the floor and the steel duct and let it dry out and harden.

BASIC RULES FOR HANDLING THE INSULATION SLABS

- The slabs must be handled with care to avoid damage to insulation or facing.
- The insulation layer must have a uniform thickness; therefore, avoid too much stress or pinching fingers during product handling and installation.

Cuts for brackets or flanges must be done with due care and precision, in order not to remove more insulation material from the grooves and cut-outs than necessary. Bends and T-joints can be insulated by cutting segments of the insulation material.

INSTALLATION OF THE SLABS ON THE DUCT

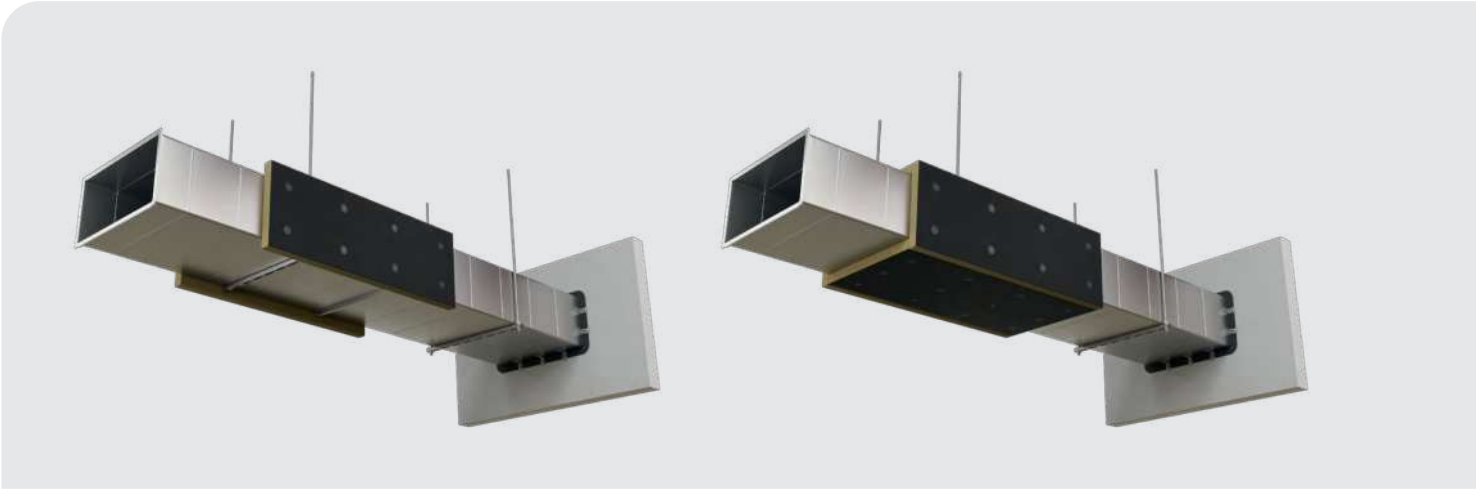
Before installing the insulating layer, ensure that:
- The ductwork fulfils air tightness criteria.
- The ductwork is assembled according to design, with proper quality, without visible holes or gaps or mechanical damage.
- The duct joints are tight and properly fit together.
- All the sizes and components comply with this guide.
- The penetration seal is installed in compliance with this guide.

The minimum size of any single slab in any direction is 200 mm.

INSTALLATION OF THE MATS ON A HORIZONTAL DUCT

1. Cut the slabs to the correct sizes.

2. First install the second slab on vertical duct sides, leaving the space on the duct between the second slab and the wall, to allow the first set of slabs to be adequately compressed against the wall. Following the same principle, install the second set of slabs on the bottom and top sides of the duct.



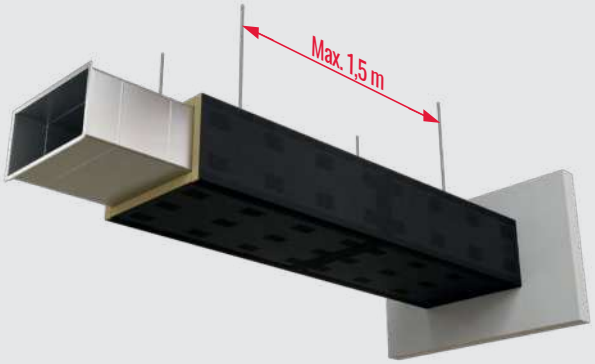
3. Install the first set of slabs adjacent to the wall in the same order: vertical sides, bottom, and top of the duct. Unless the fire sealant is still wet, the wall surface must be primed with clean water and another layer of fire sealant applied where the edge of the insulation will touch the wall: spread the fire sealant with a wet brush or spatula to make a soft layer approximately 1 mm thick. Immediately after, while the fire sealant is still wet, compress the insulation against the wall.

4. Place the following sets of slabs on the duct after one another. The last set of slabs must be compressed against the wall with the fire sealant applied following the principles of 3.

5. Where suspension rods or flanges penetrate the insulation, cut grooves or rabbets with maximum depth of 20 mm into the insulation prior to installing.

6. Check if all welding pins have been attached correctly, and install fire springs to reinforce the corner joints of the slabs.

7. To reduce the risk of condensation (optional): carefully tape all joints, head pins, and fire springs with PAROC® BlackCoat Tape; pay attention to centrally positioning the tape in all directions.



8. If there are any visible gaps between the slabs and the walls, apply an appropriate amount of fire sealant therein. Excess fire sealant needs to be removed.

INSTALLATION OF THE SLABS ON A VERTICAL DUCT

1. Cut the slabs to the correct sizes.

2. Install the first set of slabs adjacent to the floor/ceiling. Unless the fire sealant is still wet, the floor/ceiling surface must be primed with clean water and another layer of fire sealant applied where the edge of the insulation will touch the floor/ceiling: spread the fire sealant with a wet brush or spatula to make a soft layer approximately 1 mm thick. Immediately after, while the fire sealant is still wet, compress the insulation against the floor/ceiling.

3. Place the following sets of slabs on the duct after one another. The last top/bottom set of slabs must be compressed against the ceiling/floor with the fire sealant applied following the principles of 2.

4. Where flanges penetrate the insulation, cut grooves or rabbets with maximum depth of 20 mm into the insulation prior to installing.

5. Check if all welding pins have been attached correctly, and install fire springs to reinforce the corner joints of the slabs.

6. To reduce the risk of condensation (optional): carefully tape all joints, head pins, and fire springs with PAROC® BlackCoat Tape; pay attention to centrally positioning the tape in all directions.

7. If there are any visible gaps between the slabs and the floor/ceiling, apply an appropriate amount of fire sealant therein. Excess fire sealant needs to be removed.

GUIDANCE ON CUP HEAD PIN WELDING

To deliver the required fire performance of insulated duct systems, the quality of components and capacitor discharge welding process are crucial. The following parameters are critical to deliver the required weld quality. Good weld quality must be tested prior to attaching insulation on the duct.

Test of the weld quality

- Weld a minimum of five pins to the same material, steel thickness, and surface as those of the insulated duct.
- Visually inspect the weld. The pin tip should be properly melted with the steel sheet, without any visible reduction of pin diameter at the weld or radial burn patterns from the weld.
- Bend the pin using a pair of pliers until the pin breaks. The pin must not detach from the steel sheet at the weld, but from slightly above. The weld must be stronger than the pin shaft.
- Repeat the test whenever the weld parameters change (pin type, steel thickness) or whenever there is a doubt about the weld quality based on sensory perceptions during welding.

NOTE: As certain conditions to achieve good weld are affected by the insulation product (points 4 and 5 below), it is recommended to perform this test with the insulation product and remove it before testing the weld quality by bending of pins.

Conditions to achieve good weld quality

1. Sharp tip of the pin; any flattening or radius of the tip must not exceed 0,5 mm.
2. Optimal setting of the welding machine
   - Voltage
   - Spring tension in the hand tool
3. Avoiding excess manual force on the pin during welding. There must be only light touch of the pin to the steel duct surface, and when the hand tool is triggered, the pin must only be pushed against the steel duct surface by the spring force in the hand tool.
4. Sufficient pin length so that there is minimum 3 mm clearance between the insulation surface and the pin head before welding.
5. Avoiding any stray currents and additional electrical resistance for the current flowing between the pin and the steel duct surface during the welding.
   - Place the negative electrode on the same duct segment where welding is performed.
   - Keep both electrodes clean and make sure there is good contact between the pin and the hand tool, and between the negative electrode clip and the duct surface.