



Mounting instructions

DAFA Radon System™



Description

DAFA Radon System is a safe, effective system for sealing out radon. The various components of the DAFA Radon System, which combine polymer technology and radon sealing techniques, enable building designers to choose the perfect solution for sealing ground floors, flooring and foundations.

These instructions provide a good overview of how to apply and mount the DAFA Radon System.

It is important to follow the application and mounting instructions specified to get the most out of the DAFA Radon System.

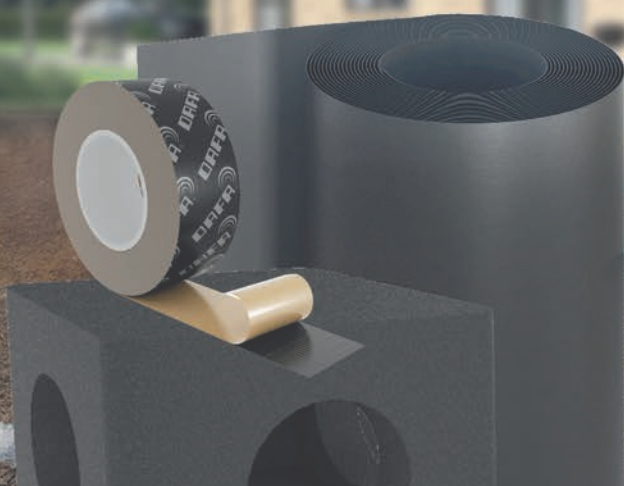
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DAFA Radon System™

Read more at www.dafa-build.com/en/radon



DAFA Radon Barrier

DAFA Radon Barrier

DAFA Radon Barrier is a polyethylene film of new unreinforced copolymer.

(See the product data sheet for more information.)

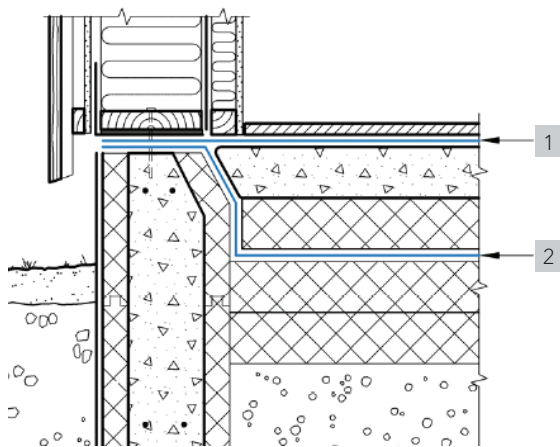


Specifications

| | |
|-----------------------|---------------|
| Length: | 25 m |
| Width(s): | 1.5 m and 4 m |
| Thickness: | 0.40 mm |
| S _d value: | > 80 m |
| Tensile strength | > 400 N |

The DAFA Radon Barrier can be used to protect against the ingress of radon without having to use any other technique or it can be combined with other techniques such as passive or active extraction of radon gas.

Radon barriers can be mounted in different parts of the building as shown in Figure 1. Thus, two categories of application are defined as follows:



Radon barrier: categories of application

Application category 1: Stable, level surface, such as a leveled concrete deck.

Application category 2: Incorporated into the insulation layer on a firm, flat surface

Fig. 1. DAFA Radon Barrier is suitable for categories 1 and 2 (see further details on page 6).

The DAFA Radon Barrier must be intact and airtight. Seal all joints carefully using the accessories for the DAFA Radon System.

See the specifications on the product data sheet:

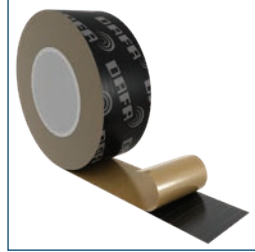
– DAFA Radon Barrier

Accessories for the DAFA Radon System™

1

DAFA UV Tape

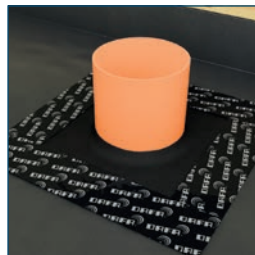
– can be used both outdoors and indoors in the building's climate envelope on materials such as radon barriers, wind barriers and roof boarding. The tape can withstand direct sunlight.



2

DAFA UV/Radon Pipe Collar 260/345

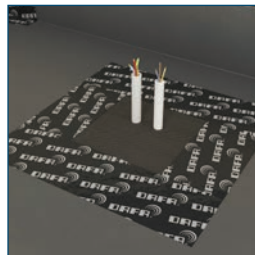
– used for sealing the radon barrier around round and rectangular pipes. Pre-stamped markings make them easy to attach.



3

DAFA UV/Radon Cable Collar 195

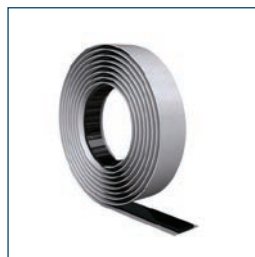
– used for sealing the radon barrier around cables and junction boxes. Pre-stamped markings make them easy to attach.



4

DAFA Butyl Tape

– used for sealing the radon barrier tightly to most building materials.



5

DAFA Radon Sealing Compound

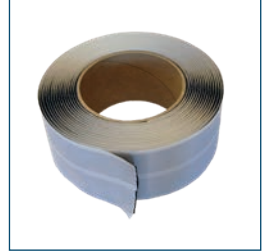
– used for sealing the radon barrier around spots with many pipe lead-ins.



6

DAFA Multi Sealing™

– used for sealing spots where the radon barrier is penetrated by structural elements. This highly flexible material can be used for lopsided and round edges.



7

DAFA Flexible Mold

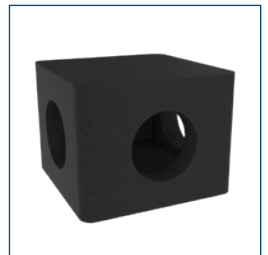
– used for constructing the formwork for sealing compound in places with many pipe lead-ins through a floor.



8

DAFA Radon Sump

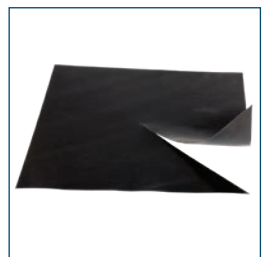
– acts as a collection point for radon gas. Can be used for both active and passive extraction.



9

DAFA Radon Corner

– specially designed for corners and ensures complete tightness. For mounting directly onto the radon barrier.



Areas of application

Application

The DAFA Radon System is ideal for mounting in most types of buildings, such as homes, offices, etc.

The radon barrier must be installed and incorporated in a manner that provides the best possible protection against radon.

Structural protection against radon

The concentration of radon in a building must not exceed the reference level, which in almost all European countries is 100 Bq/m³ for new buildings and 200 Bq/m³ for existing buildings.

Radon must be prevented from penetrating buildings by making foundations, ground decks, story-separation decks, basement floors and outer basement walls airtight. This can be done, for example, by shaping structures of carefully laid concrete to achieve a good uniform structure without cracks, and by sealing pipe and cable lead-ins where they penetrate these structural elements. It is particularly important to plan the sequence of application to prevent the radon barrier, tape, strips, collars, etc., being exposed to unnecessary strain.



Mounting of the DAFA Radon System™

Placement of the radon barrier

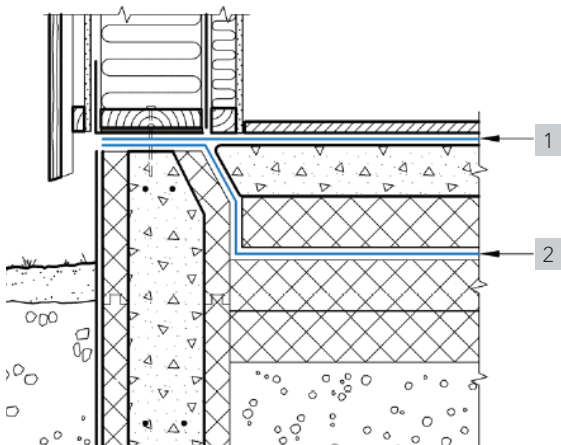
The DAFA Radon System is suitable for the following categories of application.

Application category 1

The barrier must be laid on a stable, level surface, such as concrete. It can be advantageous to lay the barrier once the carcass is completed, as it provides better control of the substrate and the climate. Radon barriers in this category will normally be covered. If this is not the case, reconsider the plan.

Application category 2

The barrier must be laid out on a level surface, such as in the upper layer of floor insulation. At least two thirds of the insulation layer should be placed below the barrier. If the barrier is to be placed between insulation and a layer of concrete, a layer of slide film should be laid out on top of the barrier before casting. The barrier must be laid out across the top of the foundation to ensure airtight cohesion between the in-situ cast foundation and the floor.



Mounting

It is advisable to mount the DAFA Radon System at temperatures above 5°C.

Before mounting the radon barrier, the structures must be fixated so that barrier, tape, strips, joints, etc., are not subjected to unnecessary strain. The surfaces where the tape, strips or barrier adhesive is to be affixed must be dry and dustless.

Do not use damp or wet materials or materials with mildew in building the structure (Danish Building Research Institute (SBI) 224).

Fixation

Always make sure that the radon barrier is tightly adhered so that it cannot be damaged when exposed to strain from the construction site, including leak testing, etc. Attach to joints or connections with an overlap of at least 150 mm. It is important that the overlap does not pucker or wrinkle.

Seal the laid joints of the radon barrier with DAFA UV Tape. Center the tape over the joint and press down to achieve maximum adhesion. Before applying, the surfaces must be clean, dry and free of dirt and dust.

After mounting, the radon barrier must be level and smooth. It is important to ensure that the radon barrier is not stretched so tightly in corners and structural joints that it unnecessarily strains the joints.



Sealing of joints

Heavy structural elements, including brick and concrete walls, concrete decks, etc., are considered impermeable to radon if their density exceeds 1,600 kg per m³ and they are more than 100 mm thick. This is contingent, however, on the structure having no cracks and being otherwise impermeable.

DAFA Butyl Tape

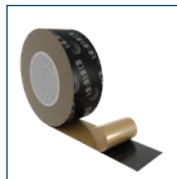
- used for sealing the radon barrier tightly to most building materials.



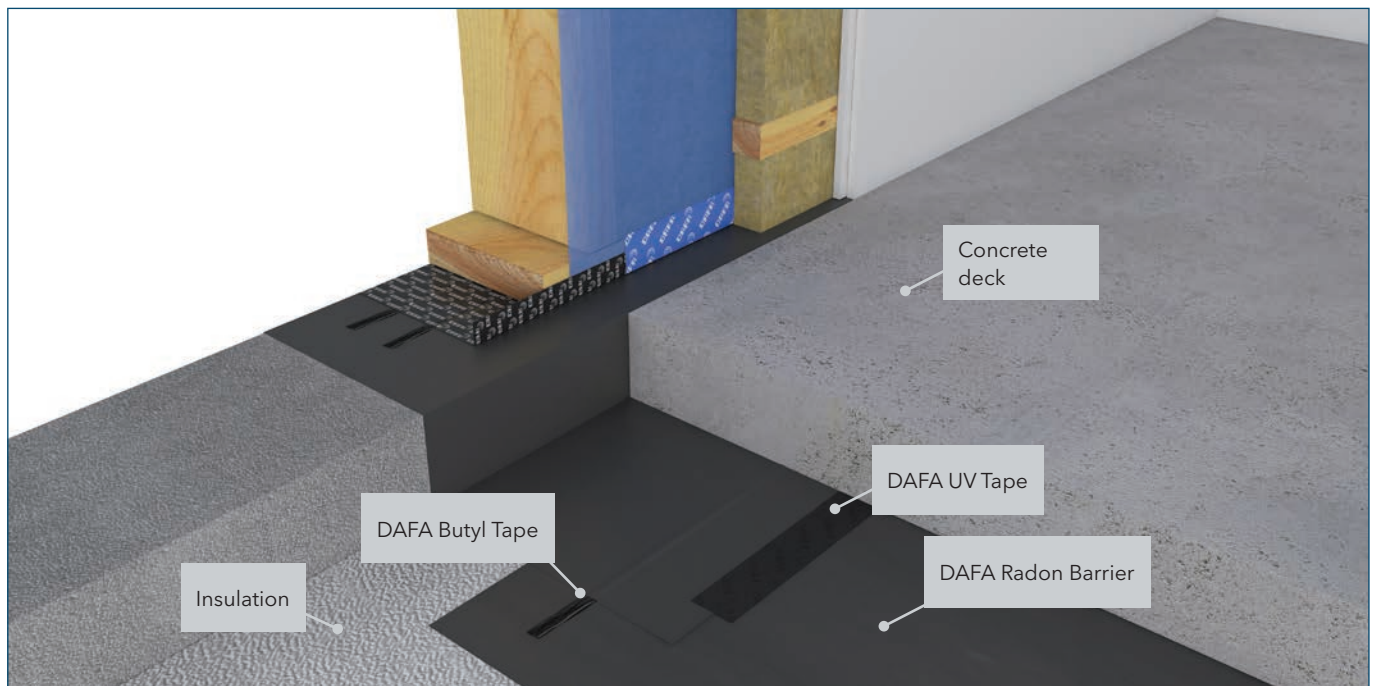
First apply DAFA Butyl Tape with an overlap of 150 mm to ensure that the radon barrier is laid as perfectly as possible to cover the entire surface.

DAFA UV Tape

- can be used both outdoors and indoors. The tape can withstand direct sunlight and periodic heavy rain and moisture.



Then, tape the radon barrier overlaps using DAFA UV Tape. This prevents any movement that can occur when joining two butyl sealant strips. The tape and radon barrier must constitute a solid joint without bubbles or holes.



See the specifications on the product data sheet:

- DAFA Butyl Tape
- DAFA UV Tape

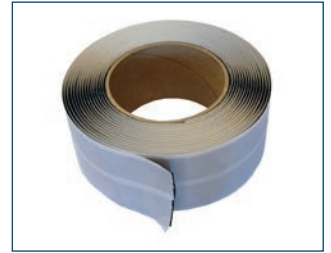
DAFA Multi Sealing™

DAFA Multi Sealing is used to seal places where the radon barrier is penetrated by wood or steel columns, for instance. DAFA Multi Sealing is an extruded butyl sealant strip, coated with stretch film. It is highly flexible, which makes it ideal for special sealing tasks.

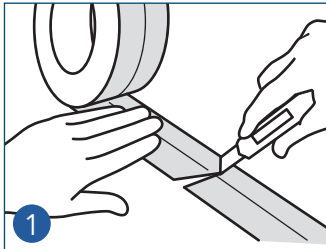
Before mounting the radon barrier, make a solid substrate to which the radon barrier and DAFA Multi Sealing can be attached with sealed joints.

Cut out the radon barrier in the corner where the object penetrates the barrier. It is important that the barrier does not pucker or wrinkle.

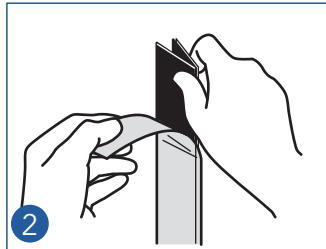
Cut out a suitable piece of DAFA Multi Sealing and remove the backing paper. The radon barrier must be clean, dry and free of dirt and dust. Press DAFA Multi Sealing firmly against the object and the barrier to achieve maximum sealing.



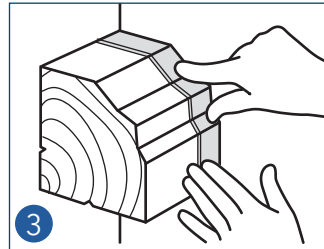
DAFA Multi Sealing



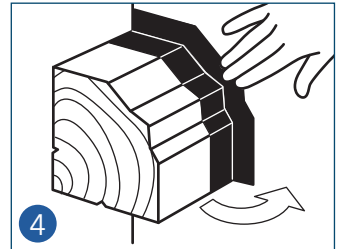
1 Cut out a suitable piece of DAFA Multi Sealing.



2 Remove half of the backing paper.



3 Apply DAFA Multi Sealing to the object. Remove the rest of the backing paper.



4 Unfold DAFA Multi Sealing and attach it to the barrier. Press DAFA Multi Sealing firmly against the object and the barrier to achieve maximum sealing.

See the specifications on the product data sheet:

- DAFA Multi Sealing

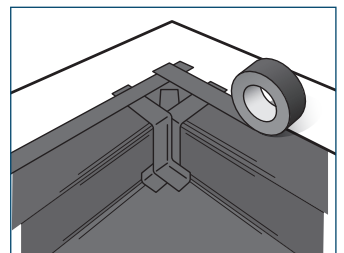
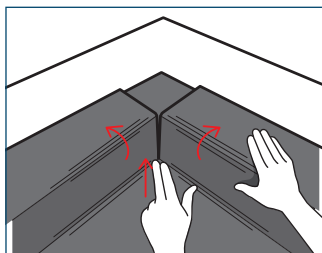
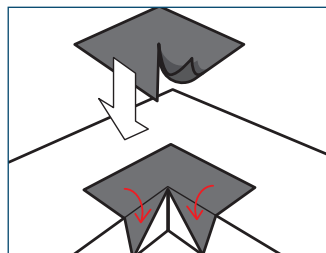
DAFA Radon Corner

The DAFA Radon Corner is designed to ensure fast and efficient sealing against radon, air and moisture in corners that are usually difficult to seal. Use a piece of DAFA Butyl Tape to attach the DAFA Radon Corner directly to the corner of a concrete foundation. Fold the DAFA Radon Barrier to fit the foundation's dimensions. Tape the joints

carefully by pressing DAFA UV Tape down on the middle of the joints. It is important that the overlap does not wrinkle. Before installation, make sure the surfaces are clean, dry and free of dirt and dust.



DAFA Radon Corner



See the specifications on the product data sheet:

- DAFA Radon Corner.

DAFA Universal UV Pipe Collar

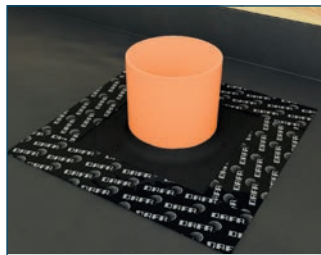
Use DAFA universal pipe collars in all structures as airtight sealants around lead-ins of round and rectangular pipes. The collar is made of black, soft and flexible EPDM fabric, coated with a strong acrylic adhesive.

Cut out the radon barrier so that the pipe fits through it tightly to ensure that it is sealed. It is important to keep the barrier from wrinkling.

The universal collar comes with pre-stamped markings. Do not make cut-outs for any objects that are not pre-stamped.



DAFA Universal UV Pipe Collar



DAFA Universal UV Pipe Collar attached around a round object

Start by removing the pre-stamped cut-out that fits the lead-in. Loosen the backing paper on both sides, but without removing it completely before attaching the collar. Move the collar in over the pipe to make the radon barrier as tight as possible before removing the backing paper. Remove the paper while pressing the collar tightly against the barrier with a smooth movement. For rectangular pipes, the universal collar must be sealed with DAFA UV Tape.

Markings, type 260

| | |
|---|--|
| 1 | Ø12 mm fits round pipes from Ø15 mm to Ø25 mm |
| 2 | Ø25 mm fits round pipes from Ø40 mm to Ø60 mm |
| 3 | Ø45 mm fits round pipes from Ø60 mm to Ø90 mm |
| 4 | Ø70 mm fits round pipes from Ø90 mm to Ø110 mm |

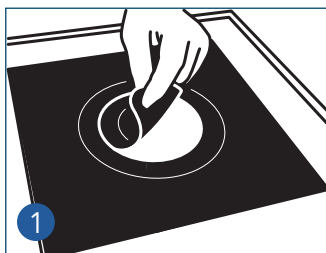
Markings, type 345

| | |
|---|---|
| 1 | Ø60 mm fits round pipes from Ø80 mm to Ø125 mm |
| 2 | Ø100 mm fits round pipes from Ø125 mm to Ø160 mm and rectangular pipes with dimensions of 100 mm x 150 mm and 150 mm x 150 mm. NOTE: Rectangular pipes must be sealed using DAFA UV Tape between the pipe and collar. |
| 3 | Ø135 mm fits round pipes from Ø160 mm to Ø200 mm |

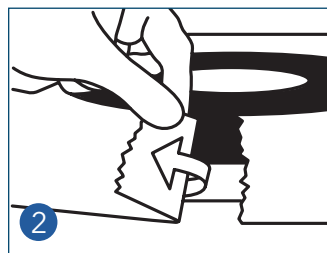
Markings, type 520

| | |
|---|-------------------------------|
| 1 | Ø150 mm fits 200mm to 250 mm |
| 2 | Ø190 mm fits 250mm to 315 mm |
| 3 | Ø255 mm fits 315 mm to 400 mm |

Installation of cable collars



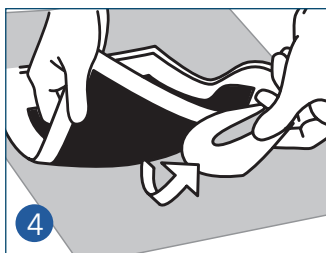
Remove the pre-stamped cut-out that fits the object penetrating the barrier.



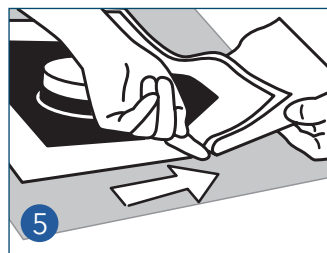
Loosen the backing paper on both sides, but without removing it completely before attaching the collar.



Move the collar in over the pipe to make the radon barrier as tight as possible before removing the backing paper.



Remove the paper.



Press the collar against the barrier with a smooth movement.

Dimensions

Type 260: 260 x 260 mm

Type 345: 345 x 345 mm

Type 520: 520 x 520 mm

See the specifications on the product data sheet:

– DAFA Universal Pipe Collar

DAFA Universal UV Cable Collar

DAFA universal cable collars are used in all structures to provide an airtight seal around cable lead-ins. The collar is made of black, soft and flexible EPDM fabric, coated with a strong acrylic adhesive.

Cut out the radon barrier so that the cable fits through it tightly for maximum sealing. It is important to keep the barrier from wrinkling.

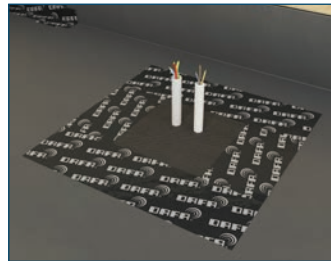
The cable collar comes with pre-stamped markings. Do not make cut-outs for any objects that are not pre-stamped.

Start by removing the stamped area that fits the cable or junction box. Loosen the backing paper on both sides, but without removing it completely before attaching the collar.

Guide the collar over the cable as close to the radon barrier as possible, before removing the backing paper. Remove the paper while pressing the collar tightly against the barrier with a smooth movement. It is important to affix the cable so the collar is not unnecessarily strained afterwards.



DAFA Universal UV Cable Collar

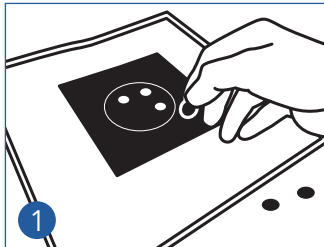


DAFA Universal UV Cable Collar for cable lead-ins

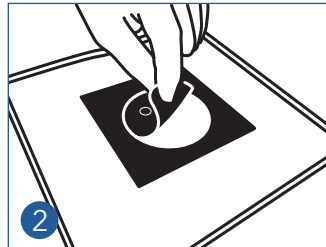
Markings, type 195

| | |
|---|--|
| 1 | 1 x Ø55 mm fits a junction box with Ø80 mm Note: Optimize the sealing effect by interconnecting junction boxes with rubber plugs |
| 2 | 4 x Ø3 mm fit cables from Ø7 mm to Ø10 mm |
| 3 | 2 x Ø7 mm fit cables from Ø10 mm to Ø22 mm |

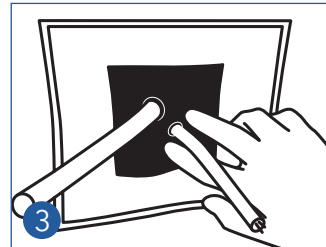
Attaching pipe collars



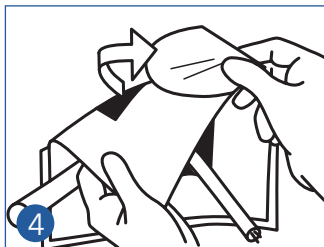
Remove the small pre-stamped cut-outs which fit the cable lead-ins.



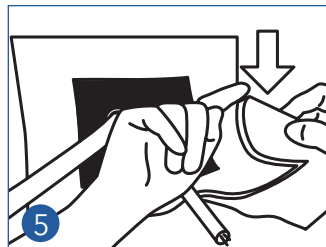
Remove the large pre-stamped cut-out if a junction box is to be sealed.



Guide the cable collar over the cables or the junction box.



Loosen the backing paper on both sides, but without removing it and then press the cable collar against the radon barrier.



Remove the backing paper while pressing the collar against the barrier with a smooth movement.

Dimensions

Type 195: 195 x 195 mm

See the specifications on the product data sheet:

- DAFA Universal UV Cable Collar

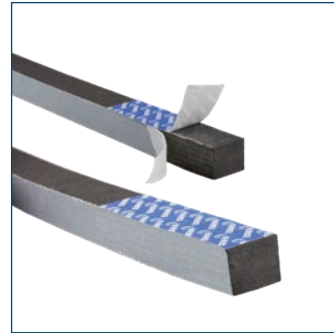
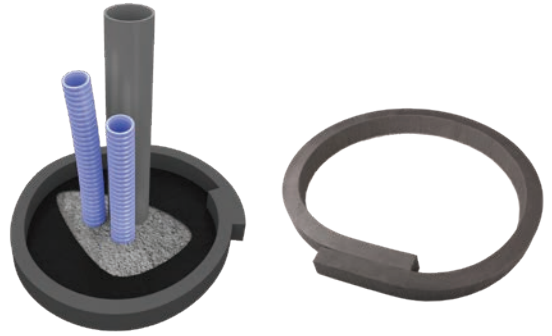
DAFA Radon Flexible Mold

The DAFA Radon Flexible Mold is a flexible PE foam strip that can be adapted to any lead-in comprising multiple pipes and cables. The underside has a strong self-adhesive tape which is protected by the backing paper. Remove the paper and attach the DAFA Radon Flexible Mold to the surface of the DAFA Radon Barrier.

The DAFA Radon Flexible Mold is used to make a mold for the DAFA Radon Sealing Compound. Attach the mold by mounting the self-adhesive underside directly to the DAFA Radon Barrier around the pipe lead-in, making sure that the sealing compound does not flow away.

Make sure the underlying structure is sealed so the fluid sealant does not flow down into the structure during attachment.

Use about 300 ml of sealing compound per mold. It is possible to add one more mold as required (in this case, 2 x 300 ml of DAFA Radon Sealing Compound are needed).



DAFA Radon Sealing Compound

Product description

DAFA Radon Sealing Compound is a premixed, self-leveling sealant for the radon barrier/system. The hardening rate is 2-3 mm in the first 24 hours (at 20°C), after which the rate decreases. If the sealing compound is used at lower temperatures, a longer hardening time should be expected.

Instructions for use

DAFA Radon Sealing Compound for cable and drainage installations in floors and foundations. The sealing compound is not suitable for permanent water impact.

Use

Application temperature: from -10°C to +40°C. To be used on a suitable clean substrate which is free of oil and grease. Remove any loose material from the radon barrier. Clean the surfaces of grease and oil. Make sure that the surface is level before applying the sealing compound. We recommend a thickness of at least 5-10 mm.



See the specifications on the product data sheet:

- DAFA Radon Sealing Compound
- DAFA Radon Flexible Mold

DAFA Radon Sump

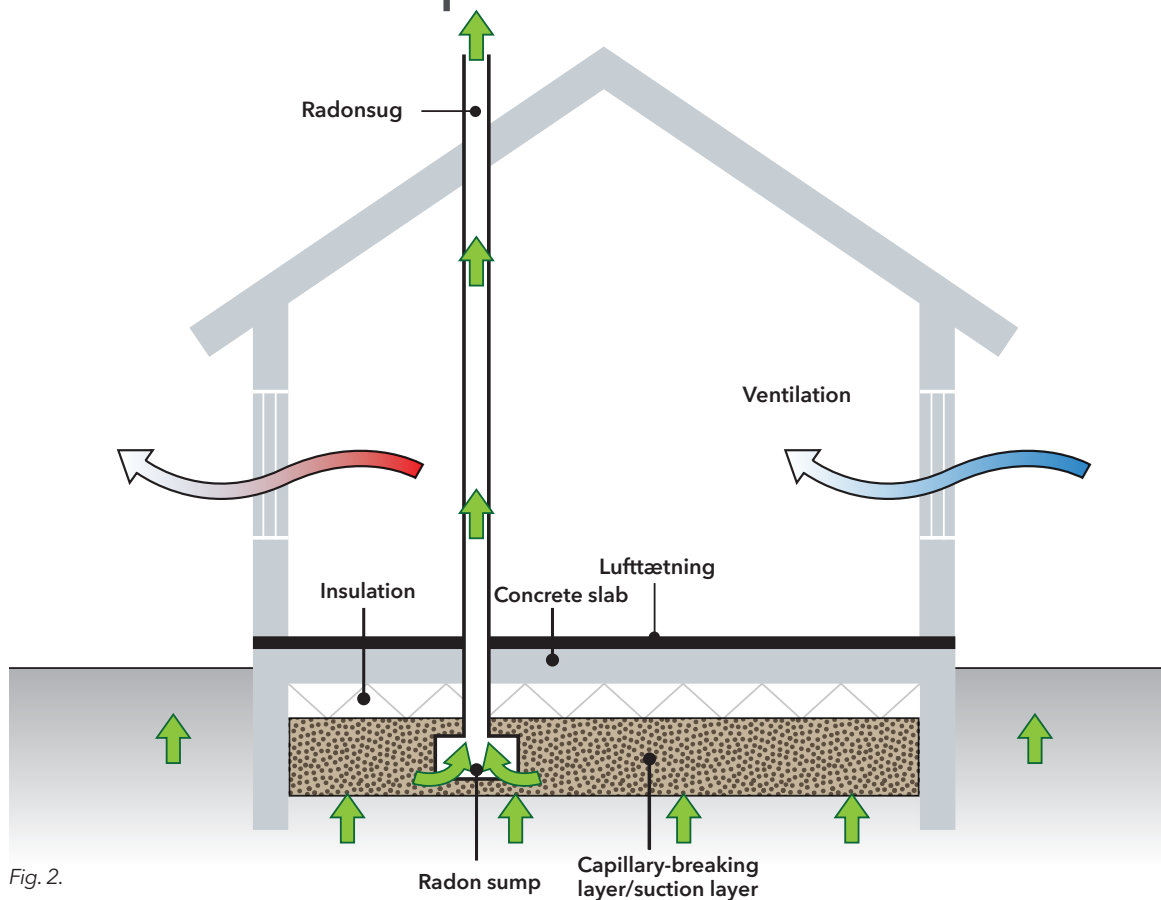
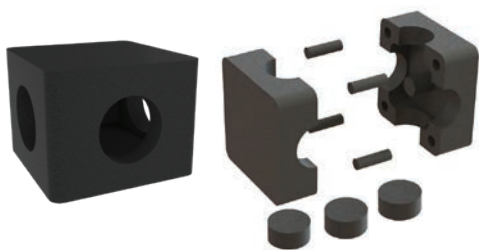


Fig. 2.

Penetration of ground air containing radon gas can be prevented by making structures airtight against the ground and establishing radon-extraction structures against the ground. Ventilation under the building works by guiding the air to and extracting it from a zone under the building. The air is sucked out through a ventilation duct connected to open air, either by passive or active suction.

The air intake and radon sump must be positioned so that the entire suction layer under the building is ventilated. Ventilation is ensured by laying in one or more air intakes underneath the building. If it is necessary to lay in additional air intakes, these can be gathered in a collection duct connected to a common air intake, which is laid into or outside the building.

The radon sump must be made so that it will not collapse,



The DAFA Radon Sump has four Ø110 mm holes, which make it possible to connect multiple suction pipes dispersed across the suction layer under the ground deck. It is important to make any lead-ins in the ground deck airtight. Therefore, the number of radon sumps, their placement and the required suction force will depend on the individual building and the suction layer under the floor structure.

Procedure:

1. Dig and excavate a recess for the sump. Make sure that fill used beneath the deck does not contain excessive amounts of fine particles in order to maximize suction. Sand is unsuitable!
2. Attach the sump, making sure the top of the sump is flush with the top of the capillary-breaking layer.
3. Place the radon sump at the spot where horizontal standard 110 mm pipes change direction by 90°, or where two or more pipes intersect.
4. The pipes can possibly be attached to the DAFA Radon Sump with DAFA UV Tape or DAFA Multi Sealing for temporary attachment.
5. Fill up with friction material. Unused holes in the radon sump must be sealed with a suitable plug or otherwise secured against clogging.

See the specifications on the product data sheet:

- DAFA Radon Sump

Theory

It is usually possible to obtain a medium reduction of radon particles in the indoor air using passive suction, and medium to large reduction using active suction. The effect depends on the air's ability to move through the suction layer (a capillary-breaking layer of coated, loose light slag, pebble gravel or shingles). The easier the air can penetrate the material in the suction layer, the greater the effect.

Radon suction using multiple radon sumps

Depending on the nature of the suction layer and the building's foundation structure, it may be necessary to establish additional radon sumps or a number of unconnected radon sumps to ensure sufficient suction in the suction layer under the entire building. If there is a need for extraction from several sections underneath a building, collection ducts can be centrally located under the building, such as beneath a hallway area. The sumps are connected to branches along the collection ducts, and the collection ducts are connected to a common ventilation duct.

The collection ducts, ventilation ducts and discharge ducts must be dimensioned to minimize the loss of air pressure. The ducts must also have as few bends as possible to minimize the loss of air pressure and minimize noise in the active system.

If a ground deck must be constructed, and complete radon protection installation is required, a radon sump should be installed. This will make it relatively easy to establish suction underneath the floor if desired later on. In a standard house, a single sump will probably be sufficient. The sump can be placed in a central location, if it is a modest-sized house and it is built to ensure that its pipe inflow is not blocked when the fill is added. To achieve maximum suction, the fill below the ground deck should not contain large quantities of fine materials.

The piping method and number of radon sumps must be assessed on a case-by-case basis by the designing/executing party.

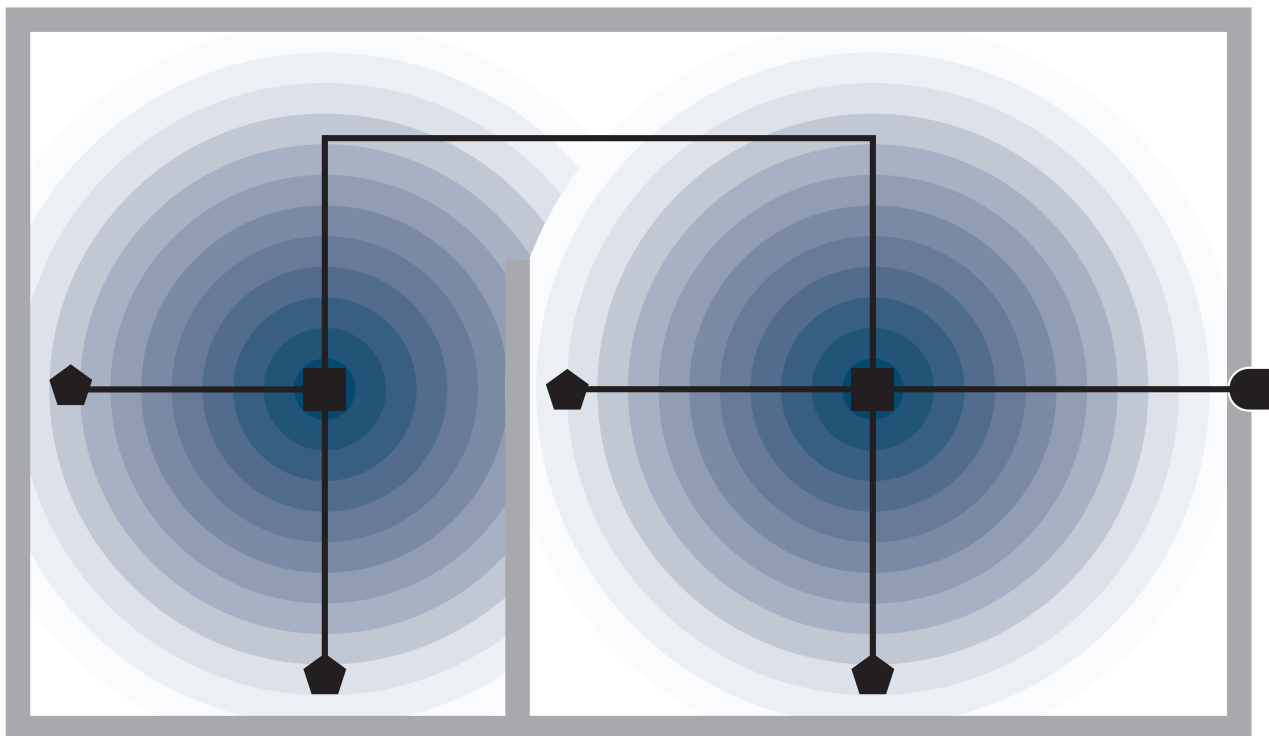


Fig. 3. The dispersion of the suction from two radon sumps placed in the suction layer underneath a building with an internal foundation. The suction layer is made of homogeneous, air-permeable material, such as loose light slag, pebble gravel, shingles or coarse gravel. Coarse gravel usually packs more densely than loose clay aggregates, pebble gravel or shingles. The more densely packed the material, the poorer the dispersion of suction from the radon sump.

Repairing the DAFA Radon System

Repairing radon barriers

Use DAFA UV Tape to repair small holes of less than 2 cm² and cracks that are no more than 10 cm long. If there are large holes or cracks, attach a piece of radon barrier of the same type as the damaged barrier. Trim the barrier so there is an overlap of at least 150 mm, and make sure that there is a firm substrate under the joint. Fasten the joint with DAFA UV Tape.

Repairing other components

Discard and dispose of any damaged loose parts, such as collars, corners, etc. Do not repair or recycle these.

References

If you need information about matters not described in this guide, please refer to the following sources:

- The Danish Building Code: www.ebst.dk/bygningsreglementet.dk
- DS/EN 13829:2001 Thermal performance of buildings – Determination of air permeability of buildings
- Danish Building Research Institute (SBI), guideline 189: Small houses
- SBI guideline 233: Protection against radon in new buildings
- SBI guideline 214: Air-tightness of the building envelope
- Constructional technology experience-sharing paper (99) 10 11 18 – 'Utætheder i klimaskærmen – måling, lokalisering og vurdering' (Leaks in the building envelope: measurement, localization and assessment)
- Constructional technology experience-sharing paper (99) 06 04 01 – 'Klimaskærmens tæthed – krav, måling, lufttætning' (Tightness of the building envelope: requirements, measurement, airtightness)
- Constructional technology experience-sharing paper (39) 08 06 30 – 'Dampspærrer i klimaskærmen – fugttransport og materialer' (Vapor barriers in the building envelope: moisture transport and materials)
- Constructional technology experience-sharing paper (39) 07 10 29 – 'Dampspærrer – udførelse og detaljer mod opvarmede rum' (Vapor barriers: execution and details against heated rooms)
- Constructional technology experience-sharing paper (39) 11 11 22 – 'Dampspærresamlinger og tætningsmidler' (Vapor barrier joints and sealing agents)
- Constructional technology experience-sharing paper (29) 03 11 26 – 'Fugtforhold og dampspærre i fryse- og kølehuse, skøjtehaller og andre afkølede rum' (Moisture conditions and vapor barriers in refrigeration buildings, skating halls and other cooled spaces)
- Constructional technology experience-sharing paper (21) 16 02 09 – 'Fugtspærrer – udførelsesdetaljer ved nybyggeri' (Vapor barriers: execution details for new construction)
- www.byggeriogenergi.dk
- DAFA product data sheets: www.dafa.dk



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