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Replaces -

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Radiation shielding sealing systems for pipe and cable transits

STATEMENT BY KIWA

With this Kiwa Covenant, issued in accordance with the Kiwa Regulations for Product Certification, Kiwa declares that legitimate confidence exists that the products supplied by

Beele Engineering

as specified in this Kiwa Covenant and marked with the Kiwa®-mark in the manner as indicated in this product certificate may, on delivery, be relied upon to comply with Kiwa Manual K15013 for Kiwa Covenants for products and processes – for the requirements described in this Covenant.



Luc Leroy
Kiwa

Publication of the Covenant is allowed.

Advice: consult www.kiwa.nl in order to ensure that this Covenant is still valid.

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Certification process consists of initial and regular assessment of:

- quality system
- product

Radiation shielding sealing systems for pipe and cable transits

CERTIFIED PRODUCTS

XATTAX[®] sealing systems

TECHNICAL SPECIFICATION OF THE PRODUCTS

The technical specifications are described on pages 3 until 18.

APPLICATION AND USE

The XATTAX[®] sealing systems are intended to be used for the sealing of the transits of pipes and/or cables through rigid walls and floors in buildings and constructions for nuclear applications. The sealing systems are resistant to gamma irradiation and provide shielding for nuclear radiation. The system is approved for wall and floors with a thickness of minimum 800 mm.

Application details of the sealing systems are described in this Covenant.

This Covenant does not cover any certification or claims for fire stopping and sealing, nor water and air tightness of the described sealing systems.

Hereby the following application conditions must be taken into account:

- the installation instructions of the producer.

MARKING

The following marks and indications must be provided on each product packaging in a clear, legible and indelible way:

- the name of manufacturer or the deposited trade mark;
- Kiwa Covenant mark "Radiation shielding sealing systems" and Kiwa Covenant number;
- the nominal dimension or dimensions;
- the year of manufacturing and preferably the quarter.

If the dimensions of the products are such that the indications applied to them may impair the product, the products may be marked per package in consultation with the manufacturer, the buyer and Kiwa. Products produced by cutting or die cutting out of sheets may be marked per package.

RECOMMENDATIONS FOR CUSTOMERS

Check at the time of delivery whether:

- the supplier has delivered in accordance with the agreement;
- the mark and the marking method are correct;
- the products show no visible defects as a result of transport etc.

Consult the supplier's processing guidelines for the proper storage, transport methods.

If you should reject a product on the basis of the above, please contact:

- Beele Engineering
- and, if necessary,
- Kiwa Nederland B.V.

Consult the supplier's processing guidelines for the proper storage and transport methods.

Radiation shielding sealing systems for pipe and cable transits

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Radiation shielding sealing systems for pipe and cable transits

Preface

This Kiwa Covenant has been prepared by the Technical Committee “Sealing products” of Kiwa Nederland B.V. accepted by the Kiwa Committee of Covenant (KCC). The KCC also supervises the certification activities and where necessary requires the Kiwa Covenant to be revised.

This Kiwa Covenant will be used by Kiwa in conjunction with the Kiwa-Regulations for Product Certification. This regulation details the method employed by Kiwa for conducting the necessary investigations prior to issuing the product certificate and the method of external control. The inspection frequency is determined by the above mentioned Technical Committee and Kiwa Committee of Covenant.

Radiation shielding sealing systems for pipe and cable transits

1. *XATTAX[®] sealing systems configurations*

1.1. **RADIATT[®] Configuration**

The sealing system consists of a compact filling of the total floor or wall penetration with 20 mm thick RADIATT shielding rubber parts (discs). The shielding properties of RADIATT shielding rubber are similar to concrete.

A technical drawing of the RADIATT configuration is presented in Annex C.

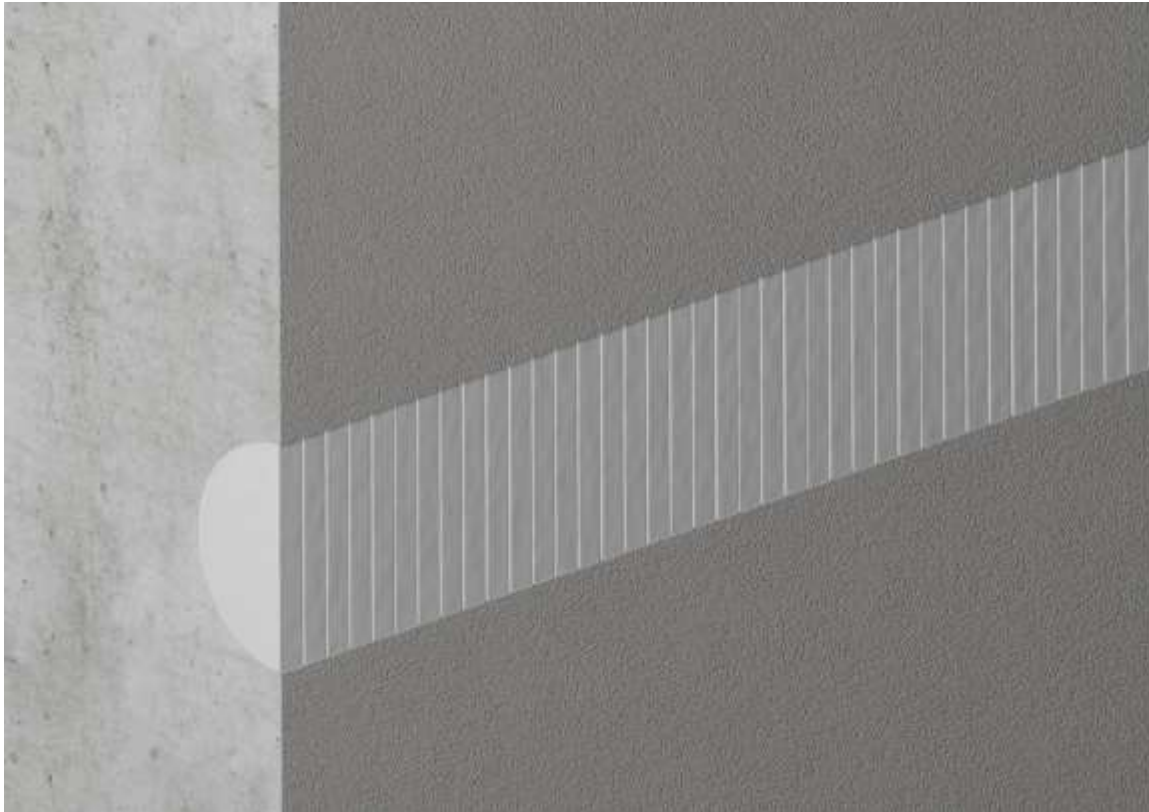


Figure 1. RADIATT configuration sealing a transit in a concrete wall (without services).

Radiation shielding sealing systems for pipe and cable transits

1.2. NOFIRNO[®] - RADIATT[®] configuration

The sealing system consists of a combination of the NOFIRNO sealing system at both ends of the transit and a compact filling of 20 mm thick RADIATT shielding rubber parts (discs) in between. The total length of the filling depends on the thickness of the penetrated wall or floor and is minimum 480 mm when applied in the minimum required wall or floor thickness of 800 mm.

The NOFIRNO sealing system consists of NOFIRNO rubber filler sleeves and NOFIRNO sealant. The thickness of the sealant is 20 mm. The length of the filler sleeves is 140 mm. the diameter size of the filler sleeves is 22/15 (outer/inner diameter in mm); filler sleeves with diameter 18/12 are used at finalising the filling to become a fixed and tight construction.

For cable penetrations additionally cable inserts sleeves are applied around the cables.

A technical drawing of the NOFIRNO / RADIATT configuration is presented in Annex D.

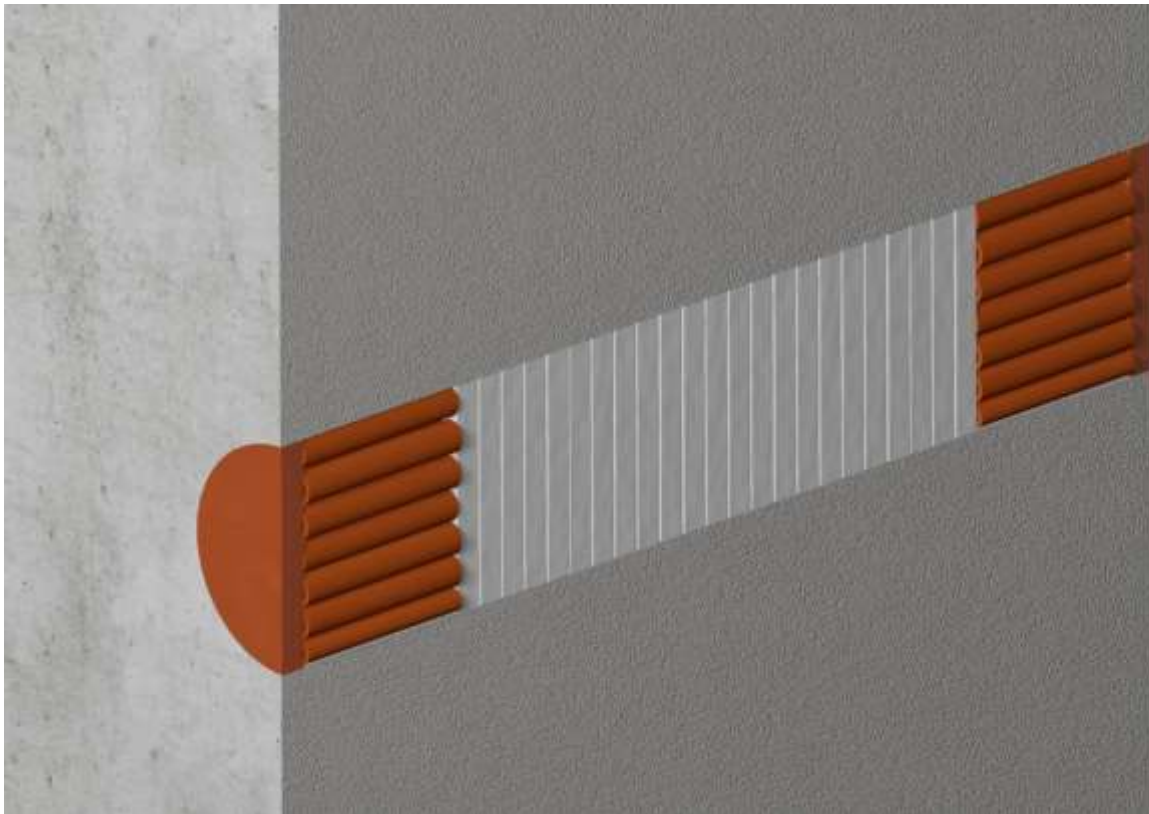


Figure 2. NOFIRNO – RADIATT configuration sealing a transit in a concrete wall (without services).

Radiation shielding sealing systems for pipe and cable transits

1.3. NOFIRNO[®] - ACTIFOAM/ULTRA[®] configuration

The sealing system consists of a combination of the NOFIRNO sealing system at both ends of the transit and a compact filling of 55 mm thick ACTIFOAM/ULTRA rubber parts (discs) in between. The total length of the filling depends on the thickness of the penetrated wall or floor and is minimum 440 mm when applied in the minimum required wall or floor thickness of 800 mm.

The NOFIRNO sealing system consists of NOFIRNO rubber filler sleeves and NOFIRNO sealant. The thickness of the sealant is 20 mm. The length of the filler sleeves is 160 mm. the diameter size of the filler sleeves is 22/15 (outer/inner diameter in mm); filler sleeves with diameter 18/12 are used at finalising the filling to become a fixed and tight construction.

For cable penetrations additionally cable inserts sleeves are applied around the cables.

A technical drawing of the NOFIRNO – ACTIFOAM/ULTRA configuration is presented in Annex E.

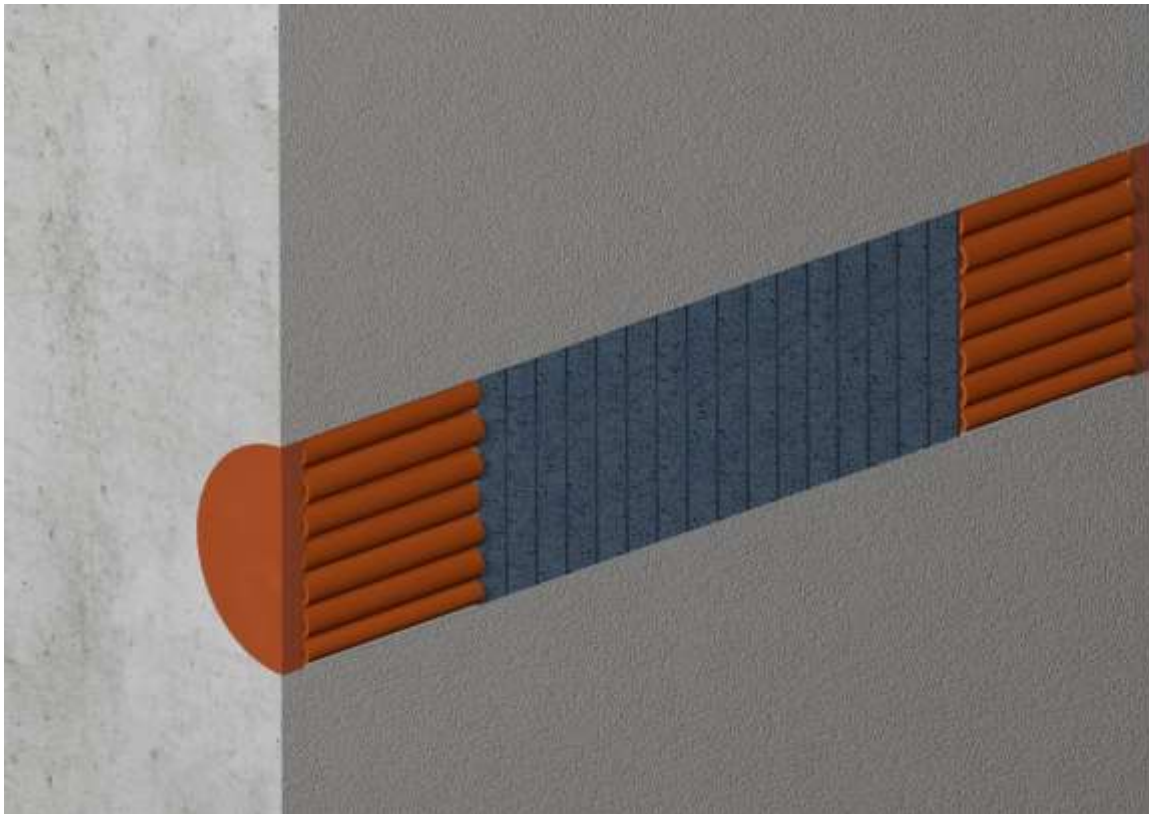


Figure 3. NOFIRNO – ACTIFOAM/ULTRA configuration sealing a transit in a concrete wall (without services).

Radiation shielding sealing systems for pipe and cable transits

1.4. NOFIRNO[®] - AQUASTOP[®] configuration

The sealing system consists of a combination of the NOFIRNO sealing system at both ends of the transit and a compact filling of 20 mm thick AQUASTOP rubber parts (discs) in between. The total length of the filling depends on the thickness of the penetrated wall or floor and is minimum 480 mm when applied in the minimum required wall or floor thickness of 800 mm.

The NOFIRNO sealing system consists of NOFIRNO rubber filler sleeves and NOFIRNO sealant. The thickness of the sealant is 20 mm. The length of the filler sleeves is 140 mm. the diameter size of the filler sleeves is 22/15 (outer/inner diameter in mm); filler sleeves with diameter 18/12 are used at finalising the filling to become a fixed and tight construction.

For cable penetrations additionally cable inserts sleeves are applied around the cables.

A technical drawing of the NOFIRNO – AQUASTOP configuration is presented in Annex F.

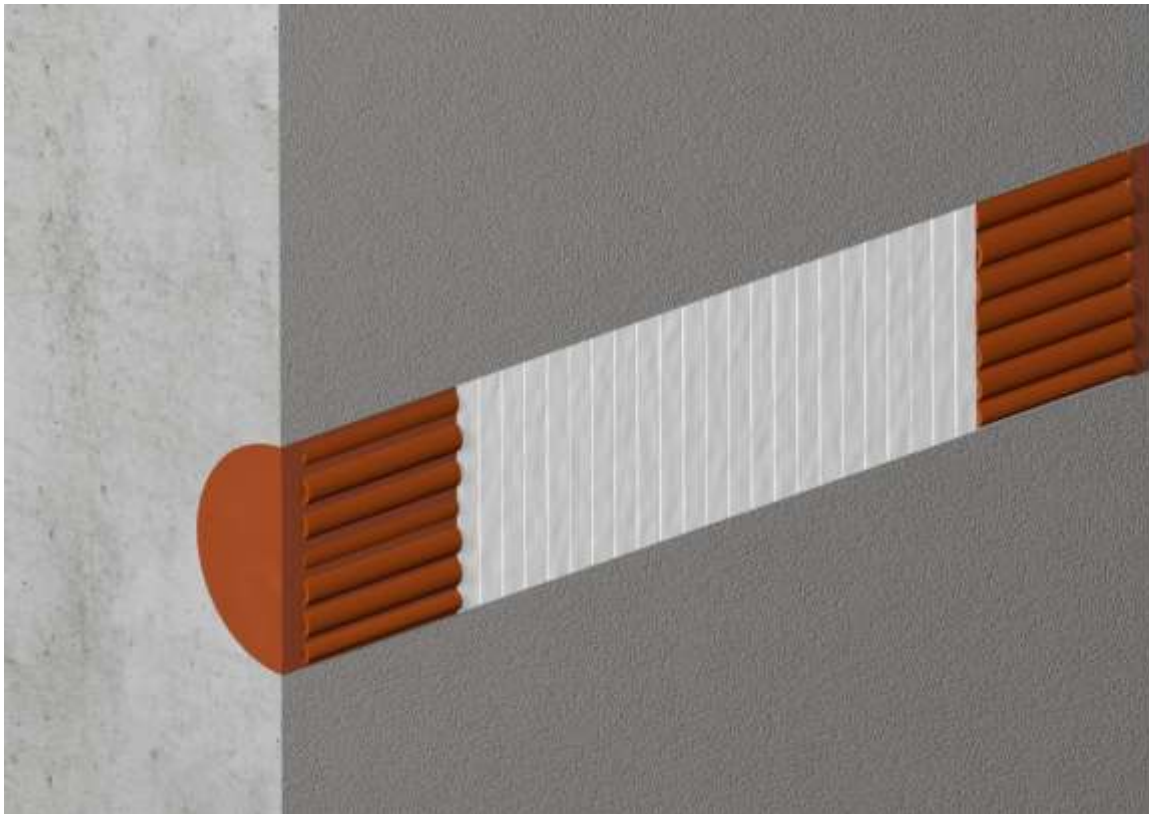


Figure 4. NOFIRNO – AQUASTOP configuration sealing a transit in a concrete wall (without services).

Radiation shielding sealing systems for pipe and cable transits

2. Intended use of the XATTAX[®] sealing systems

The XATTAX sealing systems are intended to be used for the sealing of the transits of pipes and/or cables through rigid walls and floors in buildings and constructions for nuclear applications. The sealing systems are resistant to gamma radiation and provide shielding for nuclear radiation. The system is approved for wall and floors with a thickness of minimum 800 mm.

The sealing systems are intended for plastic and metal pipes and for cables with various outer surface (smooth, textured, corrugated) through a penetration in rigid (concrete) walls and floors. The filling rate (ratio between total of the pipe and cable cross sections and penetrated surface of the transit) shall preferably be maximum 50 %. The radiation shielding of the transits depends on the filling rate and the material properties of the ducted pipes and cables and will reduce with increasing filling rate. This is independent from the intrinsic shielding properties of the XATTAX sealing systems as claimed in this Covenant.

The penetration sealing systems and components described in this Kiwa Covenant are basically maintenance free under the conditions that the installation has been carried out properly according to the manufacturer's instructions. The shielding properties of the penetration seals shall not be negatively affected by future changes to buildings or building elements.

The provisions made in this Kiwa Covenant are based on an assumed working life of these sealing systems of 60 years with respect to the materials and components described*, provided that the conditions laid down in the manufacturer's datasheet and instructions for the packaging/transport/storage/installation/use/repair are met. The indications given on the working life cannot be interpreted as a guarantee given by the producer, 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.

The real working life might be, in normal use conditions, considerable longer without major degradation affecting the sealing and shielding properties.

3. Shielding properties of transits sealed with XATTAX[®] sealing systems

The shielding properties of the XATTAX sealing systems in concrete walls have been investigated. In table 1 the measured shielding performance is presented. For comparison the measured shielding performance of a concrete wall is added.

Table 1. Shielding performance of XATTAX sealing systems

Applicable transits			Shielding performance of blank transit (without pipes and cables)
RADIATT Configuration	Construction and composition: see 1.1 and Annex C	Minimum wall or floor thickness 800 mm	Minimum 99,99 %
NOFIRNO – RADIATT Configuration	Construction and composition: see 1.2 and Annex D	Minimum wall or floor thickness 800 mm	Minimum 99,9 %
NOFIRNO – ACTIFOAM/ULTRA Configuration	Construction and composition: see 1.3 and Annex E	Minimum wall or floor thickness 800 mm	Minimum 91 %
NOFIRNO – AQUASTOP Configuration	Construction and composition: see 1.4 and Annex F	Minimum wall or floor thickness 800 mm	Minimum 99 %
Full concrete wall or floor with minimum thickness 800 mm			Minimum 99,99 %

* The manufacturer is not responsible for the working life of services (pipes and cables).

Radiation shielding sealing systems for pipe and cable transits

4. Quality system requirements

4.1. General

This chapter contains the requirements that have to be fulfilled by the manufacturer's quality system.

4.2. Manager of the quality system

Within the manufacturer's organisational structure an employee must be appointed who is in charge of managing the quality system.

4.3. Internal quality control/quality plan

As part of the quality system the manufacturer must implement an internal quality control schedule (IQC-scheme).

In this IQC-scheme the following must be demonstrably recorded:

- which aspects are inspected by the manufacturer;
- according to which methods these inspections are carried out;
- how often these inspections are carried out;
- how the inspection results are registered and stored.

The ICQ-schedule must be detailed in such a way that it provides Kiwa sufficient confidence that requirements will be continuously fulfilled.

4.4. Procedures and work instructions

The manufacturer must be able to submit:

- procedures for:
 - the handling of non-conforming products;
 - corrective actions in case non-conformities are found;
 - the handling of complaints regarding the products and / or services supplied;
- the work instructions and inspection sheets in use.
- instructions for packaging and closing off of products during storage and transport.

4.5. External inspection

The manufacturer's quality system shall be assessed by Kiwa with regard to at least the aspects mentioned in the Kiwa-Regulations for Product Certification.

The Kiwa Committee Covenant will determine the inspection frequency. At the time of validation of this Covenant this frequency has been fixed at 2 inspection visits per year.

Radiation shielding sealing systems for pipe and cable transits

4.6. Quality control of products

4.6.1. Rubber sealing products

The following routine tests shall be carried out according to the test methods mentioned in this covenant or otherwise mentioned:

- a. dimensions – internal method
- b. surface imperfections, appearance and colour – internal method
- c. hardness
- d. leakage test of plugs

The product control tests shall be carried out on lots of finished products.

4.6.2. Shielding rubber (uncured)

The following routine tests shall be carried out according to the test methods mentioned in this covenant or otherwise mentioned:

- a. appearance and colour – internal method
- b. density

The product control tests shall be carried out on lots of finished compounds (strips or sheets).

4.6.3. Sealants

The following routine tests shall be carried out according to the test methods mentioned in this covenant or otherwise mentioned.

Non cured material:

- a. film structure – internal method
- b. viscosity – internal method
- c. curing - internal method

Cured material:

- a. hardness
- b. appearance and colour – internal method
- c. density

The product control tests shall be carried out on lots of finished products (filled cartridges).

Radiation shielding sealing systems for pipe and cable transits

Annex A. Components and material compositions used for the XATTAX[®] sealing systems

A1. NOFIRNO filler and cable sleeves

The filler and cable sleeves are made of NOFIRNO rubber. The material is a high temperature curing silicone rubber compound. The colour of the compound is terracotta. The rubber compound is manufactured by Beele Engineering by a mixing process and converted into products using a high temperature injection or compression moulding process.

A2. NOFIRNO sealant

The material of the sealant is a room temperature curing silicone sealant. For the silicone base two different types are used. The colour of the compound is terracotta. The sealant is also available in blue, black and white. Other colours are admitted on the condition that only the pigment is exchanged in the composition. The sealant compound is manufactured by Beele Engineering by a mixing process and packed in 310 ml plastic cartridges.

A3. RADIATT shielding rubber

The shielding rubber parts are made of RADIATT shielding rubber. The colour of the compound is grey to white. The rubber compound is manufactured by Beele Engineering by a mixing process and converted into kneadable sheets or discs.

A4. ACTIFIOAM/ULTRA foam rubber

The parts consist ACTIFIOAM rubber to which a thin 2 mm layer of RISE ULTRA rubber is laminated. The ACTIFIOAM material is a ethene vinyl acetate rubber compound. The colour is blue. The rubber compound is manufactured by Beele Engineering by a mixing process and converted into closed cell foam plates using a high temperature compression moulding process. The RISE ULTRA material is a ethene vinyl acetate rubber compound. The colour is black. The rubber compound is manufactured by Beele Engineering by a mixing process and converted into sheets. ACTIFIOAM plates and RISE ULTRA sheets are used to manufacture ACTIFIOAM/ULTRA parts in different dimensions.

A5. AQUASTOP rubber

The AQUASTOP rubber parts are made of AQUASTOP rubber. The material is a high temperature curing silicone rubber compound. The colour of the compound is white. The rubber compound is manufactured by Beele Engineering by a mixing process and converted into kneadable sheets or discs.

Radiation shielding sealing systems for pipe and cable transits

Annex B. Material and product properties

B1. Physical-mechanical material properties

NOFIRNO rubber filler and cable sleeves

Hardness (ISO 7619-1)	65 – 85 Shore A
Density (ISO 2781)	1,55 – 1,65 Mg/m ³
Tensile strength (ISO 37)	min 2,0 MPa
Elongation at break (ISO 37)	min 100 %
Limited oxygen index (ASTM D2863)	min 40 %
Volume change in water (ISO 1817) after 7 days at 70 °C	max +8 / -1 %

ACTIFOAM/ULTRA parts

Density (ISO 2781)	0,30 – 0,45 Mg/m ³
Limited oxygen index (ASTM D2863)	min 35 %

AQUASTOP rubber (uncured)

Density (ISO 2781) *	1,55 – 1,65 Mg/m ³
Volume change in water after 7 days at 70 °C (ISO 1817)	max +15 / -1 %

RADIATT rubber (uncured)

Density (ISO 2781)	2,45 – 2,55 Mg/m ³
Volume change in water (ISO 1817) after 7 days at 70 °C	max +15 / -1 %

NOFIRNO sealant (cured)

Hardness (ISO 7619-1)	35 – 55 Shore A
Density (ISO 2781)	1,42 – 1,52 Mg/m ³
Elongation at break (ISO 37)	min 50 %
Limited oxygen index (ASTM D2863)	min 37 %
Volume change in water (ISO 1817) after 7 days at 70 °C	max +8 / -1 %

B2. Durability and Serviceability

The use category of the XATTAX sealing systems is:

Category type X : intended for use at conditions exposed to weathering.

This includes use at external and internal conditions, high temperatures in summer, frost and frost-thaw in winter, exposure to UV and exposure to rain.

B3. Durability of physical-mechanical properties of surface layer

Physical-mechanical properties after exposition during 28 days to UV-irradiation in a UV chamber, followed by 14 days in an environmental chamber, using the exposure conditions according to clause 4.2.3 EOTA TR 024.

NOFIRNO sealant

Change of appearance:	no change
Change of density:	max 2 %
Change of hardness	max 5 Shore A

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B4. Gamma irradiation resistance

Physical-mechanical properties after exposition to a total dose of 200 kGy (kilo Gray) of gamma irradiation from Co-60 source. This total dose is corresponding with the total dose of gamma irradiation that is expected on locations with pipe and cable penetrations with XATTAX sealing systems during a total service life of 60 years of nuclear power plants.

NOFIRNO rubber, NOFIRNO sealant, ACTIFOAM/ULTRA foam rubber

After exposure the materials are still flexible and elastic. There is no change in colour and there are no signs of cracks or other evidence of degradation. The materials can be bended without failure.

RADIATT shielding rubber, AQUASTOP rubber

After exposure the materials become some flexibility and elasticity (crosslinked). There is a slight change in colour and there are no signs of cracks or other evidence of degradation. The materials can be bended without failure.

The tests show that the materials are still in good condition after a total dose of 200 kGy of gamma irradiation and could resist even higher doses .

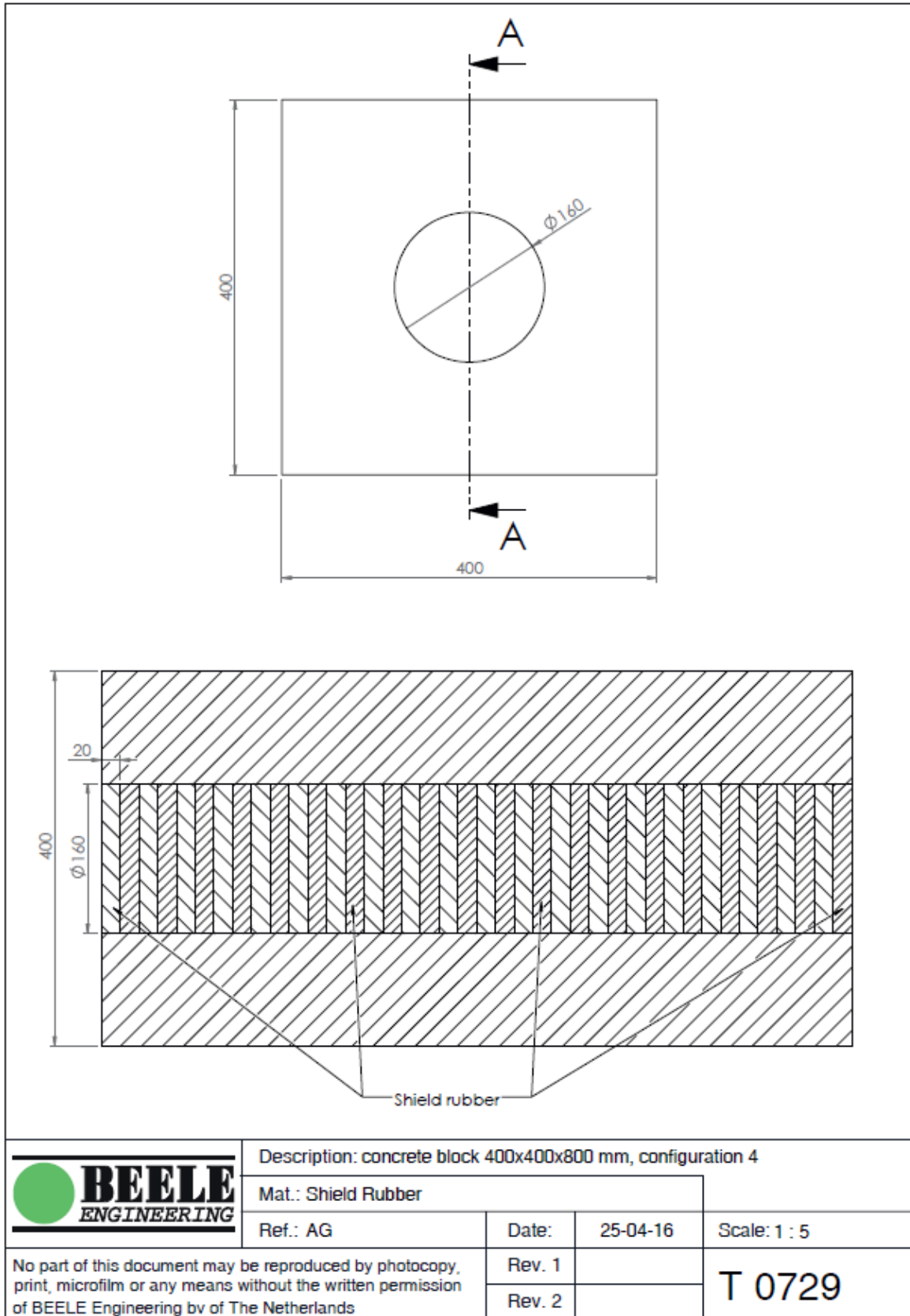
B5. Components and materials compatibility


The materials of the NOFIRNO rubber filler and cable sleeves, ACTIFOAM/ULTRA parts, AQUASTOP rubber, RADIATT rubber and the NOFIRNO sealant are compatible with metal parts, plasticised plastic parts and polymeric cable sheaths.

Radiation shielding sealing systems for pipe and cable transits

Annex C. XATTAX sealing system RADIATT configuration

Example of the RADIATT configuration in a wall transit without services

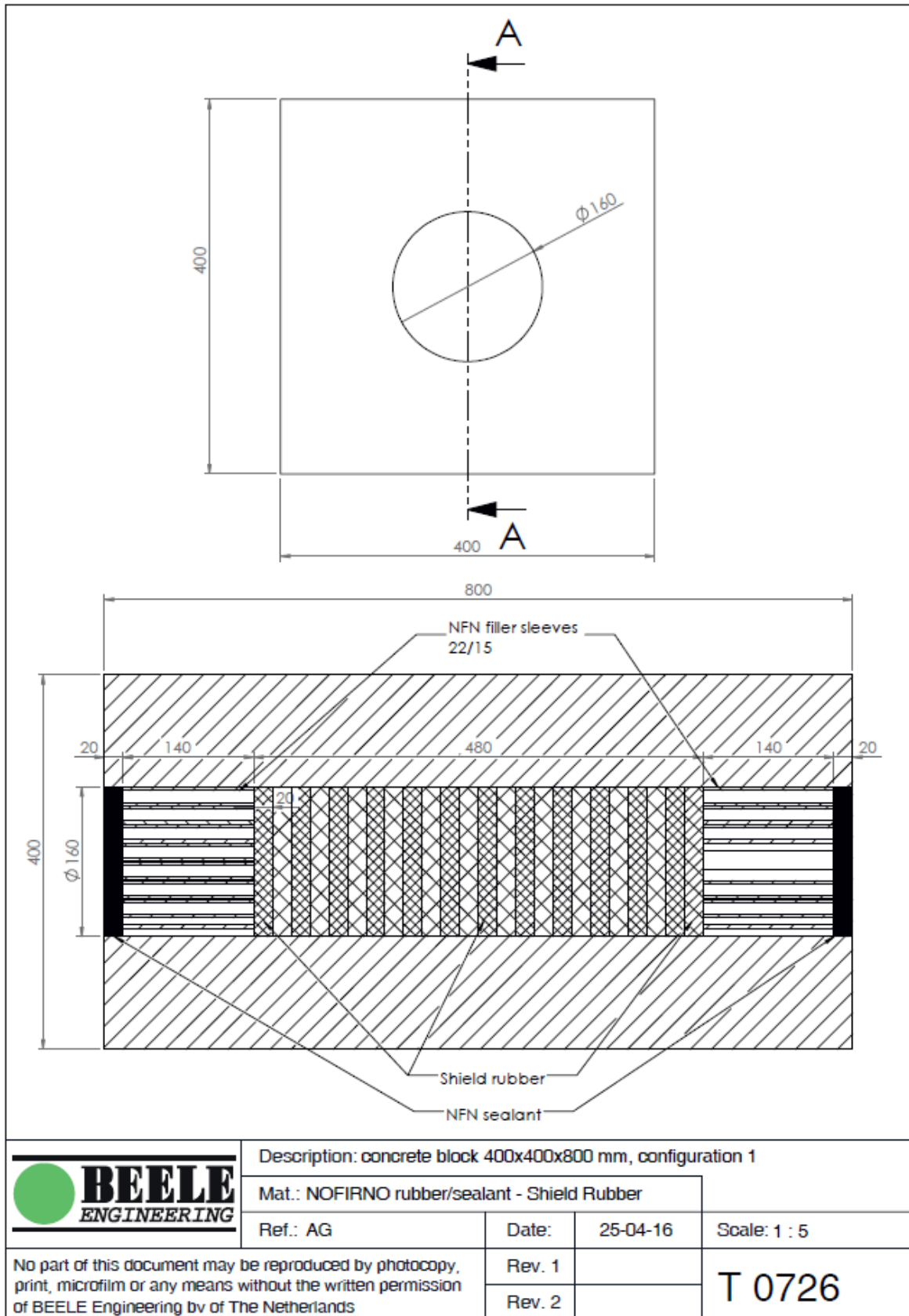


	Description: concrete block 400x400x800 mm, configuration 4		
	Mat.: Shield Rubber		
Ref.: AG	Date:	25-04-16	Scale: 1 : 5
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	Rev. 2		

Radiation shielding sealing systems for pipe and cable transits

Annex D. XATTAX sealing system NOFIRNO – RADIATT configuration

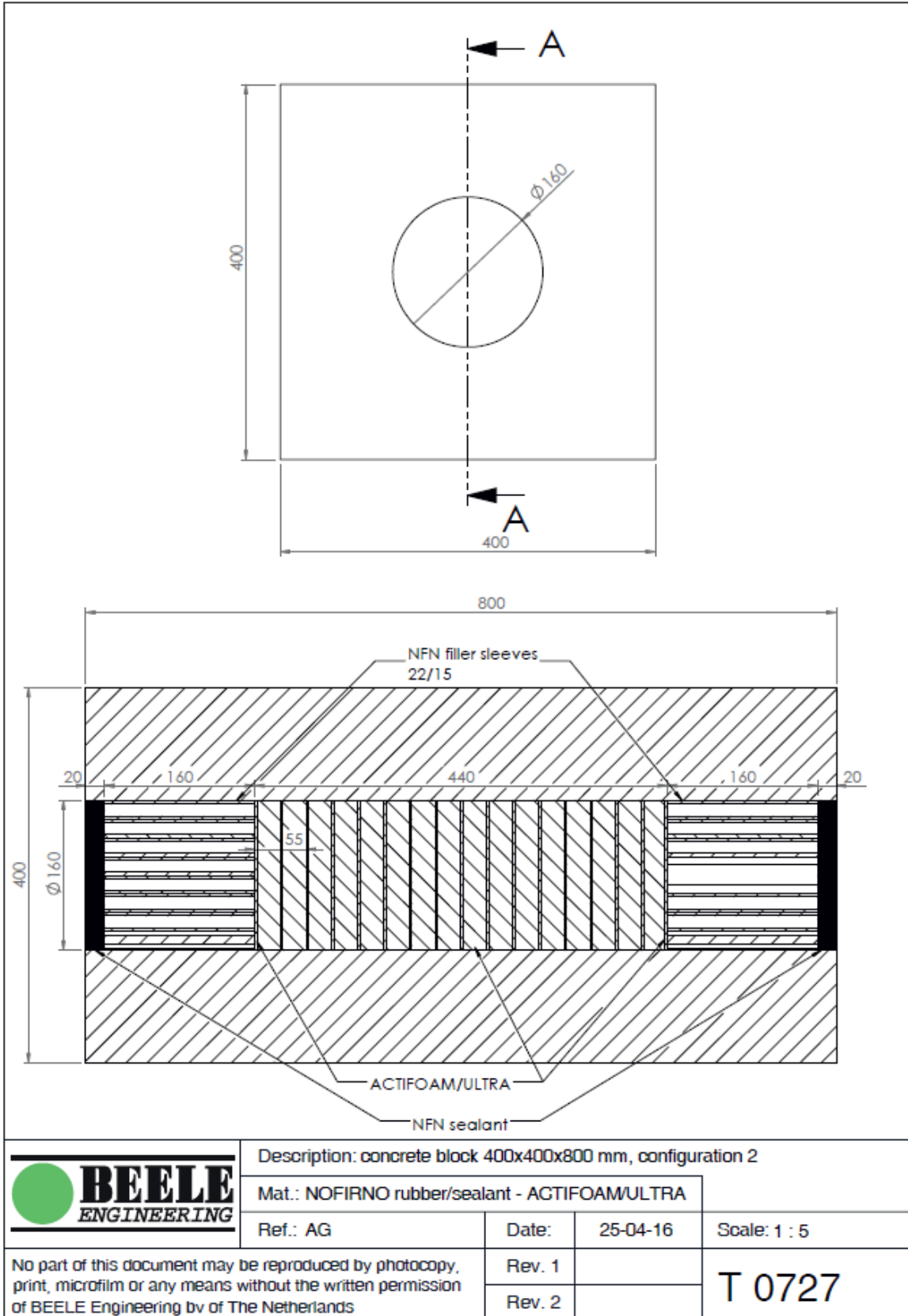
Example of the NOFIRNO – RADIATT configuration in a wall transit without services



Radiation shielding sealing systems for pipe and cable transits

Annex E. XATTAX sealing system NOFIRNO – ACTIFOAM/ULTRA configuration

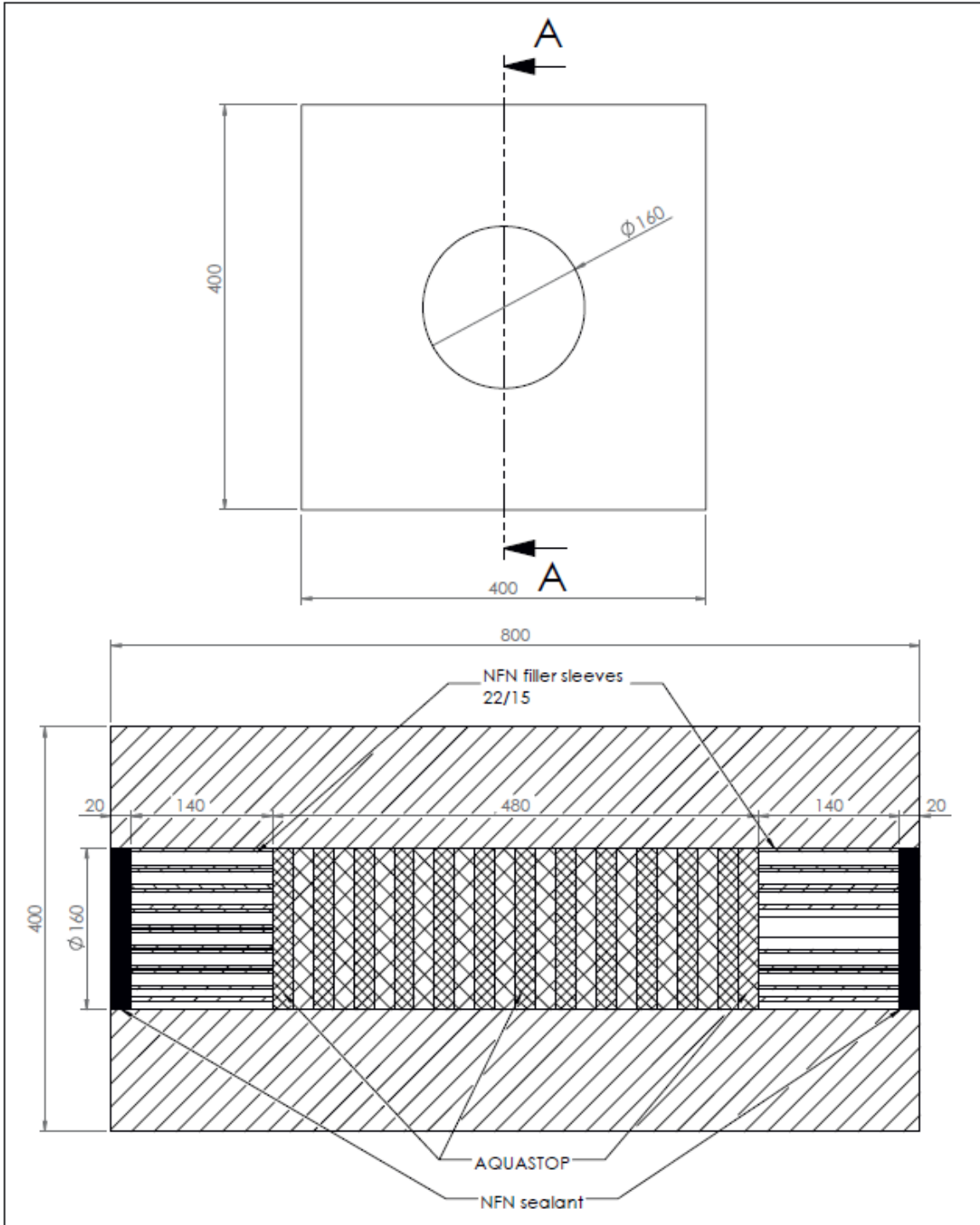
Example of the NOFIRNO – ACTIFOAM/ULTRA configuration in a wall transit without services




Radiation shielding sealing systems for pipe and cable transits

Annex F. XATTAX sealing system NOFIRNO – AQUASTOP configuration

Example of the NOFIRNO – AQUASTOP configuration in a wall transit without services



	Description: concrete block 400x400x800 mm, configuration 5			
	Mat.: NOFIRNO rubber/sealant - AQUASTOP rubber			
Ref.: AG	Date:	25-04-16	Scale: 1 : 5	
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