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European Technical Assessment

ETA-19/0584 of 06/11/2019

General Part

Technical Assessment Body issuing the European Technical Assessment	Instytut Techniki Budowlanej
Trade name of the construction product	Roxtec R seal
Product family to which the construction product belongs	Fire Stopping and Fire Sealing Products. Penetration Seals
Manufacturer	ROXTEC INTERNATIONAL A.B. Box 540 S-37123 Karlskrona Sweden
Manufacturing plant	ROXTEC INTERNATIONAL A.B. Rombvägen 2 S-371 60 Karlskrona Sweden
This European Technical Assessment contains	27 pages including 3 Annexes which form an integral part of this Assessment
This European Technical Assessment is issued in accordance with regulation (EU) No 305/2011, on the basis of	European Assessment Document (EAD) 350454-00-1104 “Fire Stopping and Fire Sealing Products. Penetration Seals”

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Specific Part

1 Technical description of the product

The Roxtec R seal is a round, modular system penetration seal, comprising a steel frame (Roxtec SLFR sleeve) into which circular, elastomeric block (Roxtec R, Roxtec RO or Roxtec RO OMD) is installed. Roxtec R, Roxtec RO or Roxtec RO OMD blocks are filled with Roxtec RM modules – cuboid, elastomeric blocks, which consist of two halves. The type and arrangement of modules are matched in order to completely fill in the space in an opening of a seal. Modules are compressed around the service with the use of a compression mechanism, which is integrated in the seal. The components of the seal are shown in table below and Annex B.

Component	Description	Size
Circular blocks (Roxtec R seals)		
R	Circular block, for cables and metal pipes, made of blue, halogen-free EPDM rubber, with stainless steel fittings and bolts	R 50 to R 200
RO		RO 50 to RO 200
RO OMD	Openable circular block, for cables, made of blue and black, halogen-free EPDM rubber, with stainless steel fittings and bolts	RO OMD 50 to RO OMD 200
Cuboid blocks (Roxtec RM modules)		
RM	Cuboid block, for cables and metal pipes, made of blue and black, halogen-free EPDM rubber	RM 15 to RM 120
Metal frames (Roxtec SLFR sleeves)		
SLF SLF EXTENDED SLF SQ	Round, metal frame with flange; can be bolted or cast in walls and floors; made of stainless steel, galvanised steel or coated carbon steel	SLF 50 to SLF 200
SLFO SLFO EXTENDED SLFO SQ	Round, openable, metal frame with flange; can be bolted or cast in walls and floors; made of stainless steel or galvanised carbon steel	SLFO 50 to SLFO 200

The Roxtec RM modules have an adaptable centre with removable layers.

Circular blocks are available in different sizes. The Roxtec R blocks are non-openable and the Roxtec RO blocks are openable. The Roxtec RO OMD blocks are openable and have removable layers on the outside side of the block, to enable adjusting to fit non-standard sleeve sizes.

Steel frames (Roxtec SLFR sleeves) are available in different sizes, non-openable (Roxtec SLF sleeve) and openable (Roxtec SLFO sleeve) variants.

Roxtec R seals are used to form mixed penetration seals where metal pipes or cables penetrate walls and floors.

Auxiliary products, used with Roxtec R seals to form penetration seals are:

- stone mineral wool insulation (pipe or cable insulation) in accordance with EN 14303 or EN 13162, with reaction to fire class A1, according to EN 13501-1, and with minimum density of 100 kg/m^3,

- loose, stone mineral wool insulation (used to fill cavities in separating elements) in accordance with EN 14303 or EN 13162, with reaction to fire class A1, according to EN 13501-1, compressed to the density of at least 100 kg/m^3,
- Roxtec Lubricant, produced by ROXTEC INTERNATIONAL A.B., with the nominal density of 890 kg/m^3, used for lubrication of Roxtec R seal components.

2 Specification of the intended use in accordance with the applicable European Assessment Document (EAD)

2.1 Intended use

The intended use of Roxtec R seal is to reinstate the fire resistance performance of rigid wall or rigid floor constructions, where they are penetrated by cables or metal pipes.

The specific elements of construction that the Roxtec R seal may be used to provide a penetration seal in, are as follows:

Rigid walls: The wall must have a minimum thickness of 200 mm and comprise concrete, reinforced concrete, aerated concrete, ceramic brick, cavity brick or checker brick, with a minimum density of 600 kg/m^3.

Rigid floors: The floor must have a minimum thickness of 200 mm and comprise concrete, reinforced concrete or aerated concrete, with a minimum density of 600 kg/m^3.

The supporting construction shall be classified in accordance with EN 13501-2 for the required fire resistance period (equal to or greater than specified in Annex C).

Roxtec R seal may be used to provide a penetration seal with specific cables and metal pipes (according to Annexes A and C).

Details of penetration seals are provided in Annex C. Additional provisions are provided in Annex A. For the installation procedure see Roxtec installation instructions.

Pipes or cables shall be supported at maximum 400 mm away from both faces of the wall constructions and from the upper face of floor constructions.

The performances given in this European Technical Assessment are based on an assumed working life of the product of 25 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer or the Technical Assessment Body, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

2.2 Use category

Roxtec R seal with sleeves of stainless or galvanised steel – use category: Type X.

Roxtec R seal with sleeves of coated carbon steel – use category: Type Z_2.

Products that meet requirements for type X, meet the requirements for all other types. Products that meet requirements for type Y_1 also meet the requirements for type Y_2, Z_1 and Z_2. Products that meet the requirements for type Y2 also meet the requirements for type Z_1 and Z_2. Products that meet the requirements for type Z_1, also meet the requirements for type Z_2.

Use category types are as follows:

Type X: intended for use in conditions exposed to weathering.

Type Y_1: intended for use at temperatures below 0°C with exposure to UV but no exposure to rain.

Type Y_2: intended for use at temperatures below 0°C, but with no exposure to rain nor UV.

Type Z_1: intended for use in internal conditions with humidity equal to or higher than 85% RH, excluding temperatures below 0°C.

Type Z_2: intended for use in internal conditions with humidity lower than 85% RH, excluding temperatures below 0°C, without exposure to rain or UV.

3 Performance of the product and references to the methods used for its assessment

3.1 Performance of the product

3.1.1 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class B-s1,d0
Resistance to fire	Annex C

3.1.2 Hygiene, health and the environment (BWR 3)

No performance assessed.

3.1.3 Safety and accessibility in use (BWR 4)

Essential characteristic	Performance
Durability	Roxtec R seal with sleeves of stainless or galvanised steel – use category: Type X Roxtec R seal with sleeves of coated carbon steel – use category: Type Z_2

3.1.4 Protection against noise (BWR 5)

No performance assessed.

3.1.5 Energy economy and heat retention (BWR 6)

No performance assessed.

3.2 Methods used for the assessment

The assessment of the products has been made in accordance with the European Assessment Document EAD 350454-00-1104 “Fire Stopping and Fire Sealing Products. Penetration Seals”.

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

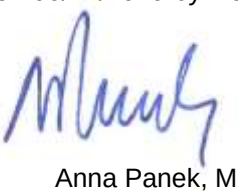
According to Decision 99/454/EC of the European Commission, as amended by Decision 2001/596/EC of the European Commission the system 1 of assessment and verification of constancy of performance applies (see Annex V to Regulation (EU) No 305/2011).

5 Technical details necessary for the implementation of the AVCP system, as provided in the applicable European Assessment Document (EAD)

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited in Instytut Techniki Budowlanej.

For type testing the results of the tests performed as part of the assessment for the European Technical Assessment shall be used unless there are changes in the production line or plant. In such cases the necessary type testing has to be agreed between Instytut Techniki Budowlanej and the notified body.

Issued in Warsaw on 06/11/2019 by Instytut Techniki Budowlanej



Anna Panek, MSc
Deputy Director of ITB

Additional provisions

- The Roxtec R seal shall be fixed on one or both sides of the wall or fixed at the top of the floor (for details see Annex C).
- Circular blocks (R, RO or RO OMD) may be filled with multiple cuboid blocks (RM modules). Each service (single pipe or single cable) shall be placed in a separate RM module.
- The diameter of the opening in separating element shall not be greater of more than 19 mm than the outside diameter of metal sleeves of Roxtec R seals.
- The flanges of steel sleeves collar shall be fixed to the wall or the floor by steel fasteners (8 x 65 mm) or cast into the wall or floor. Number and arrangement of fasteners depend on the type of the sleeve. The flange of the sleeve may be additionally glued to the separating element by means of elastic, polyurethane based joint sealant.
- In case of Roxtec R seals installed from one side of the supporting construction ("single Roxtec R seals"), the cavity inside the supporting construction is filled with loose mineral wool, compressed to the density of at least 100 kg/m^3.
- In case of Roxtec R seals installed form both sides of the supporting construction ("double Roxtec R seals"), the cavity inside the supporting construction is not filled with loose mineral wool.
- Cables and pipes are insulated by means of stone mineral wool of density minimum 100 kg/m^3. In specific cases, the mineral wool is placed only in the supporting construction cavity (for details see Annex C).
- Penetration seals may be placed in line and cluster orientation in the separating element.
- There may be zero distance between adjacent penetration seals (between the flanges of the SLFR frames) in separating elements.
- Classifications given in Annex C for steel and copper pipes are also valid for other metal pipes with:
  - thermal conductivity lower than respectively steel and copper, and
  - melting point at least equal to respectively steel and copper, and greater than:
    - 843 °C for the fire resistance class EI 30 and E 30,
    - 903 °C for the fire resistance class EI 45 and E 45,
    - 946 °C for the fire resistance class EI 60 and E 60,
    - 1006 °C for the fire resistance class EI 90 and E 90,
    - 1049 °C for the fire resistance class EI 120 and E 120,
    - 1109 °C for the fire resistance class EI 180 and E 180,
    - 1153 °C for the fire resistance class EI 240 and E 240.
- Classifications given in Annex C for locally insulated metal pipes or locally insulated cables does not cover non-insulated pipes or cables. The length, thickness and density of a local insulation may be increased but may not be reduced.
- Classifications given in Annex C for cables is valid only if cable supports does not pass through the seal.
- Subsequent exchange of services in the penetration seals is permitted, provided that the changed services are covered by this ETA provisions.
- Blank penetration seals (without services) are permitted for specific variants (for details see Annex C).
- Services are placed in angle 90° to the supporting construction.

Roxtec R Seal	**Annex A**
Additional provisions	of European Technical Assessment ETA-19/0584

Components of Roxtec R seals

Round frames / sleeves:

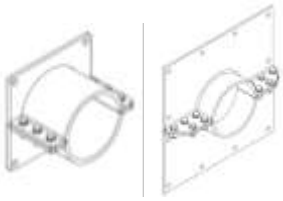
SLF

SLF EXTENDED

SLF SQ

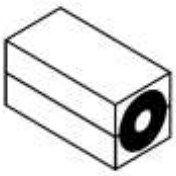
SLFO

SLFO EXTENDED

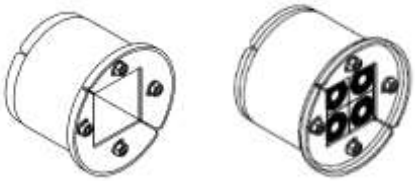


SLFO SQ

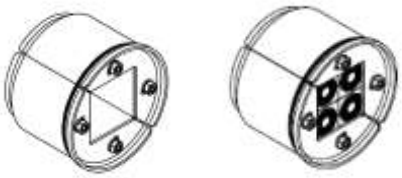
Cuboid block (RM module):



Circular blocks with and without RM modules:



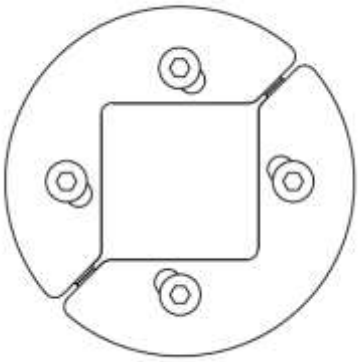
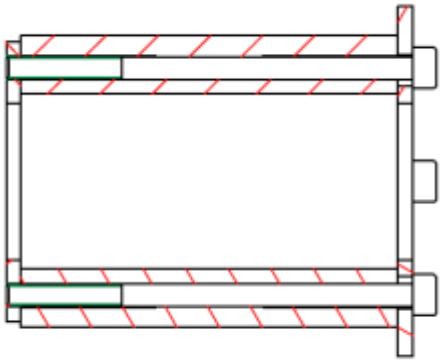
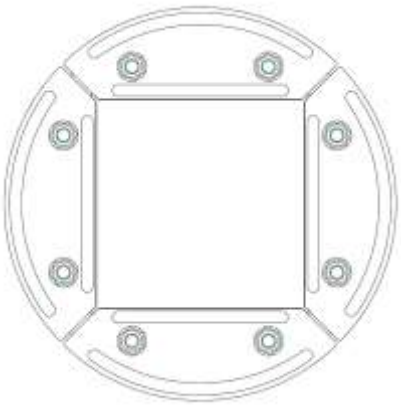
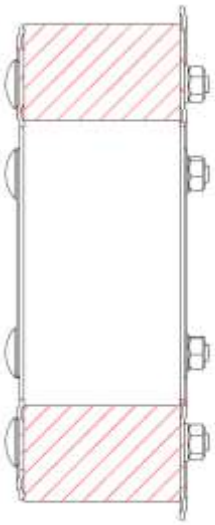
R and RO



RO OMD

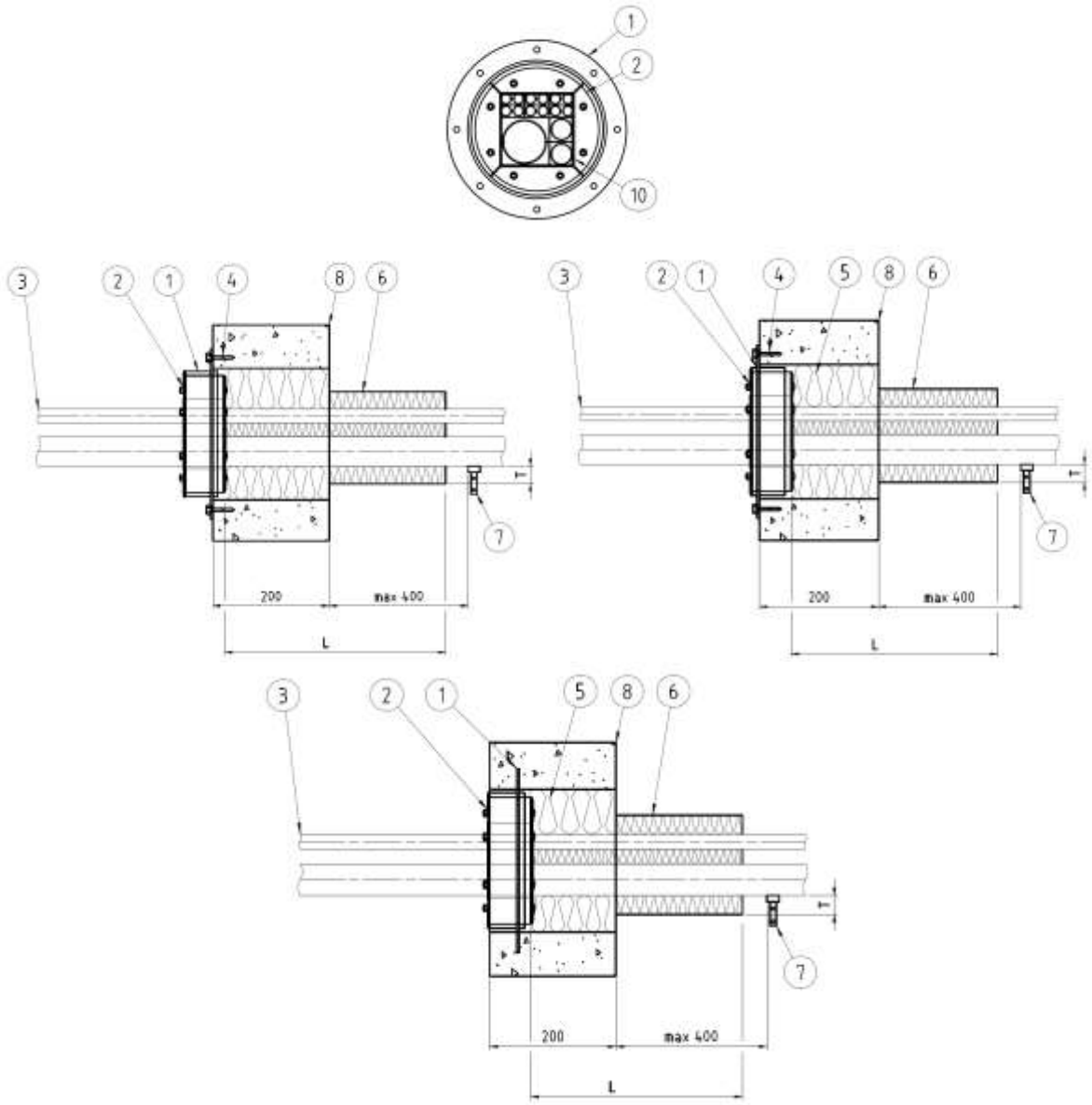
Roxtec R Seal	**Annex B**
Components of Roxtec R seal	of European Technical Assessment ETA-19/0584

Examples of circular blocks:

Front view	Cross section
	
	

Roxtec R Seal	**Annex B**
Components of Roxtec R seal	of European Technical Assessment ETA-19/0584

Fig. C1. Single cables in mixed penetration seals in rigid wall, made with use of single Roxtec R seals



1 SLFR sleeve (metal frame)
2 R seal (circular block)
3 Single cable (per RM module)
4 Lightweight concrete screw Ø8 x 65 mm
5 Cavity insulation (loose stone mineral wool, compressed to the density of ≥ 100 kg/m^3)
6 Additional cable insulation (stone mineral wool insulation density of ≥ 100 kg/m^3)
7 Cable support
8 Rigid wall, with a minimum thickness of 200 mm
10 RM module (cuboid block)

Roxtec R Seal	**Annex C1**
Construction details of penetration seals Cables in mixed penetration seals in rigid wall	of European Technical Assessment ETA-19/0584

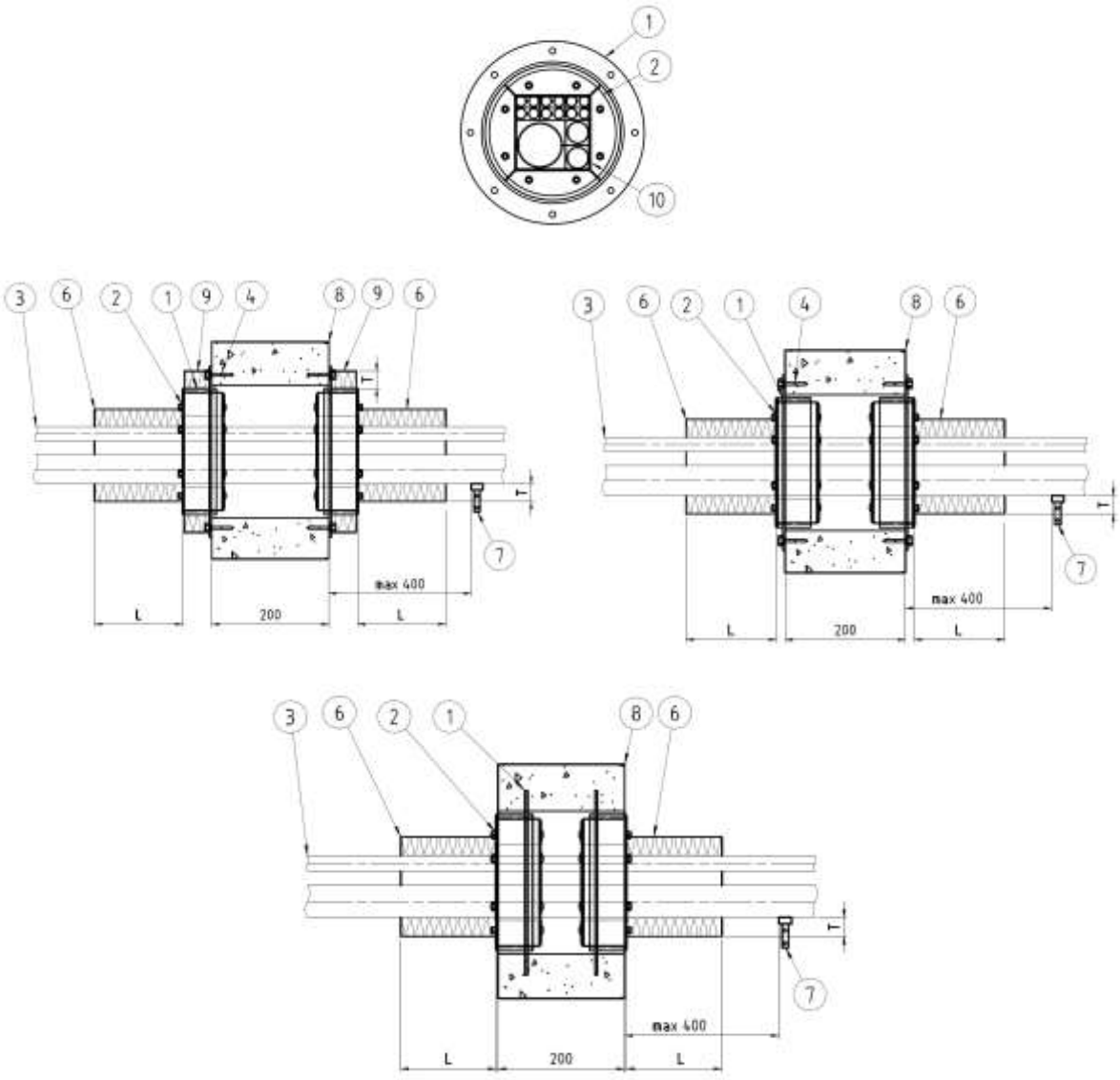
Resistance to fire classification of penetration seals of cables in rigid wall, made in accordance with fig. C1 and Annex A.

Type of cable[1)]	Mineral wool insulation length, L	Mineral wool insulation thickness, T	Fire resistance class
Small cables, with diameter ≤ 21 mm	400 mm	30 mm	**EI 120 / E 240**
Medium cables, with diameter ≤ 50 mm	450 mm	30 mm	**EI 90 / E 120**
	500 mm	60 mm	**EI 90 / E 240**
Large cables, with diameter ≤ 80 mm	550 mm	30 mm	**EI 90 / E 120**
	575 mm	60 mm	**EI 90 / E 240**
Blank seal	150 mm	cavity only[2)]	**EI 120**

1) Classification covers all cable types currently and commonly used in building practice in EU with a diameter not greater than specified, except tied bundles, waveguides and non-sheathed cables (wires); optical fibre cables are covered

2) "cavity only" means that only the cavity is filled over the length "L"

Fig. C2. Single cables in mixed penetration seals in rigid wall, made with use of double Roxtec R seals



1 SLFR sleeve (metal frame)
2 R seal (circular block)
3 Single cable (per RM module)
4 Lightweight concrete screw Ø8 x 65 mm
6 Additional cable insulation (stone mineral wool insulation density of ≥ 100 kg/m^3)
7 Cable support
8 Rigid wall, with a minimum thickness of 200 mm
9 Protruding sleeve insulation (stone mineral wool insulation density of ≥ 100 kg/m^3)
10 RM module (cuboid block)

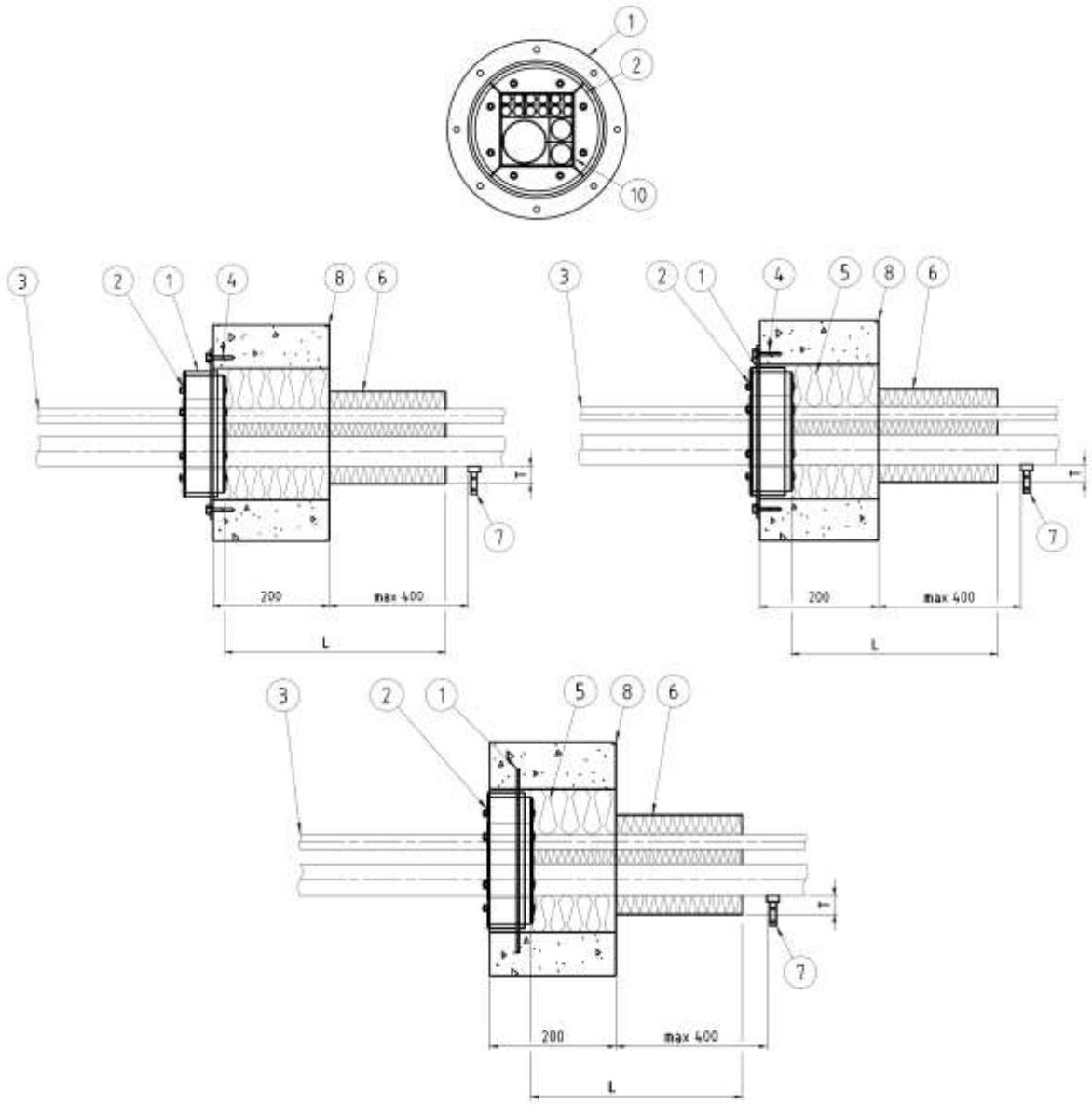
Roxtec R Seal	**Annex C3**
Construction details of penetration seals Cables in mixed penetration seals in rigid wall	of European Technical Assessment ETA-19/0584

Resistance to fire classification of penetration seals of cables in rigid wall, made in accordance with fig. C2 and Annex A.

Type of cable[1)]	Mineral wool insulation length, L	Mineral wool insulation thickness, T	Fire resistance class
Small cables, with diameter ≤ 21 mm	50 mm	30 mm	**EI 240**
Medium cables, with diameter ≤ 50 mm	125 mm	30 mm	**EI 120 / E 240**
Large cables, with diameter ≤ 80 mm	150 mm	30 mm	**EI 120 / E 240**
Blank seal	–	–	**EI 90 / E 120**

1) Classification covers all cable types currently and commonly used in building practice in EU with a diameter not greater than specified, except tied bundles, waveguides and non-sheathed cables (wires); optical fibre cables are covered

Fig. C3. Copper pipes in mixed penetration seals in rigid wall, made with use of single Roxtec R seals



1 SLFR sleeve (metal frame)
2 R seal (circular block)
3 Copper pipe
4 Lightweight concrete screw Ø8 x 65 mm
5 Cavity insulation (loose stone mineral wool, compressed to the density of ≥ 100 kg/m^3)
6 Additional pipe insulation (stone mineral wool insulation density of ≥ 100 kg/m^3)
7 Pipe support
8 Rigid wall, with a minimum thickness of 200 mm
10 RM module (cuboid block)

Roxtec R Seal	**Annex C5**
Construction details of penetration seals Pipes in mixed penetration seals in rigid wall	of European Technical Assessment ETA-19/0584

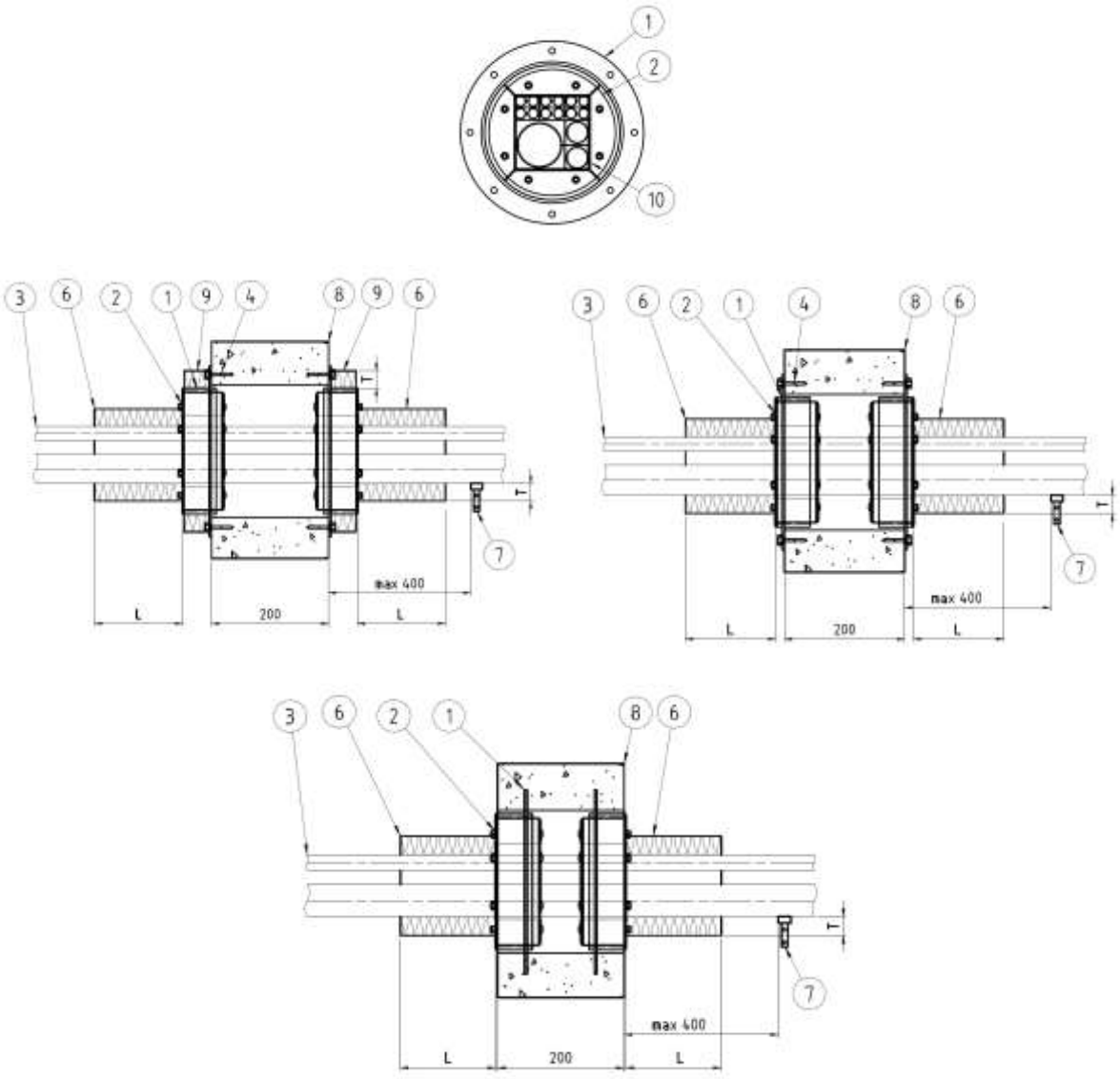
Resistance to fire classification of penetration seals of copper pipes in rigid wall, made in accordance with fig. C3 and Annex A.

Copper pipe		Mineral wool insulation length, L	Mineral wool insulation thickness, T	Fire resistance class
Pipe diameter D, mm	Pipe wall thickness t, mm			
≤ 8,0	≥ 0,8	200 mm	cavity only[1)]	**EI 240 – U/C** **EI 240 – U/U** **EI 240 – C/U** **EI 240 – C/C**
8,0 < D ≤ 22,0	≥ 1,0	200 mm	cavity only[1)]	**EI 30 / E 240 – U/C** **EI 30 / E 240 – U/U** **EI 30 / E 240 – C/U** **EI 30 / E 240 – C/C**
8,0 < D ≤ 54,0	1,5 ≤ t ≤ 14,2	490 mm	60 mm	**EI 45 / E 240 – U/C** **EI 45 / E 240 – U/U** **EI 45 / E 240 – C/U** **EI 45 / E 240 – C/C**
		600 mm	60 mm	**EI 120 – U/C** **EI 120 – U/U** **EI 120 – C/U** **EI 120 – C/C**

1) "cavity only" means that only the cavity is filled over the length "L"

Roxtec R Seal	**Annex C6**
Resistance to fire classification of penetration seals Pipes in mixed penetration seals in rigid wall	of European Technical Assessment ETA-19/0584

Fig. C4 Copper pipes in mixed penetration seals in rigid wall, made with use of double Roxtec R seals



1 SLFR sleeve (metal frame)
2 R seal (circular block)
3 Copper pipe
4 Lightweight concrete screw Ø8 x 65 mm
6 Additional pipe insulation (stone mineral wool insulation density of ≥ 100 kg/m^3)
7 Pipe support
8 Rigid wall, with a minimum thickness of 200 mm
9 Protruding sleeve insulation (stone mineral wool insulation density of ≥ 100 kg/m^3)
10 RM module (cuboid block)

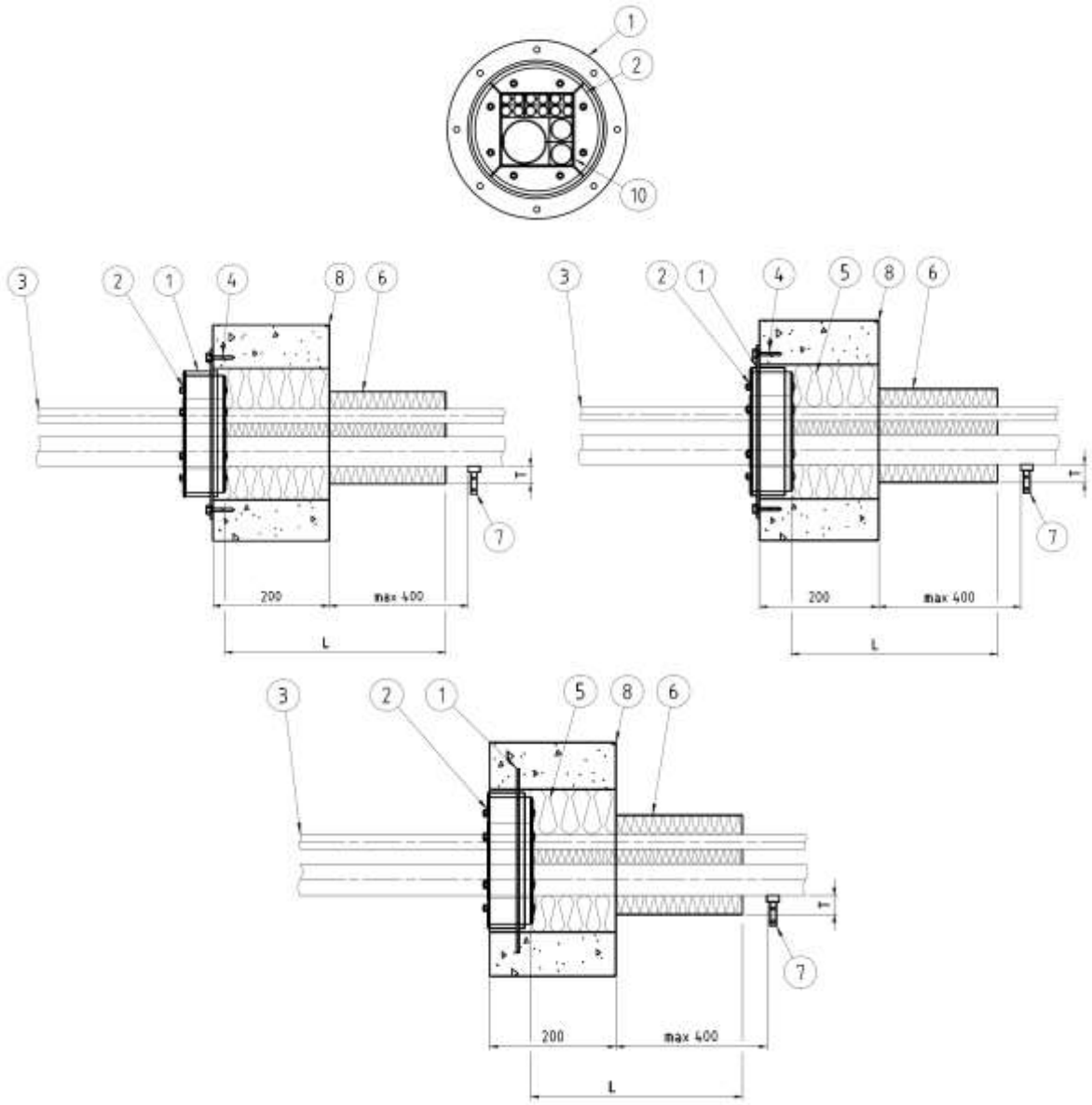
Roxtec R Seal	**Annex C7**
Construction details of penetration seals Pipes in mixed penetration seals in rigid wall	of European Technical Assessment ETA-19/0584

Resistance to fire classification of penetration seals of copper pipes in rigid wall, made in accordance with fig. C4 and Annex A.

Copper pipe		Mineral wool insulation length, L	Mineral wool insulation thickness, T	Fire resistance class
Pipe diameter D, mm	Pipe wall thickness t, mm			
≤ 8,0	≥ 0,8	–	–	**EI 120 / E 240 – U/C** **EI 120 / E 240 – U/U** **EI 120 / E 240 – C/U** **EI 120 / E 240 – C/C**
8,0 < D ≤ 22,0	≥ 1,0	–	–	**EI 120 / E 240 – U/C** **EI 120 / E 240 – U/U** **EI 120 / E 240 – C/U** **EI 120 / E 240 – C/C**
22,0 < D ≤ 42,0	1,5 ≤ t ≤ 14,2	290 mm	30 mm	**EI 240 – U/C** **EI 240 – U/U** **EI 240 – C/U** **EI 240 – C/C**
42,0 < D ≤ 54,0	1,5 ≤ t ≤ 14,2	250 mm	60 mm	**EI 120 / E 240 – U/C** **EI 120 / E 240 – U/U** **EI 120 / E 240 – C/U** **EI 120 / E 240 – C/C**

"–" means that there is no pipe insulation

Fig. C5. Steel pipes in mixed penetration seals in rigid wall, made with use of single Roxtec R seals



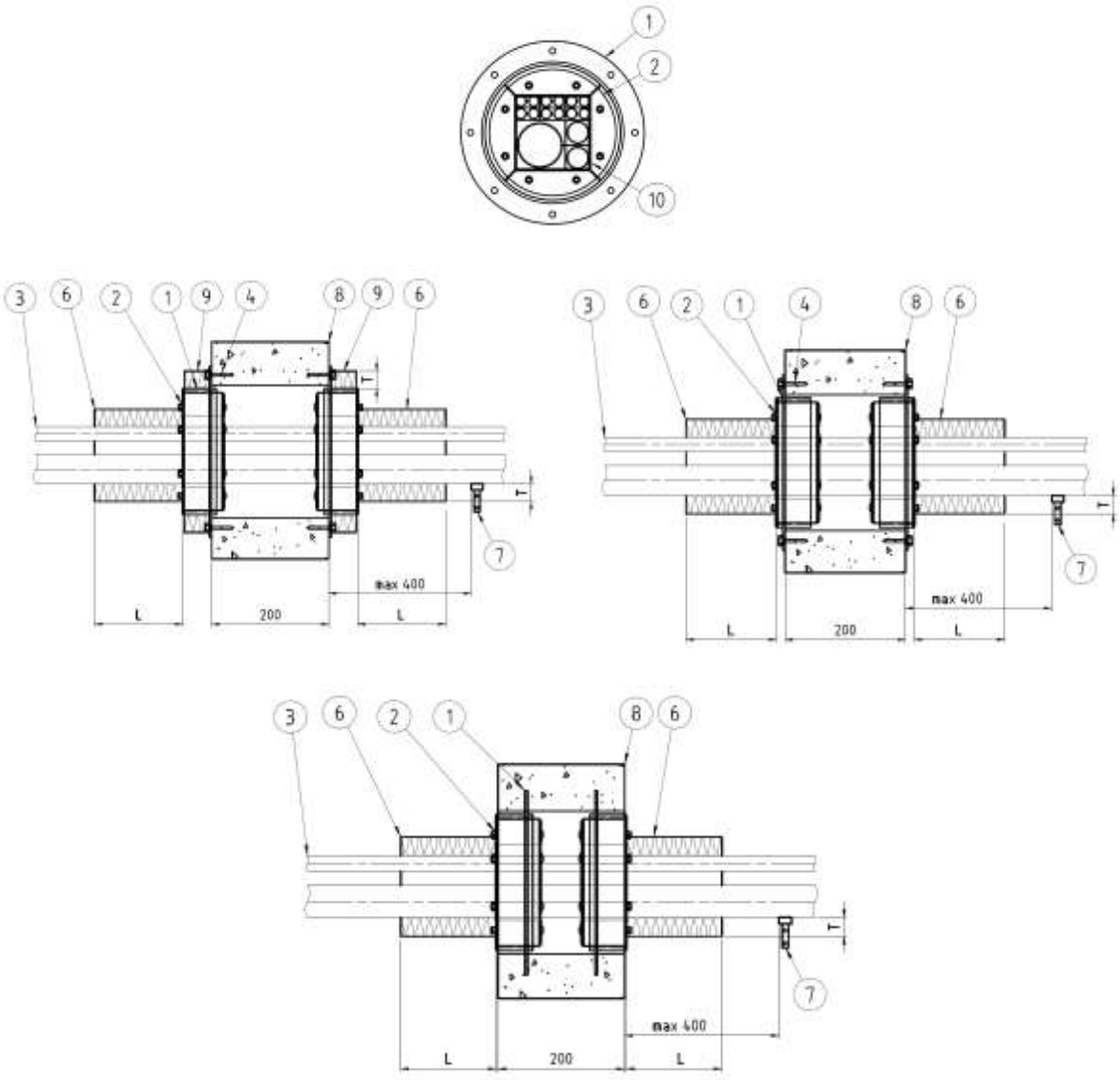
1 SLFR sleeve (metal frame)
2 R seal (circular block)
3 Steel pipe
4 Lightweight concrete screw Ø8 x 65 mm
5 Cavity insulation (loose stone mineral wool, compressed to the density of ≥ 100 kg/m^3)
6 Additional pipe insulation (stone mineral wool insulation density of ≥ 100 kg/m^3)
7 Pipe support
8 Rigid wall, with a minimum thickness of 200 mm
10 RM module (cuboid block)

Roxtec R Seal	**Annex C9**
Construction details of penetration seals Pipes in mixed penetration seals in rigid wall	of European Technical Assessment ETA-19/0584

Resistance to fire classification of penetration seals of steel pipes in rigid wall, made in accordance with fig. C5 and Annex A.

Steel pipe		Mineral wool insulation length, L	Mineral wool insulation thickness, T	Fire resistance class
Pipe diameter D, mm	Pipe wall thickness t, mm			
≤ 40	1,5 ≤ t ≤ 14,2	250 mm	30 mm	**EI 120 – U/C** **EI 120 – U/U** **EI 120 – C/U** **EI 120 – C/C**
		320 mm	30 mm	**EI 120 / E 240 – U/C** **EI 120 / E 240 – U/U** **EI 120 / E 240 – C/U** **EI 120 / E 240 – C/C**

Fig. C6. Steel pipes in mixed penetration seals in rigid wall, made with use of double Roxtec R seals



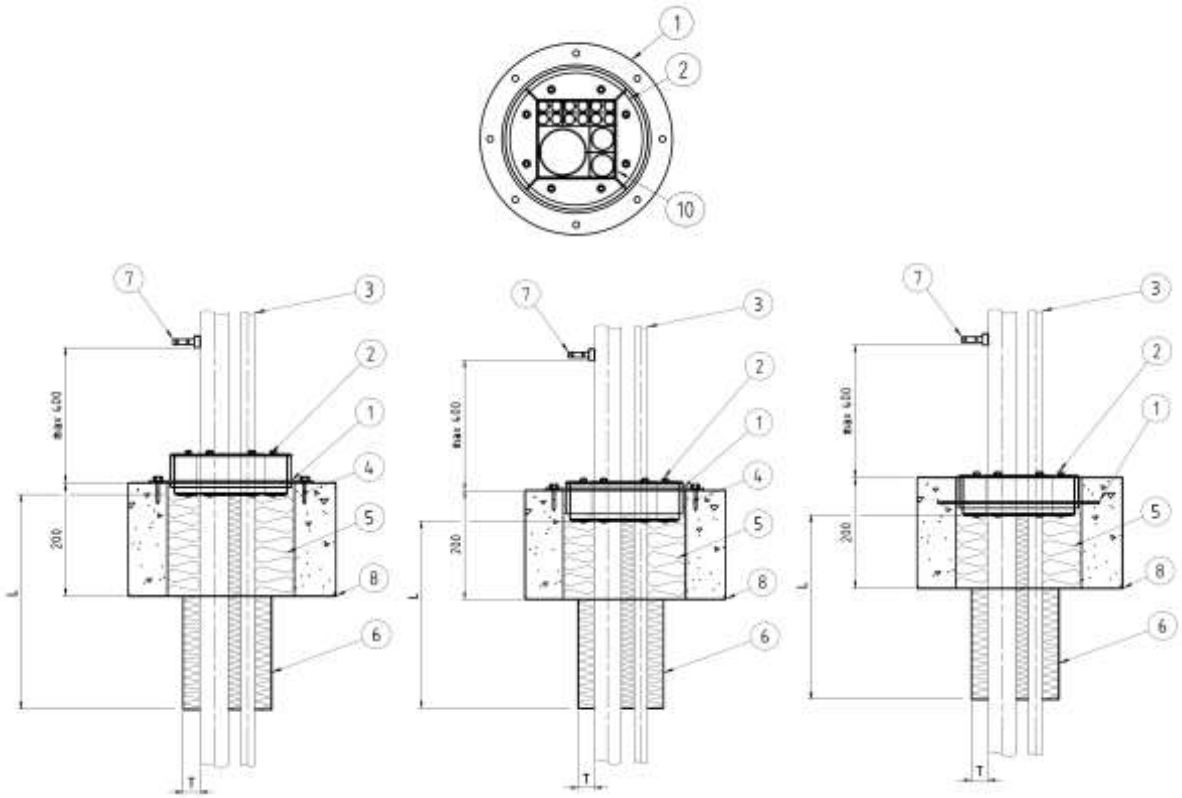
1 SLFR sleeve (metal frame)
2 R seal (circular block)
3 Steel pipe
4 Lightweight concrete screw Ø8 x 65 mm
6 Additional pipe insulation (stone mineral wool insulation density of ≥ 100 kg/m^3)
7 Pipe support
8 Rigid wall, with a minimum thickness of 200 mm
9 Protruding sleeve insulation (stone mineral wool insulation density of ≥ 100 kg/m^3)
10 RM module (cuboid block)

Roxtec R Seal	**Annex C11**
Construction details of penetration seals Pipes in mixed penetration seals in rigid wall	of European Technical Assessment ETA-19/0584

Resistance to fire classification of penetration seals of steel pipes in rigid wall, made in accordance with fig. C6 and Annex A.

Steel pipe		Mineral wool insulation length, L	Mineral wool insulation thickness, T	Fire resistance class
Pipe diameter D, mm	Pipe wall thickness t, mm			
≤ 40	1,5 ≤ t ≤ 14,2	100 mm	30 mm	**EI 240 – U/C** **EI 240 – U/U** **EI 240 – C/U** **EI 240 – C/C**

Fig. C7. Single cables in mixed penetration seals in rigid floor, made with use of single Roxtec R seals



1 SLFR sleeve (metal frame)
2 R seal (circular block)
3 Single cable (per RM module)
4 Lightweight concrete screw Ø8 x 65 mm
5 Cavity insulation (loose stone mineral wool, compressed to the density of ≥ 100 kg/m^3)
6 Additional cable insulation (stone mineral wool insulation density of ≥ 100 kg/m^3)
7 Cable support
8 Rigid floor, with a minimum thickness of 200 mm
10 RM module (cuboid block)

Roxtec R Seal	Annex C13
Construction details of penetration seals Cables in mixed penetration seals in rigid floor	of European Technical Assessment ETA-19/0584

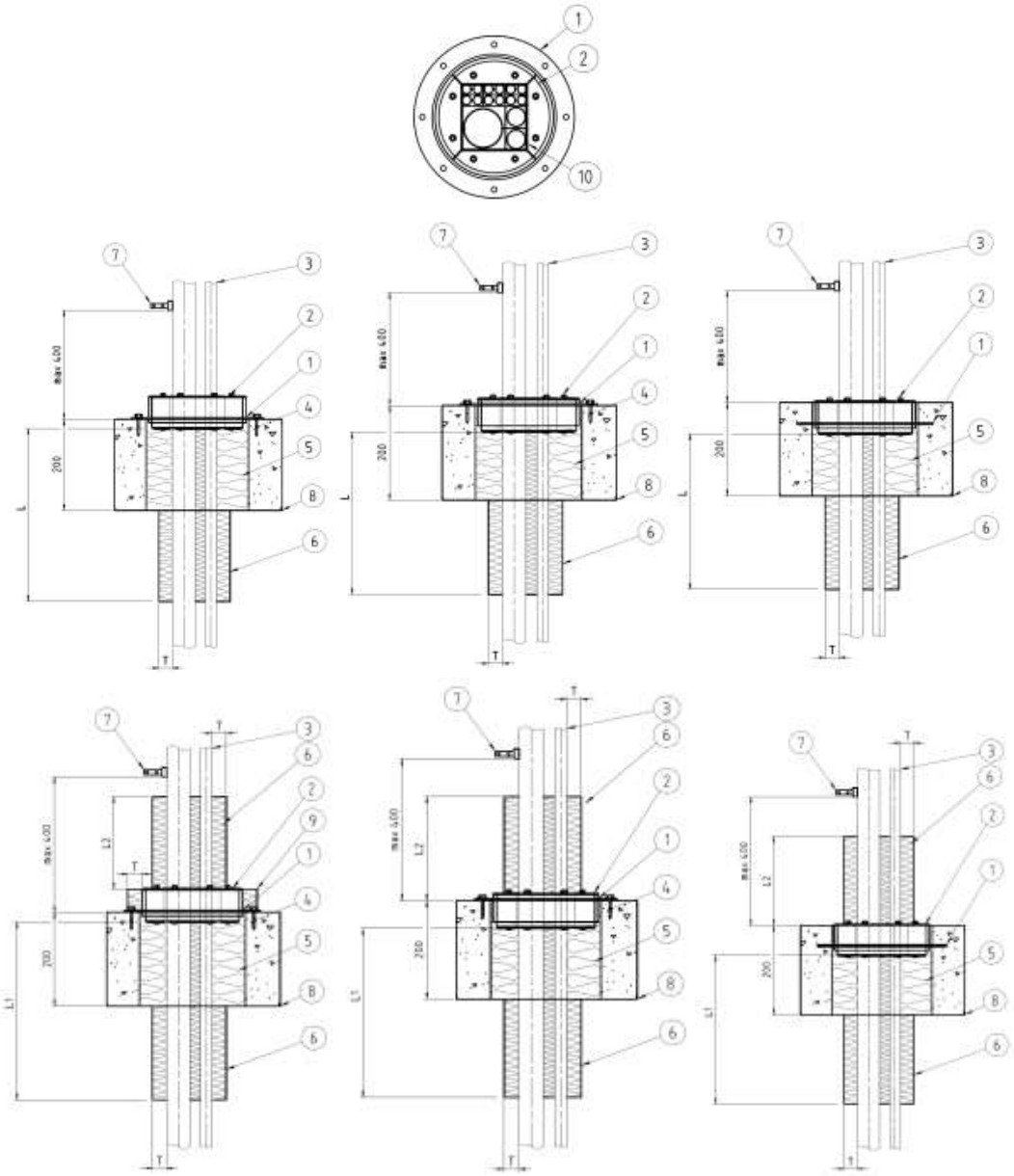
Resistance to fire classification of penetration seals of cables in rigid floor, made in accordance with fig. C7 and Annex A.

Type of cable[1)]	Mineral wool insulation length, L	Mineral wool insulation thickness, T	Fire resistance class
Small cables, with diameter ≤ 21 mm	300 mm	30 mm	**EI 180 / E 240**
Medium cables, with diameter ≤ 50 mm	300 mm	30 mm	**EI 180**
Large cables, with diameter ≤ 80 mm	300 mm	30 mm	**EI 120 / E 180**
Blank seal	50 mm	cavity only[2)]	**EI 240**

1) Classification covers all cable types currently and commonly used in building practice in EU with a diameter not greater than specified, except tied bundles, waveguides and non-sheathed cables (wires); optical fibre cables are covered

2) "cavity only" means that only the cavity is filled over the length "L"

Fig. C8. Copper pipes in mixed penetration seals in rigid floor, made with use of single Roxtec R seals



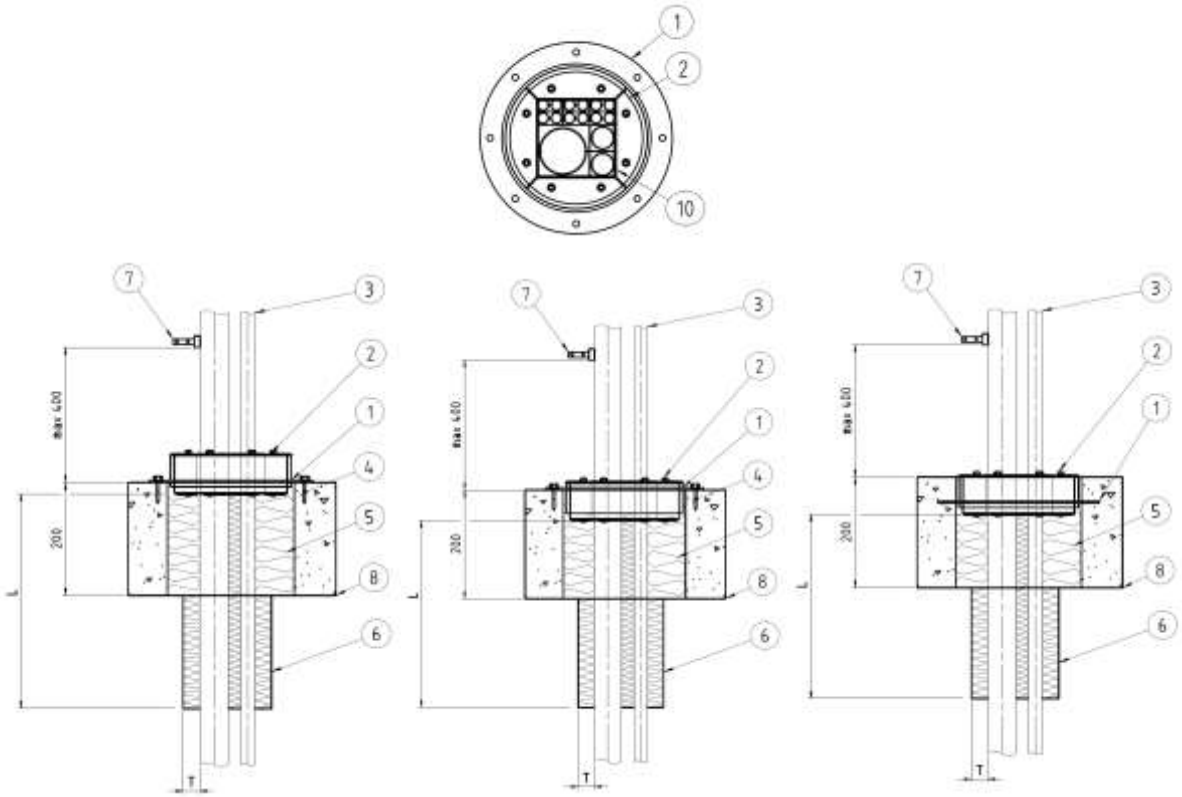
1 SLFR sleeve (metal frame)
2 R seal (circular block)
3 Copper pipe
4 Lightweight concrete screw Ø8 x 65 mm
5 Cavity insulation (loose stone mineral wool, compressed to the density of ≥ 100 kg/m^3)
6 Additional pipe insulation (stone mineral wool insulation density of ≥ 100 kg/m^3)
7 Pipe support
8 Rigid floor, with a minimum thickness of 200 mm
9 Protruding sleeve insulation (stone mineral wool insulation density of ≥ 100 kg/m^3)
10 RM module (cuboid block)

Roxtec R Seal	**Annex C15**
Construction details of penetration seals Pipes in mixed penetration seals in rigid floor	of European Technical Assessment ETA-19/0584

Resistance to fire classification of penetration seals of copper pipes in rigid floor, made in accordance with fig. C8 and Annex A.

Copper pipe		Mineral wool insulation at the bottom of the floor		Mineral wool insulation at the top of the floor		Fire resistance class
Pipe diameter D, mm	Pipe wall thickness t, mm	length, L1 or L	thickness, T	length, L2	thickness, T	
≤ 8,0	≥ 0,8	200 mm	30 mm	–	–	**EI 120 / E 240 – U/C** **EI 120 / E 240 – U/U** **EI 120 / E 240 – C/U** **EI 120 / E 240 – C/C**
8,0 < D ≤ 22,0	≥ 1,0	600 mm	30 mm	–	–	**EI 60 / E 240 – U/C** **EI 60 / E 240 – U/U** **EI 60 / E 240 – C/U** **EI 60 / E 240 – C/C**
8,0 < D ≤ 42,0	1,5 ≤ t ≤ 14,2	590 mm	60 mm	300 mm	60 mm	**EI 180 / E 240 – U/C** **EI 180 / E 240 – U/U** **EI 180 / E 240 – C/U** **EI 180 / E 240 – C/C**
42,0 < D ≤ 54,0	1,5 ≤ t ≤ 14,2	500 mm	60 mm	–	–	**EI 60 / E 120 – U/C** **EI 60 / E 120 – U/U** **EI 60 / E 120 – C/U** **EI 60 / E 120 – C/C**
		675 mm	60 mm	400 mm	60 mm	**EI 120 / E 240 – U/C** **EI 120 / E 240 – U/U** **EI 120 / E 240 – C/U** **EI 120 / E 240 – C/C**

Fig. C9. Steel pipes in mixed penetration seals in rigid floor, made with use of single Roxtec R seals



1 SLFR sleeve (metal frame)
2 R seal (circular block)
3 Steel pipe
4 Lightweight concrete screw Ø8 x 65 mm
5 Cavity insulation (loose stone mineral wool, compressed to the density of ≥ 100 kg/m^3)
6 Additional pipe insulation (stone mineral wool insulation density of ≥ 100 kg/m^3)
7 Pipe support
8 Rigid floor, with a minimum thickness of 200 mm
10 RM module (cuboid block)

Roxtec R Seal	**Annex C17**
Construction details of penetration seals Pipes in mixed penetration seals in rigid floor	of European Technical Assessment ETA-19/0584

Resistance to fire classification of penetration seals of steel pipes in rigid floor, made in accordance with fig. C9 and Annex A.

Steel pipe		Mineral wool insulation length, L	Mineral wool insulation thickness, T	Fire resistance class
Pipe diameter D, mm	Pipe wall thickness t, mm			
≤ 40	1,5 ≤ t ≤ 14,2	250 mm	30 mm	**EI 120 – U/C** **EI 120 – U/U** **EI 120 – C/U** **EI 120 – C/C**
		320 mm	30 mm	**EI 240 – U/C** **EI 240 – U/U** **EI 240 – C/U** **EI 240 – C/C**

Roxtec R Seal	**Annex C18**
Construction details of penetration seals Pipes in mixed penetration seals in rigid floor	of European Technical Assessment ETA-19/0584