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European Technical Assessment

ETA-19/0155 of 30/06/2021

General Part

Technical Assessment Body issuing the European Technical Assessment	Instytut Techniki Budowlanej
Trade name of the construction product	Roxtec RS 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 65 Lyckeby Sweden
This European Technical Assessment contains	26 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"
This version replaces	ETA-19/0155 issued on 29/03/2019

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Specific Part

1 Technical description of the product

The Roxtec RS seal is a round, modular system penetration seal, comprising of a circular elastomeric block (Roxtec RS or Roxtec RS OMD) which can be installed either directly into the structure or in a steel frame (Roxtec SLFRS sleeve) mounted in the structure. Roxtec RS or Roxtec RS OMD compress around the service with the use of a compression mechanism, which is integrated in the seal. Elastomeric block consists of two halves. The components of the seal are shown in table below and Annex B.

Component	Description	Size
Blocks (RS seals)		
RS	Circular block, for cables and metal pipes, made of blue and black, halogen-free EPDM rubber, with stainless steel fittings and bolts	RS 25 to RS 125
	Circular block, for metal pipes, made of blue and black, halogen-free EPDM rubber, with stainless steel fittings and bolts	RS 150 to RS 300
RS OMD	Circular block, for cables and metal pipes, made of blue and black, halogen-free EPDM rubber, with stainless steel fittings and bolts	RS OMD 25 to RS 125 OMD
Metal frames (SLFRS sleeves)		
SLF SLF EXTENDED SLF SQ	Round, metal frame with flange; can be bolted or cast to structures; made of stainless steel, galvanised steel or coated carbon steel	SLF 25 to SLF 300
SLFO SLFO EXTENDED SLFO SQ	Round, openable, metal frame with flange; can be bolted or cast to structures; made of stainless steel or galvanised carbon steel	SLFO 25 to SLFO 300

The Roxtec RS seal block has an adaptable center with removable layers. The Roxtec RS OMD seal block has removable layers on both inside and outside of the block, to enable adjusting to fit non-standard sleeve sizes.

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

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

Auxiliary products, used with Roxtec RS 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 RS 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 RS 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 RS 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 and 1700 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 RS 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 provisions 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 RS seal with sleeves of stainless or galvanised steel – use category: Type X.

Roxtec RS 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 RS seal and Roxtec RS seal with sleeves of stainless or galvanised steel – use category: Type X Roxtec RS seal and Roxtec RS 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 30/06/2021 by Instytut Techniki Budowlanej

Anna Panek, MSc
Deputy Director of ITB

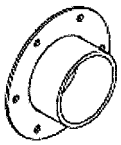
Additional provisions:

- The Roxtec RS 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).
- The diameter of the opening in separating element shall not be greater than 19 mm more than the outside diameter of metal sleeves of Roxtec RS seal.
- The diameter of the opening of a core drill hole shall be according to aperture instruction for RS seal installed directly into structure.
- 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 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 RS seal installed from one side of the supporting construction ("single Roxtec RS seal"), 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 RS seal installed form both sides of the supporting construction ("double Roxtec RS seal"), 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 SLFRS 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.
- Services are placed in angle 90° to the supporting construction.

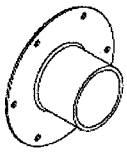
Roxtec RS Seal	**Annex A** of European Technical Assessment ETA-19/0155
Additional provisions	

Components of Roxtec RS seal

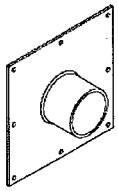
Metal frames / sleeves (SLFR sleeves):



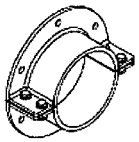
SLF



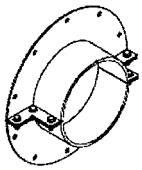
SLF EXTENDED



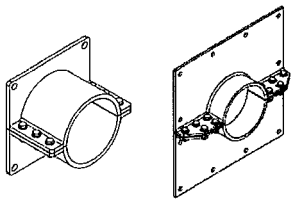
SLF SQ



SLFO

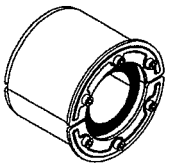


SLFO EXTENDED

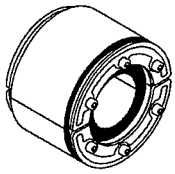


SLFO SQ

Circular seal (Roxtec RS):

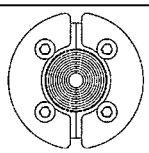
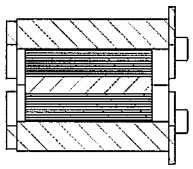
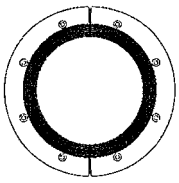
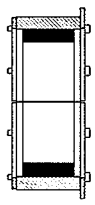


RS



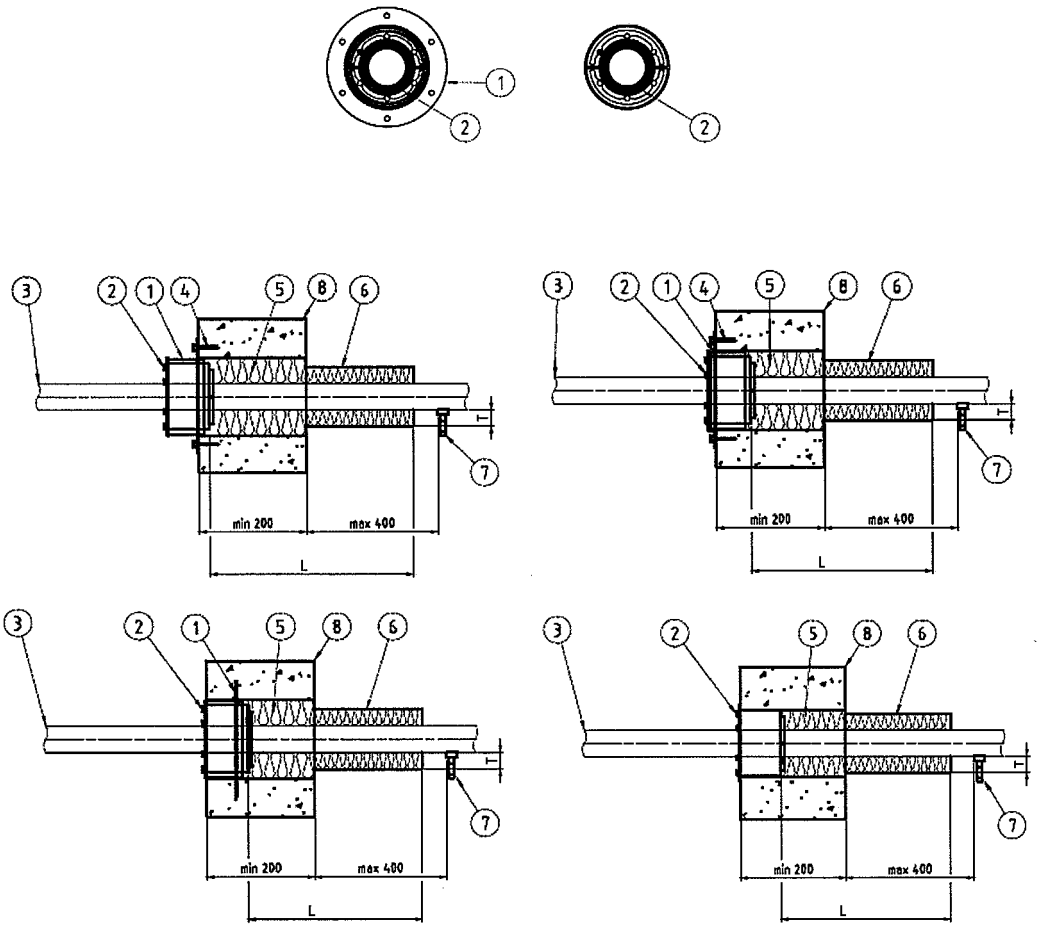
RS OMD

Examples of circular blocks:

Front view	Cross section
	
	

Roxtec RS Seal	**Annex B** of European Technical Assessment ETA-19/0155
Components of Roxtec RS seal	

Fig. C1. Single cable penetration seals in rigid wall, made with use of single Roxtec RS seal



1 SLFRS sleeve
2 RS seal
3 Single cable
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

Roxtec RS Seal	Annex C1 of European Technical Assessment ETA-19/0155
Construction details of penetration seals Single cables penetration seals in rigid wall	

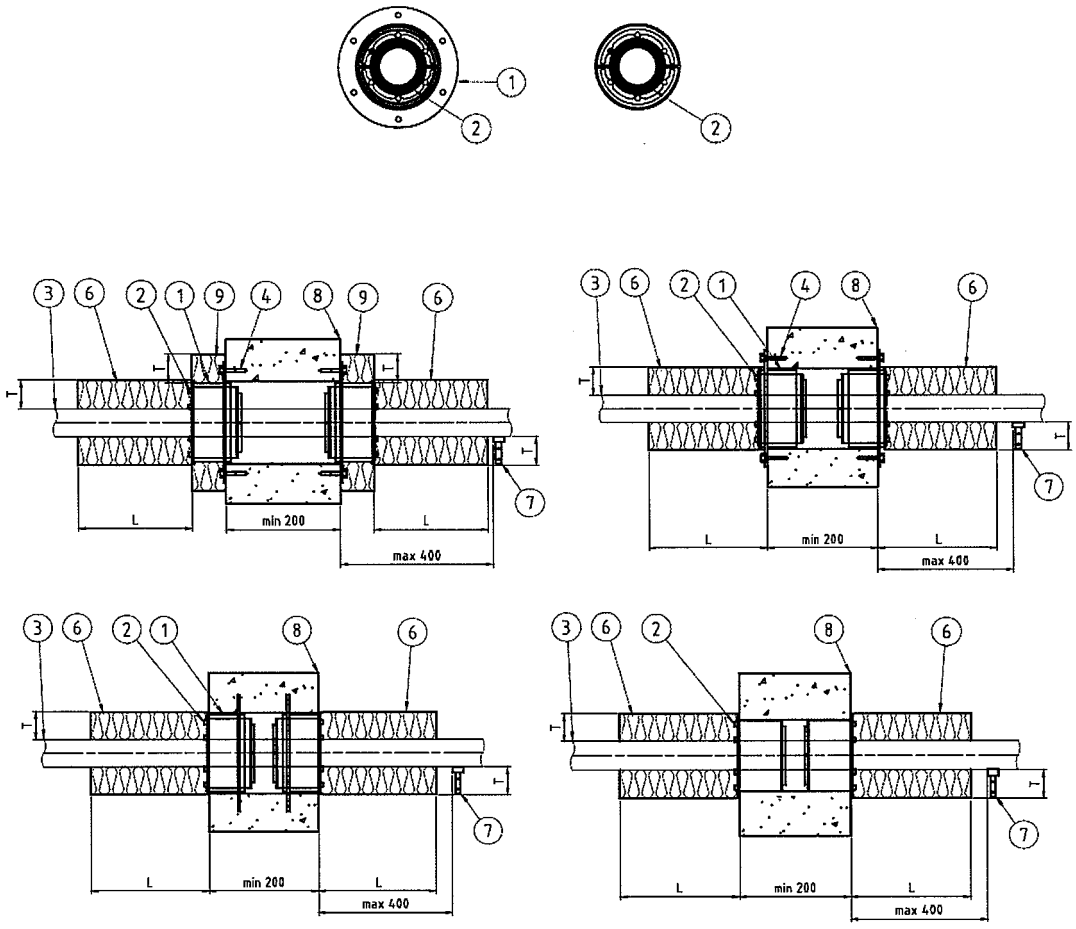
Resistance to fire classification of penetration seals of single cables in rigid wall, made in accordance with Fig. C1 and Annex A.

Type of cable [1]	Mineral wool insulation length, L, mm	Mineral wool insulation thickness, T, mm	Fire resistance class	
			with sleeve	without sleeve
Small cables, with diameter ≤ 21 mm	-	-	**EI 90 / E 180**	**EI 120 / E 180**
	200	"cavity only" [2]	**EI 120**	**EI 120 / E 180**
	250	60	**EI 240**	**EI 240**
Medium cables, with diameter ≤ 50 mm	-	-	**EI 60 / E 180**	**EI 120 / E 180**
	350	30	**EI 90 / E 120**	**EI 120 / E 180**
	550	30	**EI 120**	**EI 120 / E 180**
	500	90	**EI 120 / E 240**	**EI 120 / E 240**
Large cables, with diameter ≤ 80 mm	-	-	**EI 45**	**EI 90 / E 180**
	350	30	**EI 90 / E 120**	**EI 90 / E 180**
	650	90	**EI 120 / E 240**	**EI 120 / E 240**
Blank seal	-	-	-	**EI 90**

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 cable penetration seals in rigid wall, made with use of double Roxtec RS seals



1 SLFRS sleeve
2 RS seal
3 Single cable
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)

Roxtec RS Seal	**Annex C3** of European Technical Assessment ETA-19/0155
Construction details of penetration seals Single cables penetration seals in rigid wall	

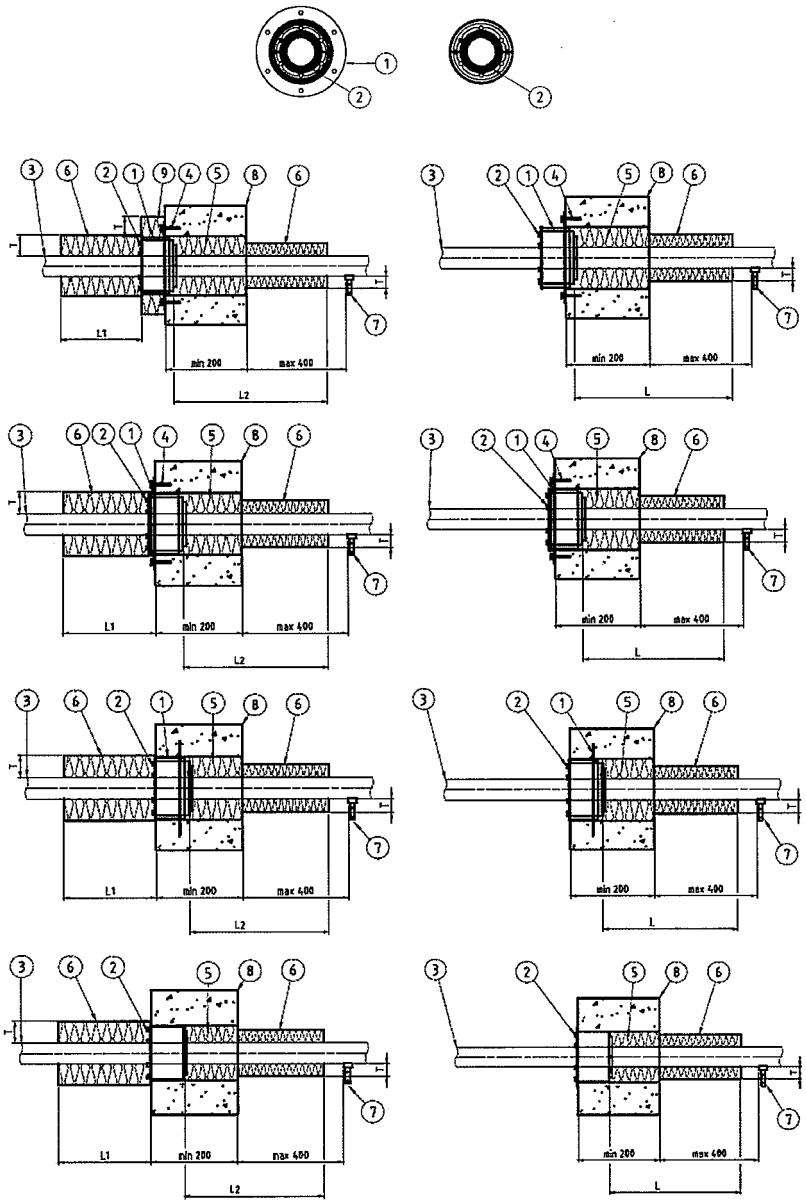
Resistance to fire classification of penetration seals of single cables in rigid wall, made in accordance with Fig. C2 and Annex A.

Type of cable [1]	Mineral wool insulation length, L, mm	Mineral wool insulation thickness, T, mm	Fire resistance class	
			with sleeve	without sleeve
Small cables, with diameter ≤ 21 mm	-	-	**EI 120 / E 180**	**EI 180**
	100 [2]	30 [2]	**EI 120 / E 240**	**EI 180 / E 240**
Medium cables, with diameter ≤ 50 mm	-	-	**EI 45 / E 180**	**EI 180**
	175 [2]	30 [2]	**EI 120 / E 240**	**EI 180 / E 240**
Large cables, with diameter ≤ 80 mm	-	-	**EI 45 / E 180**	**EI 180**
	200 [2]	30 [2]	**EI 120 / E 240**	**EI 180 / E 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) Sleeve insulated with mineral wool insulation density of 100 kg/m^3 and the same thickness as the service; in case of option without sleeve the length of insulation shall be increased by min. 55 mm

Fig. C3. Copper pipe penetration seals in rigid wall, made with use of single Roxtec RS seal



1 SLFRS sleeve
2 RS seal
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 cable 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)

Roxtec RS Seal	**Annex C5** of European Technical Assessment ETA-19/0155
Construction details of penetration seals Copper pipes penetration seals in rigid wall	

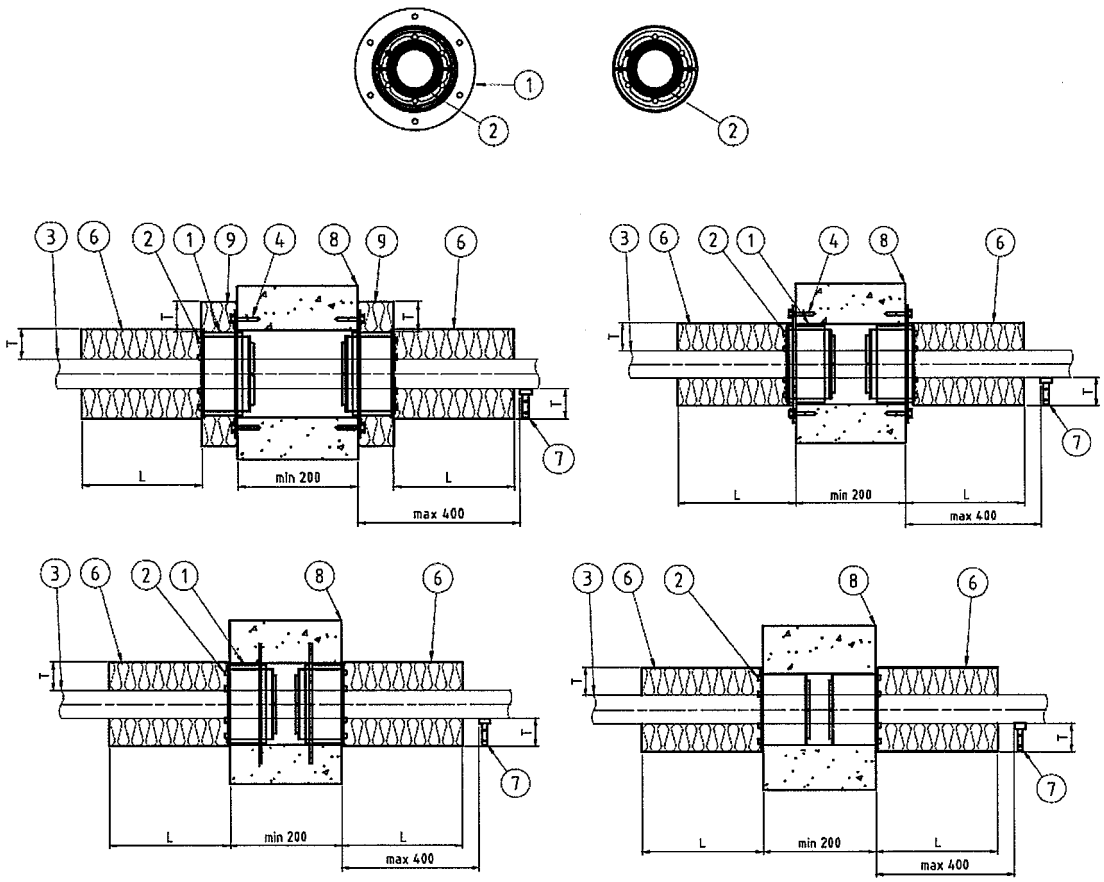
Resistance to fire classification of penetration seals of copper pipes in rigid wall, made in accordance with Fig. C3 and Annex A.

Copper pipe		Mineral wool insulation length, L1, mm	Mineral wool insulation length, L or L2, mm	Mineral wool insulation thickness, T, mm	Fire resistance class	
Diameter (D), mm	Pipe wall thickness (t), mm				with sleeve	without sleeve [2]
≤ 8,0	≥ 0,8	-	200	cavity only [1]	EI 240 - U/C EI 240 - C/U EI 240 - U/U EI 240 - C/C	EI 240 - U/C EI 240 - C/U EI 240 - U/U EI 240 - C/C
8,0 < D ≤ 22,0	≥ 1,0	-	400	30	EI 240 - U/C EI 240 - C/U EI 240 - U/U EI 240 - C/C	EI 240 - U/C EI 240 - C/U EI 240 - U/U EI 240 - C/C
22,0 < D ≤ 26,0	≥ 1,1	-	600	60	EI 60 / E 120 - U/C EI 60 / E 120 - C/U EI 60 / E 120 - U/U EI 60 / E 120 - C/C	EI 60 / E 120 - U/C EI 60 / E 120 - C/U EI 60 / E 120 - U/U EI 60 / E 120 - C/C
		650	650	90	EI 90 / E 120 - U/C EI 90 / E 120 - C/U EI 90 / E 120 - U/U EI 90 / E 120 - C/C	EI 90 / E 120 - U/C EI 90 / E 120 - C/U EI 90 / E 120 - U/U EI 90 / E 120 - C/C
26,0 < D ≤ 38,0	2,0 ≤ t ≤ 14,2	650	650	90	EI 90 / E 120 - U/C EI 90 / E 120 - C/U EI 90 / E 120 - U/U EI 90 / E 120 - C/C	EI 90 / E 180 - C/U EI 90 / E 180 - U/C EI 90 / E 180 - U/U EI 90 / E 180 - C/C
	2,0 ≤ t ≤ 14,2	-	650	90	-	EI 90 / E 180 - C/U EI 90 / E 180 - U/C EI 90 / E 180 - U/U EI 90 / E 180 - C/C
38,0 < D ≤ 42,0	1,3 ≤ t ≤ 14,2	650	650	90	EI 90 / E 120 - U/C EI 90 / E 120 - C/U EI 90 / E 120 - U/U EI 90 / E 120 - C/C	EI 90 / E 120 - U/C EI 90 / E 120 - C/U EI 90 / E 120 - U/U EI 90 / E 120 - C/C
	1,5 ≤ t ≤ 14,2	-	600	60	EI 60 / E 120 - U/C EI 60 / E 120 - C/U EI 60 / E 120 - U/U EI 60 / E 120 - C/C	EI 60 / E 120 - U/C EI 60 / E 120 - C/U EI 60 / E 120 - U/U EI 60 / E 120 - C/C
42,0 < D ≤ 54,0	1,3 ≤ t ≤ 14,2	650	650	90	EI 90 / E 120 - U/C EI 90 / E 120 - C/U EI 90 / E 120 - U/U EI 90 / E 120 - C/C	EI 90 / E 120 - U/C EI 90 / E 120 - C/U EI 90 / E 120 - U/U EI 90 / E 120 - C/C
	1,5 ≤ t ≤ 14,2	-	700	60	EI 60 / E 120 - U/C EI 60 / E 120 - C/U EI 60 / E 120 - U/U EI 60 / E 120 - C/C	EI 60 / E 120 - U/C EI 60 / E 120 - C/U EI 60 / E 120 - U/U EI 60 / E 120 - C/C
54,0 < D ≤ 108,0	2,0 ≤ t ≤ 14,2	650	650	90	EI 90 / E 120 - U/C EI 90 / E 120 - C/U EI 90 / E 120 - U/U EI 90 / E 120 - C/C	EI 90 / E 180 - U/C EI 90 / E 180 - C/U EI 90 / E 180 - U/U EI 90 / E 180 - C/C

[1] "cavity only" means that only the cavity is filled over the length "L2"

[2] Fire resistance class is valid for penetration seals made in rigid wall supporting construction density of ≥ 1700 kg/m³

Fig. C4. Copper pipe penetration seals in rigid wall, made with use of double Roxtec RS seals



1 SLFRS sleeve
2 RS seal
3 Copper pipe
4 Lightweight concrete screw Ø8 x 65 mm
6 Additional cable 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)

Roxtec RS Seal	**Annex C7** of European Technical Assessment ETA-19/0155
Construction details of penetration seals Copper pipes penetration seals in rigid wall	

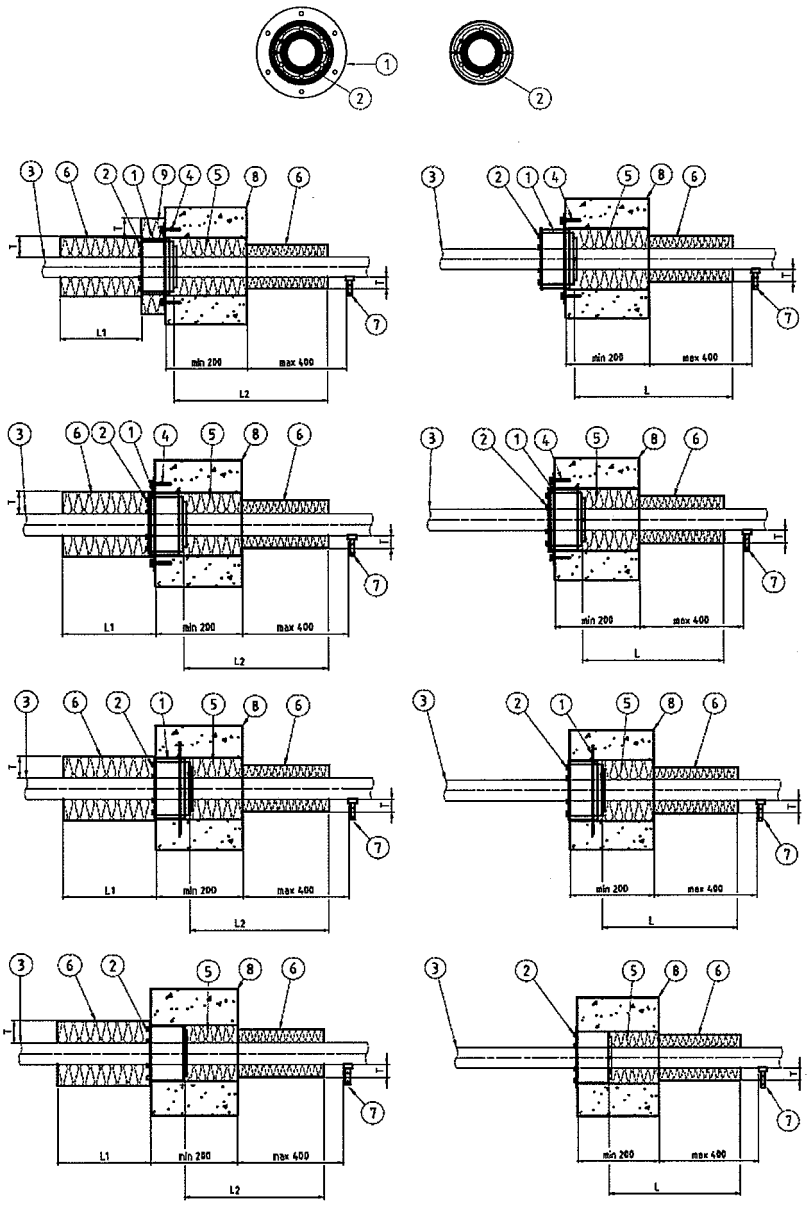
Resistance to fire classification of penetration seals of copper pipes in rigid wall, made in accordance with Fig. C4 and Annex A.

Copper pipe		Mineral wool insulation length, L, mm	Mineral wool insulation thickness, T, mm	Fire resistance class	
Diameter (D), mm	Pipe wall thickness (t), mm			with sleeve	without sleeve [2]
≤ 8,0	≥ 0,8	-	-	EI 180 / E 240 - U/C EI 180 / E 240 - C/U EI 180 / E 240 - U/U EI 180 / E 240 - C/C	EI 180 / E 240 - U/C EI 180 / E 240 - C/U EI 180 / E 240 - U/U EI 180 / E 240 - C/C
8,0 < D ≤ 15,0	≥ 0,9	-	-	EI 90 / E 180 - U/C EI 90 / E 180 - C/U EI 90 / E 180 - U/U EI 90 / E 180 - C/C	EI 90 / E 180 - U/C EI 90 / E 180 - C/U EI 90 / E 180 - U/U EI 90 / E 180 - C/C
	≥ 1,0	290 [1]	30 [1]	EI 120 / E 240 - U/C EI 120 / E 240 - C/U EI 120 / E 240 - U/U EI 120 / E 240 - C/C	EI 120 / E 240 - U/C EI 120 / E 240 - C/U EI 120 / E 240 - U/U EI 120 / E 240 - C/C
15,0 < D ≤ 22,0	≥ 1,0	-	-	EI 90 / E 180 - U/C EI 90 / E 180 - C/U EI 90 / E 180 - U/U EI 90 / E 180 - C/C	EI 90 / E 180 - U/C EI 90 / E 180 - C/U EI 90 / E 180 - U/U EI 90 / E 180 - C/C
	≥ 1,1	290 [1]	30 [1]	EI 120 / E 240 - U/C EI 120 / E 240 - C/U EI 120 / E 240 - U/U EI 120 / E 240 - C/C	EI 120 / E 240 - U/C EI 120 / E 240 - C/U EI 120 / E 240 - U/U EI 120 / E 240 - C/C
22,0 < D ≤ 42,0	1,5 ≤ t < 14,2	290 [1]	30 [1]	EI 120 / E 240 - U/C EI 120 / E 240 - C/U EI 120 / E 240 - U/U EI 120 / E 240 - C/C	EI 120 / E 240 - U/C EI 120 / E 240 - C/U EI 120 / E 240 - U/U EI 120 / E 240 - C/C
42,0 < D ≤ 54,0	1,5 ≤ t ≤ 14,2	250 [1]	60 [1]	EI 120 / E 240 - U/C EI 120 / E 240 - C/U EI 120 / E 240 - U/U EI 120 / E 240 - C/C	EI 120 / E 240 - U/C EI 120 / E 240 - C/U EI 120 / E 240 - U/U EI 120 / E 240 - C/C
54,0 < D ≤ 108,0	2,0 ≤ t ≤ 14,2	585 [1]	90 [1]	EI 90 / E 240 - U/C EI 90 / E 240 - C/U EI 90 / E 240 - U/U EI 90 / E 240 - C/C	EI 90 / E 240 - U/C EI 90 / E 240 - C/U EI 90 / E 240 - U/U EI 90 / E 240 - C/C

[1] Sleeve insulated with mineral wool density of 100 kg/m³ and same thickness as the service; in case of option without sleeve the length od insulation shall be increased by min. 55 mm

[2] Fire resistance class is valid for penetration seals made in rigid wall supporting construction density of ≥ 1700 kg/m³

Fig. C5. Steel pipe penetration seals in rigid wall, made with use of single Roxtec RS seal



1 SLFRS sleeve
2 RS seal
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 cable 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)

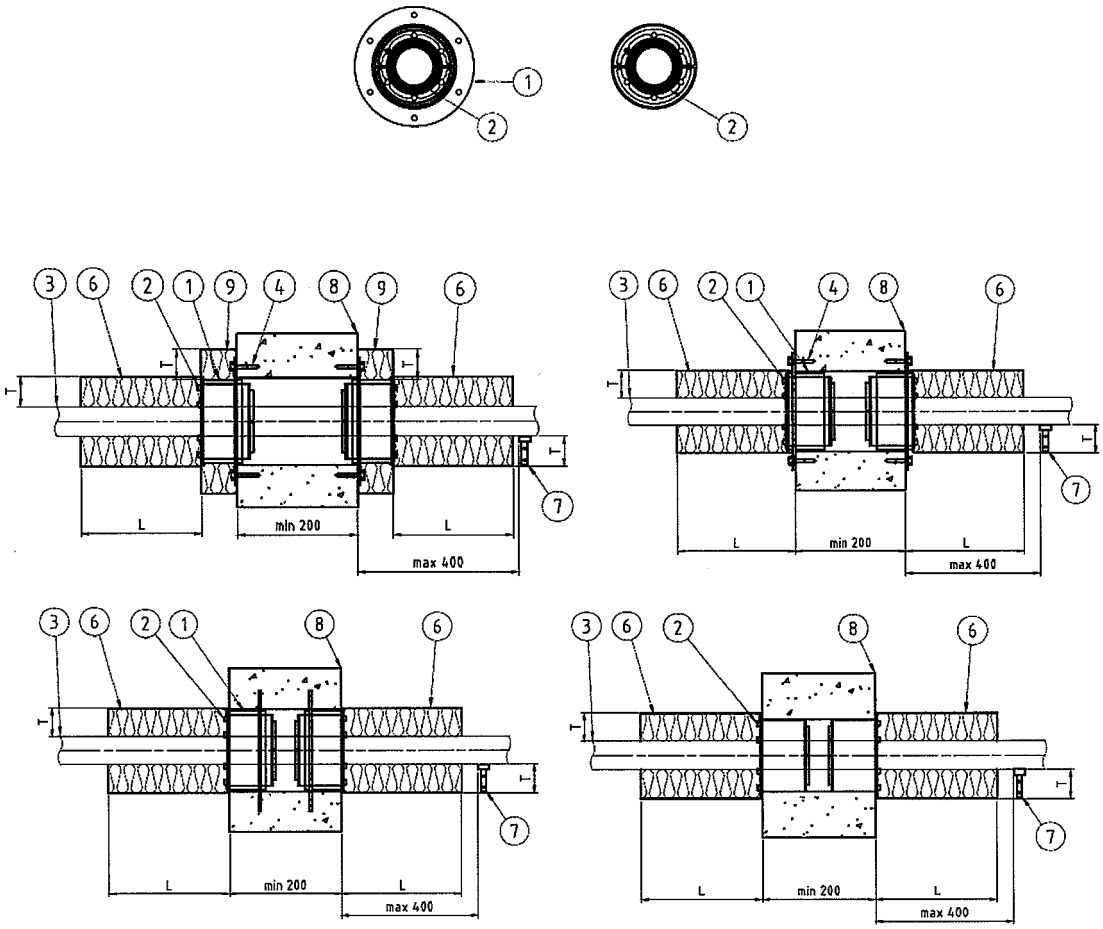
Roxtec RS Seal	**Annex C9** of European Technical Assessment ETA-19/0155
Construction details of penetration seals Steel pipes penetration seals in rigid wall	

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, L1, mm	Mineral wool insulation length, L or L2, mm	Mineral wool insulation thickness, T, mm	Fire resistance class	
Diameter (D), mm	Pipe wall thickness (t), mm				with sleeve	without sleeve [1]
D ≤ 40,0	1,5 ≤ t ≤ 14,2	-	250	30	EI 120 - U/C EI 120 - C/U EI 120 - U/U EI 120 - C/C	EI 120 - U/C EI 120 - C/U EI 120 - U/U EI 120 - C/C
40,0 < D ≤ 75,0	2,0 ≤ t ≤ 14,2	-	500	30	EI 120 - U/C EI 120 - C/U EI 120 - U/U EI 120 - C/C	EI 120 - U/C EI 120 - C/U EI 120 - U/U EI 120 - C/C
75,0 < D ≤ 160,0	2,0 ≤ t ≤ 14,2	470	470	120	EI 90 / E 120 - U/C EI 90 / E 120 - C/U EI 90 / E 120 - U/U EI 90 / E 120 - C/C	EI 90 / E 120 - U/C EI 90 / E 120 - C/U EI 90 / E 120 - U/U EI 90 / E 120 - C/C
197,0 < D ≤ 236,0	2,0 ≤ t ≤ 14,2	600	600	120	EI 60 / E 120 - U/C EI 60 / E 120 - C/U EI 60 / E 120 - U/U EI 60 / E 120 - C/C	EI 180 - C/U EI 180 - U/C EI 180 - U/U EI 180 - C/C

[1] Fire resistance class is valid for penetration seals made in rigid wall supporting construction density of ≥ 1700 kg/m³

Fig. C6. Steel pipe penetration seals in rigid wall, made with use of double Roxtec RS seals



1 SLFRS sleeve
2 RS seal
3 Steel pipe
4 Lightweight concrete screw Ø8 x 65 mm
6 Additional cable 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)

Roxtec RS Seal	**Annex C11** of European Technical Assessment ETA-19/0155
Construction details of penetration seals Steel pipes penetration seals in rigid wall	

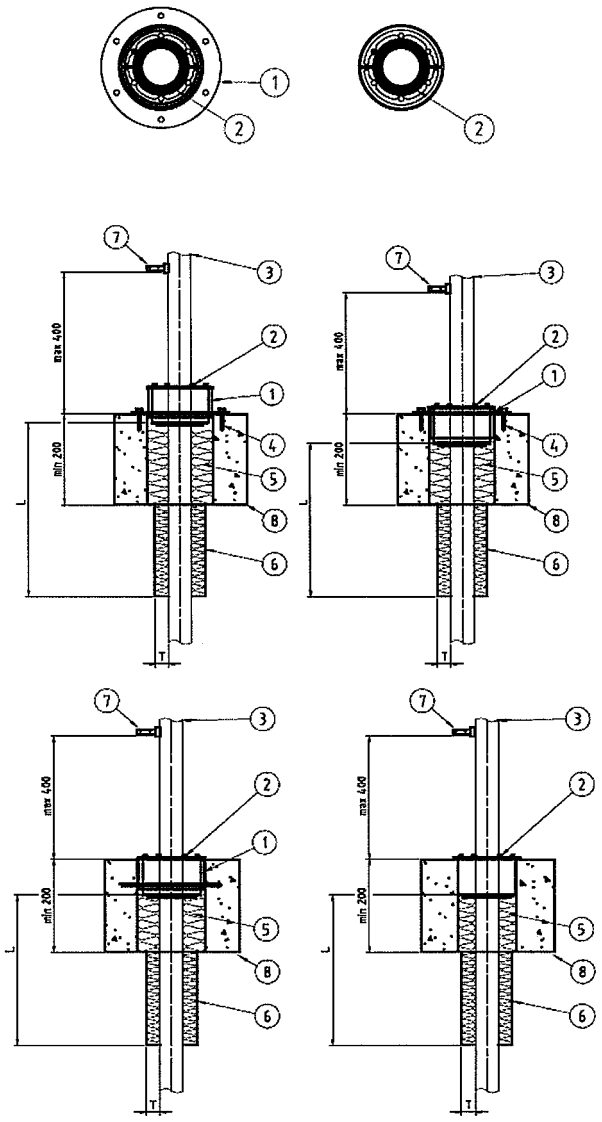
Resistance to fire classification of penetration seals of steel pipes in rigid wall, made in accordance with Fig. C6 and Annex A.

Steel pipe		Mineral wool insulation length, L, mm	Mineral wool insulation thickness, T, mm	Fire resistance class	
Diameter (D), mm	Pipe wall thickness (t), mm			with sleeve	without sleeve [1]
D ≤ 40,0	1,5 ≤ t ≤ 14,2	100 [2]	30 [2]	EI 120 / E 240 - U/C EI 120 / E 240 - C/U EI 120 / E 240 - U/U EI 120 / E 240 - C/C	EI 120 / E 240 - U/C EI 120 / E 240 - C/U EI 120 / E 240 - U/U EI 120 / E 240 - C/C
40,0 < D ≤ 68,0	2,0 ≤ t ≤ 14,2	250 [2]	60 [2]	EI 240 - U/C EI 240 - C/U EI 240 - U/U EI 240 - C/C	EI 240 - U/C EI 240 - C/U EI 240 - U/U EI 240 - C/C
68,0 < D ≤ 75,0	2,0 ≤ t ≤ 14,2	250 [2]	60 [2]	EI 240 - U/C EI 240 - C/U EI 240 - U/U EI 240 - C/C	EI 240 - U/C EI 240 - C/U EI 240 - U/U EI 240 - C/C
75,0 < D ≤ 160,0	2,0 ≤ t ≤ 14,2	700 [2]	120 [2]	EI 90 / E 240 - U/C EI 90 / E 240 - C/U EI 90 / E 240 - U/U EI 90 / E 240 - C/C	EI 90 / E 240 - U/C EI 90 / E 240 - C/U EI 90 / E 240 - U/U EI 90 / E 240 - C/C
160,0 < D ≤ 236,0	2,0 ≤ t ≤ 14,2	900 [2]	120 [2]	EI 90 / E 240 - U/C EI 90 / E 240 - C/U EI 90 / E 240 - U/U EI 90 / E 240 - C/C	EI 90 / E 240 - U/C EI 90 / E 240 - C/U EI 90 / E 240 - U/U EI 90 / E 240 - C/C

[1] Fire resistance class is valid for penetration seals made in rigid wall supporting construction density of ≥ 1700 kg/m³

[2] Sleeve insulated with mineral wool density of 100 kg/m³ and the same thickness as the service; in case of option without sleeve the length of insulation shall be increased by min. 55 mm

Fig. C7. Single cable penetration seals in rigid floor, made with use of single Roxtec RS seal



1 SLFRS sleeve
2 RS seal
3 Single cable
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

Roxtec RS Seal	**Annex C13** of European Technical Assessment ETA-19/0155
Construction details of penetration seals Single cables penetration seals in rigid floor	

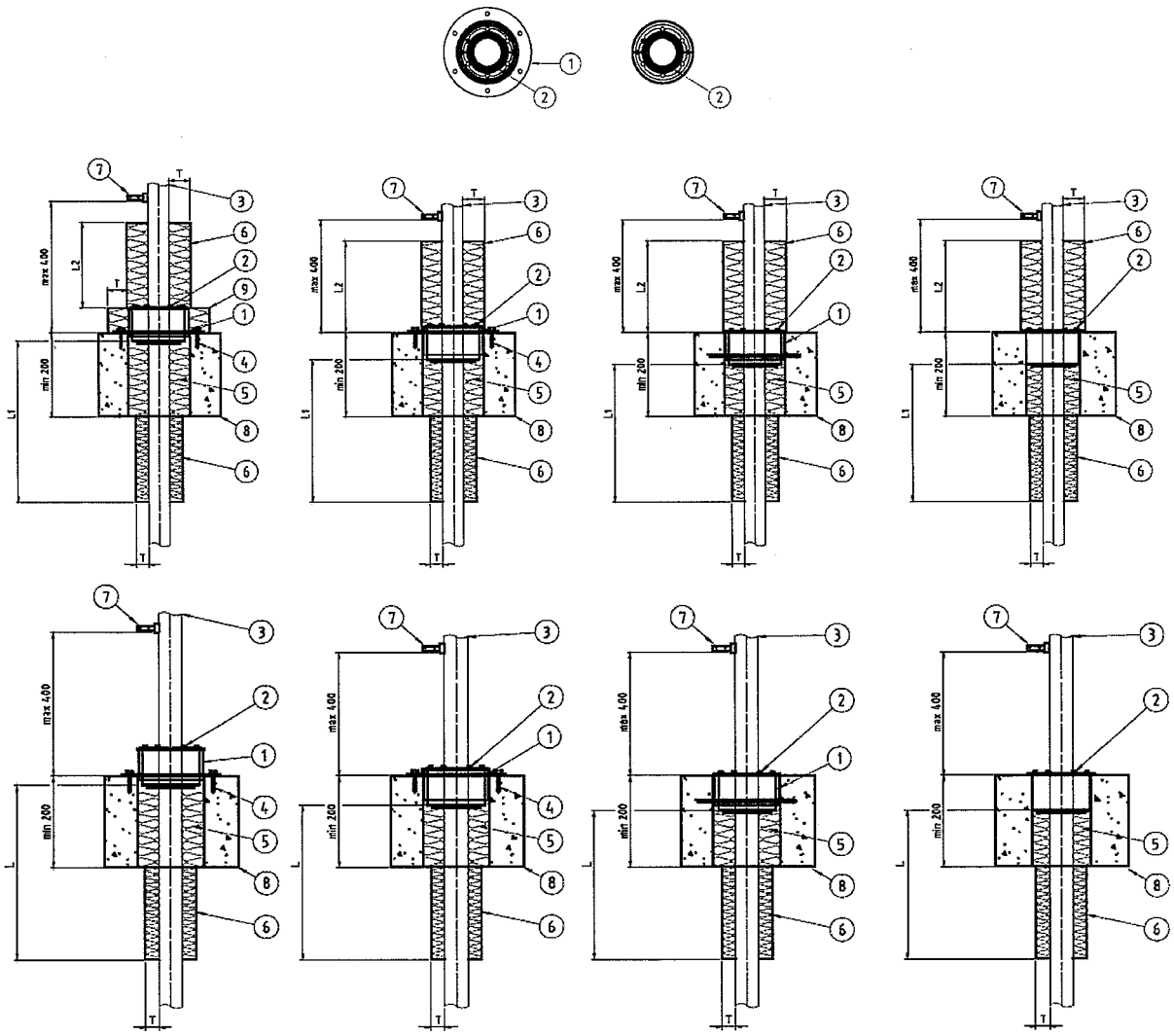
Resistance to fire classification of penetration seals of cables in rigid floor, made in accordance with Fig. C7 and Annex A.

Type of cable[1)]	Mineral wool insulation length, L, mm	Mineral wool insulation thickness, T, mm	Fire resistance class	
			with sleeve	without sleeve
Small cables, with diameter ≤ 21 mm	50	"cavity only" [2)]	**EI 180**	**EI 180**
Medium cables, with diameter ≤ 50 mm	400	30	**EI 120 / E 180**	**EI 120 / E 180**
Large cables, with diameter ≤ 80 mm	400	30	**EI 120 / E 180**	**EI 120 / E 180**

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 pipe penetration seals in rigid floor, made with use of single Roxtec RS seal



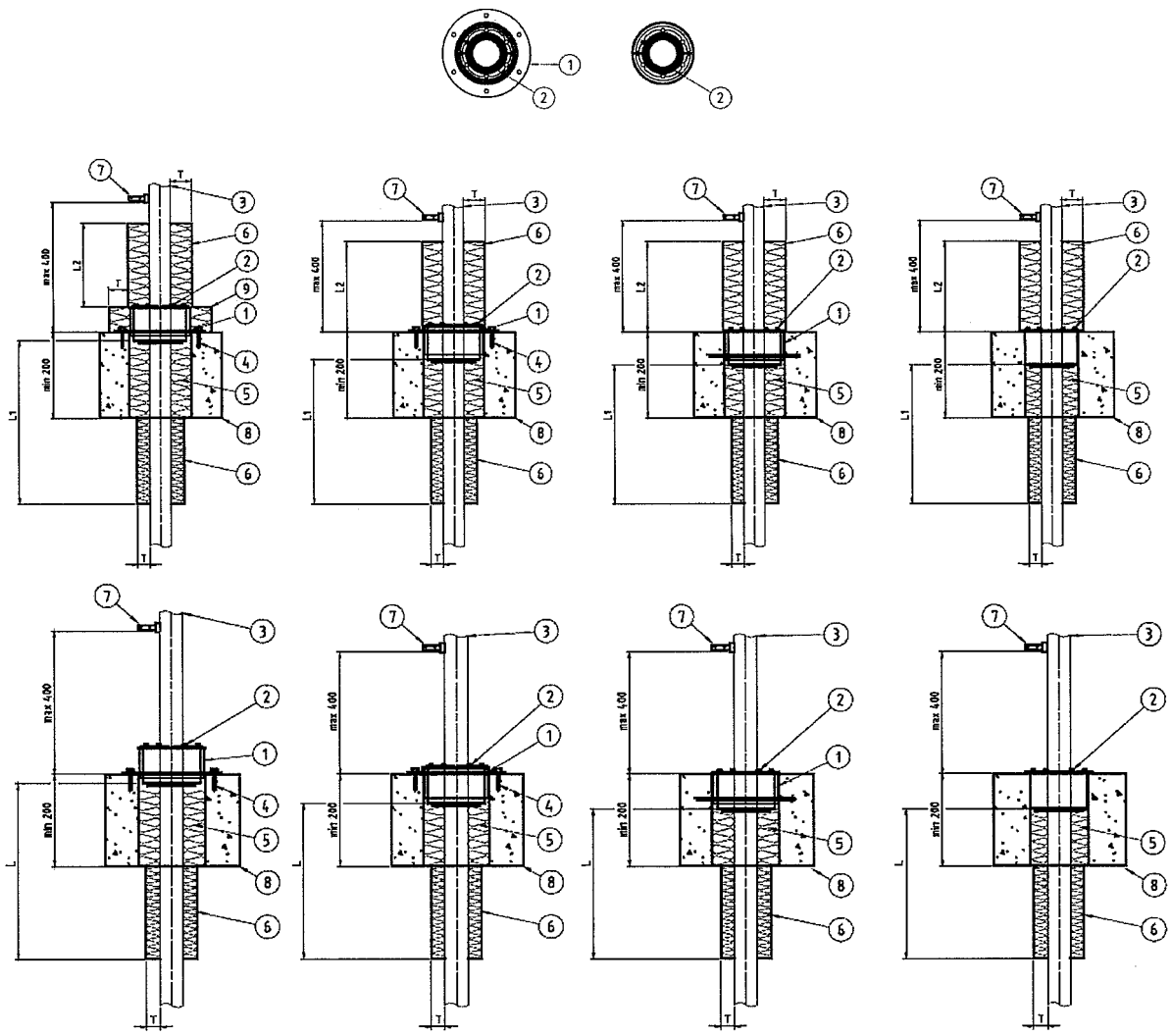
1 SLFRS sleeve
2 RS seal
3 Copper pipe
4 Lightweight concrete screw Ø8 x 65 mm
5 Cavity insulation (loose stone mineral wool, compressed to the density of ≥ 100 kg/m^3)
6 Additional cable insulation (stone mineral wool insulation density of ≥ 100 kg/m^3)
7 Pipe support
8 Rigid floor, with a minimum thickness of 200 mm
9 Protruding sleeve insulation (stone mineral wool insulation density of ≥ 100 kg/m^3)

Roxtec RS Seal	**Annex C15** of European Technical Assessment ETA-19/0155
Construction details of penetration seals Copper pipes penetration seals in rigid floor	

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	
Diameter (D), mm	Pipe wall thickness (t), mm	length, L1 or L, mm	thickness, T, mm	length, L2, mm	thickness, T, mm	with sleeve	without sleeve
≤ 8,0	≥ 0,8	200	30	-	-	EI 240 - U/C EI 240 - C/U EI 240 - U/U EI 240 - C/C	EI 240 - U/C EI 240 - C/U EI 240 - U/U EI 240 - C/C
8,0 < D ≤ 22,0	≥ 1,0	600	30	-	-	EI 240 - U/C EI 240 - C/U EI 240 - U/U EI 240 - C/C	EI 240 - U/C EI 240 - C/U EI 240 - U/U EI 240 - C/C
22,0 < D ≤ 42,0	1,5 ≤ t ≤ 14,2	500	60	-	-	EI 90 / E 120 - U/C EI 90 / E 120 - C/U EI 90 / E 120 - U/U EI 90 / E 120 - C/C	EI 90 / E 120 - U/C EI 90 / E 120 - C/U EI 90 / E 120 - U/U EI 90 / E 120 - C/C
		590	60	300	60	EI 120 / E 240 - U/C EI 120 / E 240 - C/U EI 120 / E 240 - U/U EI 120 / E 240 - C/C	EI 120 / E 240 - U/C EI 120 / E 240 - C/U EI 120 / E 240 - U/U EI 120 / E 240 - C/C
42,0 < D ≤ 54,0	1,5 ≤ t ≤ 14,2	500	60	-	-	EI 60 / E 120 - U/C EI 60 / E 120 - C/U EI 60 / E 120 - U/U EI 60 / E 120 - C/C	EI 60 / E 120 - U/C EI 60 / E 120 - C/U EI 60 / E 120 - U/U EI 60 / E 120 - C/C
		675	60	400	60	EI 120 / E 240 - U/C EI 120 / E 240 - C/U EI 120 / E 240 - U/U EI 120 / E 240 - C/C	EI 120 / E 240 - U/C EI 120 / E 240 - C/U EI 120 / E 240 - U/U EI 120 / E 240 - C/C
54,0 < D ≤ 108,0	2,0 ≤ t ≤ 14,2	400	90	400	90	EI 60 / E 120 - U/C EI 60 / E 120 - C/U EI 60 / E 120 - U/U EI 60 / E 120 - C/C	EI 60 / E 120 - U/C EI 60 / E 120 - C/U EI 60 / E 120 - U/U EI 60 / E 120 - C/C
		735	90	685	90	EI 90 / E 240 - U/C EI 90 / E 240 - C/U EI 90 / E 240 - U/U EI 90 / E 240 - C/C	EI 90 / E 240 - U/C EI 90 / E 240 - C/U EI 90 / E 240 - U/U EI 90 / E 240 - C/C

Fig. C9. Steel pipe penetration seals in rigid floor, made with use of single Roxtec RS seal



1 SLFRS sleeve
2 RS seal
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 cable 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)

Roxtec RS Seal	**Annex C17** of European Technical Assessment ETA-19/0155
Construction details of penetration seals Steel pipes penetration seals in rigid floor	

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 at the bottom of the floor		Mineral wool insulation at the top of the floor		Fire resistance class	
Diameter (D), mm	Pipe wall thickness (t), mm	length, L1 or L, mm	thickness, T, mm	length, L2, mm	thickness, T, mm	with sleeve	without sleeve
D ≤ 40,0	1,5 ≤ t ≤ 14,2	250	30	-	-	EI 120 - U/C EI 120 - C/U EI 120 - U/U EI 120 - C/C	EI 120 - U/C EI 120 - C/U EI 120 - U/U EI 120 - C/C
		320	30	-	-	EI 240 - U/C EI 240 - C/U EI 240 - U/U EI 240 - C/C	EI 240 - U/C EI 240 - C/U EI 240 - U/U EI 240 - C/C
40,0 < D ≤ 75,0	2,0 ≤ t ≤ 14,2	500	30	-	-	EI 120 - U/C EI 120 - C/U EI 120 - U/U EI 120 - C/C	EI 120 - U/C EI 120 - C/U EI 120 - U/U EI 120 - C/C
		615	60	-	-	EI 180 / E 240 - U/C EI 180 / E 240 - C/U EI 180 / E 240 - U/U EI 180 / E 240 - C/C	EI 180 / E 240 - U/C EI 180 / E 240 - C/U EI 180 / E 240 - U/U EI 180 / E 240 - C/C
75,0 < D ≤ 160,0	2,0 ≤ t ≤ 14,2	470	120	470	120	EI 120 - U/C EI 120 - C/U EI 120 - C/C	EI 120 - U/C EI 120 - C/U EI 120 - C/C
		840	120	1010	120	EI 240 - U/C EI 240 - C/U EI 240 - C/C	EI 240 - U/C EI 240 - C/U EI 240 - C/C
160,0 < D ≤ 236,0	2,0 ≤ t ≤ 14,2	600	120	600	120	EI 90 / E 120 - U/C EI 90 / E 120 - C/U EI 90 / E 120 - C/C	EI 90 / E 120 - U/C EI 90 / E 120 - C/U EI 90 / E 120 - C/C
		1050	120	1210	120	EI 240 - U/C EI 240 - C/U EI 240 - C/C	EI 240 - U/C EI 240 - C/U EI 240 - C/C