



# NSAI

Agrément

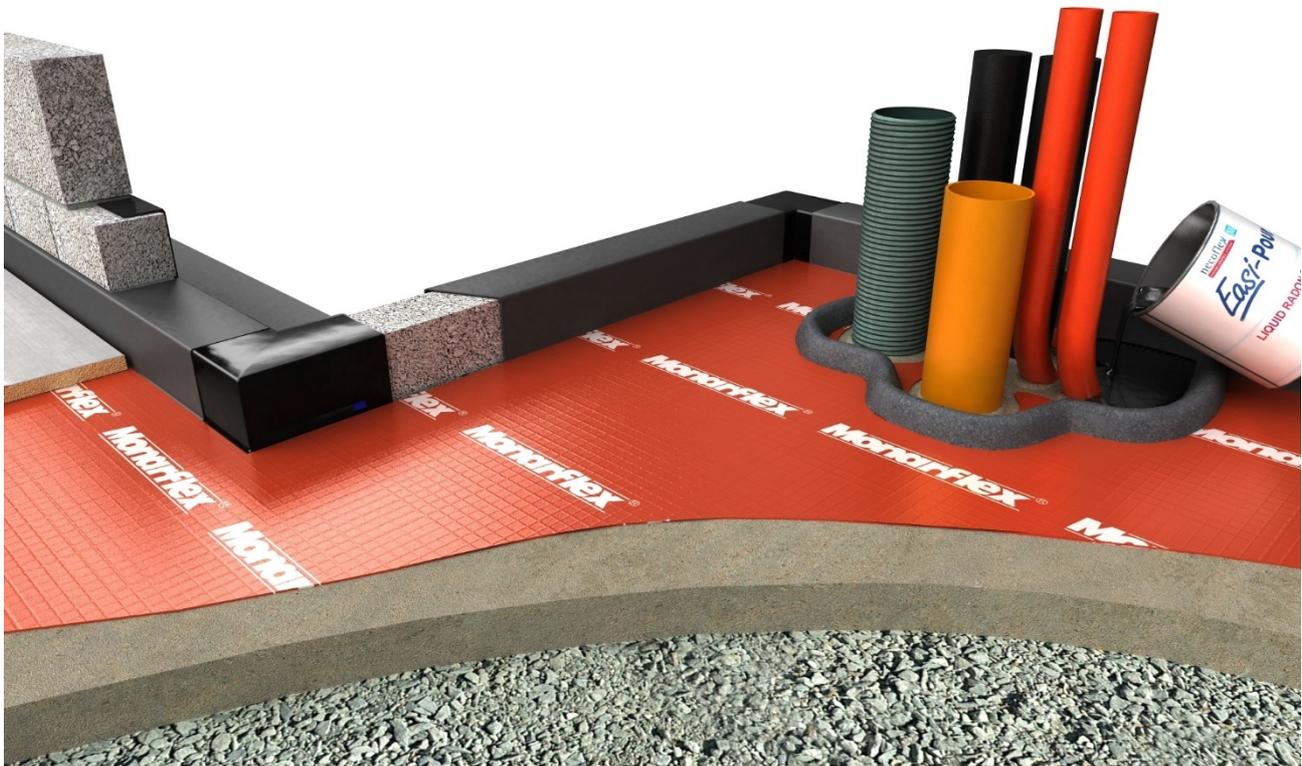
## IRISH AGRÉMENT BOARD CERTIFICATE No. 09/0328

Necoflex Ltd., Unit 36 Airway Industrial Estate,  
Viscount Avenue, Cloghran, Dublin D17 CD96.  
T: +353 (0)1 802 3333  
F: +353 (0)1 803 6060  
E: [necoflexsupport@bmiigroup.com](mailto:necoflexsupport@bmiigroup.com)  
W: [www.necoflex.ie](http://www.necoflex.ie)

# Necoflex RAM Radon, Air & Moisture Protection System

**NSAI Agrément (Irish Agrément Board)** is designated by Government to issue European Technical Approvals.

NSAI Agrément Certificates establish proof that the certified products are '**proper materials**' suitable for their intended use under Irish site conditions, and in accordance with the **Building Regulations 1997 to 2021**.



### PRODUCT DESCRIPTION:

This Certificate relates to the Necoflex RAM – Radon, Air and Moisture Protection System for ground floors in buildings. It is used to seal floors, walls and service penetrations, thereby ensuring the necessary degree of separation between the interior spaces of a building and the underlying soil.

Detail Sheet 1 relates to the *Easi-Sump*<sup>®</sup> and *Easi-Sump*<sup>®</sup> *Cap-Link*<sup>®</sup>.

In the opinion of NSAI, the Necoflex RAM System, as described in this Certificate, complies with the requirements of the Building Regulations 1997 to 2021.

### USE:

Radon (incl. Rn-222, Rn-220, RnD) is a naturally occurring radioactive gas which enters buildings from the underlying soil. The gas can accumulate within a building to such a concentration as to constitute a health hazard.

Radon is excluded from buildings using passive and active systems. The provision of a suitable protection system, designed and installed by competent personnel will substantially reduce the risk of a building having radon activity above a recommended target health level of 10-40 Bq/m<sup>3</sup> (USA).

Air tightness of ground floors in buildings is necessary in order to prevent air entering from the

soil below. Uncontrolled air movement will negatively affect the heating and ventilation performance of a building. This is particularly important in circumstances where a sub-floor Radon Soil Gas Control System (radon sump) is activated. Depressurisation of the sub-floor could potentially affect certain types of heating appliance causing dangerous combustion leakage. It may also increase heat losses from the building. The provision of a suitable passive ground floor sealing system will reduce the risk of a building being negatively affected by uncontrolled air movement.

Moisture and water ingress from the exterior of a building can lead to the deterioration of the fabric of the building and encourages the growth of mould which is harmful to human health. Ground water can penetrate from below, rising vertically by capillary action. The provision of a suitable sealing system in the foundation walls, ground floors and around service and structural penetrations will reduce the risk of moisture and water ingress.

A passive radon, air and moisture protection system effectively deals with the three critical areas of ground floor sealing: Walls; Floors; Penetrations (Service and Structural):

1. Perimeter and internal walls, including designed cavities require suitable radon resisting damp proof courses (DPCs), cavity trays and pre-formed corner sections.
2. Floor areas require a loose-laid radon membrane properly sealed and joined to the perimeter and internal wall sections.
3. Service and structural penetrations require pre-formed collars where appropriate, adhesive flashing and a self-levelling liquid radon sealant to deal with irregular shapes and/or multiple service pipes.

Passive control systems should also incorporate an underfloor sump or sumps (see Detail Sheet 1), which can be subsequently converted into an active control system by the use of suitable ventilation fans.

**Note: DPMs must be CE marked to IS EN 13967<sup>[1]</sup>.**

**MANUFACTURE AND MARKETING:**

The products are supplied and marketed by:

Necoflex Ltd.,  
Unit 36 Airways Industrial Estate,  
Viscount Avenue,  
Cloghran,  
Dublin,  
D17 CD96.  
T: +353 (0)1 802 3333  
F: +353 (0)1 803 6060  
E: [necoflexsupport@bmigroup.com](mailto:necoflexsupport@bmigroup.com)  
W: [www.necoflex.ie](http://www.necoflex.ie)

The products are manufactured by the BMI Group at the following locations:

BMI Netherlands, PO Box 2301, Hoendiep 316, 9704 CH Groningen, Holland.	Monarflex s. r. o., Továrenská, 943 03 Štúrovo, Slovakia.
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***Part D – Materials and Workmanship*****D1 – Materials and Workmanship****D3 – Proper Materials**

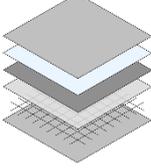
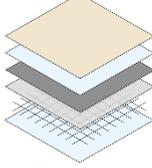
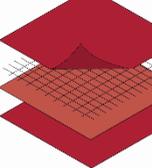
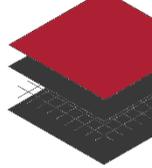
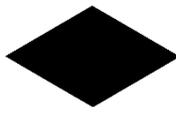
The Necoflex RAM System is comprised of 'proper materials' i.e materials which are fit for their intended use and for the conditions in which they are to be used.

Buildings incorporating the Necoflex RAM System can be designed to meet the following clauses of the Building Regulations 1997 to 2021:

***Part A – Structure*****A1 – Loading*****Part B – Fire Safety******Part B Vol 2 – Fire Safety*****B3 & B8 – Internal Fire Spread (Structure)*****Part C – Site Preparation and Resistance to Moisture*****C3 – Dangerous Substances**

Passive control systems should also incorporate an underfloor sump or sumps (see Detail Sheet 1), which can be subsequently converted into an active control system by the use of suitable ventilation fans.

**C4 – Resistance to Weather and Ground Moisture*****Part F – Ventilation*****F1 – Means of Ventilation*****Part L – Conservation of Fuel and Energy*****L1 – Conservation of Fuel and Energy**

Test (units)	Monarflex® Radon, Air & Moisture Protection Membranes				
	 <b>RAC</b>	 <b>Reflex Super</b>	 <b>RMB400</b>	 <b>RMB350</b>	 <b>Necoseal</b>
Tensile Strength (N/50mm)	MD 870, CD 830	MD 710, CD 640	MD 600, CD 740	MD 480, CD 450	MD 345, CD 345
Elongation (%)	MD 29, CD 15	MD 26, CD 14	MD 19, CD 14	MD 19, CD 13	MD 690, CD 780
Tear Resistance (N)	MD 744, CD 712	MD 495, CD 480	MD 475, CD 425	MD 405, CD 425	MD 190, CD 190
Moisture Vapour Transmission Rate (g/m <sup>2</sup> /day)	< 0.03	< 0.03	< 0.2	< 0.3	< 0.21
Water Vapour Resistance (MNs/g)	> 4100	> 4100	> 1025	> 680	> 990
Radon Transmittance (10 <sup>-9</sup> m/s)	1	1	17	16	15
Radon Permeability (10 <sup>-12</sup> m <sup>2</sup> /s)	0.4	0.4	7	5.6	4.5
Standard Roll Specification					
Roll Size (m)	2 x 25	2 x 25, 2 x 50	2 x 25, 4 x 25	2 x 25, 4 x 25	4 x 20
Colour	Grey	Sand/Aluminium-Clear (upper/lower)	Red	Red/Black (upper/lower)	Black
Nominal Weight per Unit Area (g/m <sup>2</sup> )	813	461	407	355	270
Nominal Thickness (microns)	810	430	410	355	300
Materials	Virgin Polyethylene blend and Aluminium	Virgin Polyethylene blend and Aluminium	Virgin Polyethylene blend	Virgin Polyethylene blend	Virgin Polyethylene blend
Reinforcement (mm)	12 x 12 Multi-filament Polyester 1670 dtex	12 x 12 Multi-filament Polyester 1670 dtex	9 x 12 Multi-filament Polyester 1670 dtex	12 x 12 Multi-filament Polyester 1100 dtex	None

**Table 1: Technical Data**

## 2.1 PRODUCT DESCRIPTION

This Certificate relates to the Necoflex RAM - Radon, Air and Moisture Protection System. Using the following components it combines polymer DPC technology and radon sealing techniques to enable building designers select the most appropriate solution for each of the three critical areas of ground floor sealing: Walls, Floors and Penetrations (Service and Structural).

### 2.1.1 Walls

**Easi-Load Radon DPC**, which meets the requirements of IS EN 14909<sup>[2]</sup> has been developed using multi-layer polymer technology to give robust protection where a radon, air and moisture seal must pass through masonry walls. It is particularly suitable for cavity wall construction and can be used at all floor/wall junctions. As well as offering high radon, air and

moisture vapour resistance, Easi-Load Radon DPC also has a high tear strength, will not extrude under load and provides excellent mortar adhesion. It is available in 900mm width, and rolls are 20m in length. Ends should be overlapped by 100mm and sealed using a single strip of Monobond RT 30mm tape.

**Easi-Load Radon Corner Assembly** (Irish Patent No S85782) has been developed to provide a fast and effective radon, air and moisture seal in traditionally difficult to seal corners.

The assembly comprises 3 pieces, each carefully pre-formed from Low Density Polyethylene (LDPE), without seams or joints, in factory-controlled conditions. Its unique design makes it suitable for sealing various upstand heights.

### 2.1.2 Floors

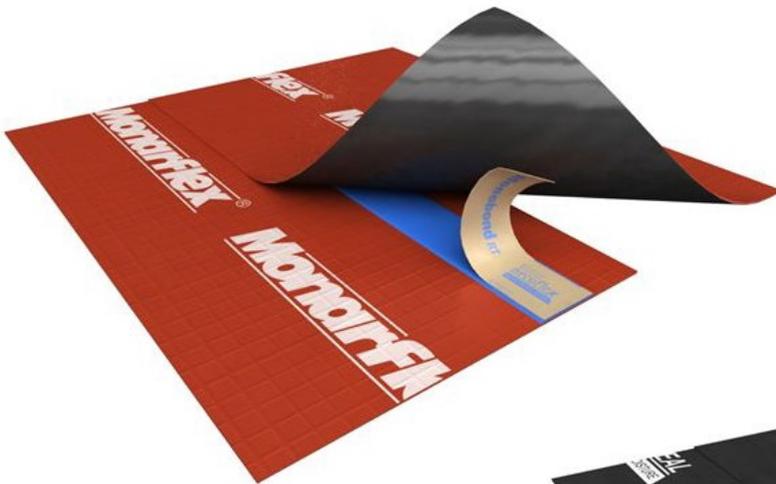
**RAC, Reflex Super, RMB400 RMB350 and Necoseal** are loose-laid radon resisting membranes made from blends of virgin low density polyethylene (LDPE). When used in a new building as part of the Necoflex RAM system, they provide an effective barrier to the passage of radon, air and moisture from the underlying soil. RAC can be used to exclude volatile organic compounds (VOCs) from underground storage tanks, Hydrocarbons, or the range of gases from landfill sites such as methane and CO<sub>2</sub>.

Reflex Super is intended for use to exclude methane and CO<sub>2</sub>. Both RAC and Reflex Super are high performance radon resisting membranes.

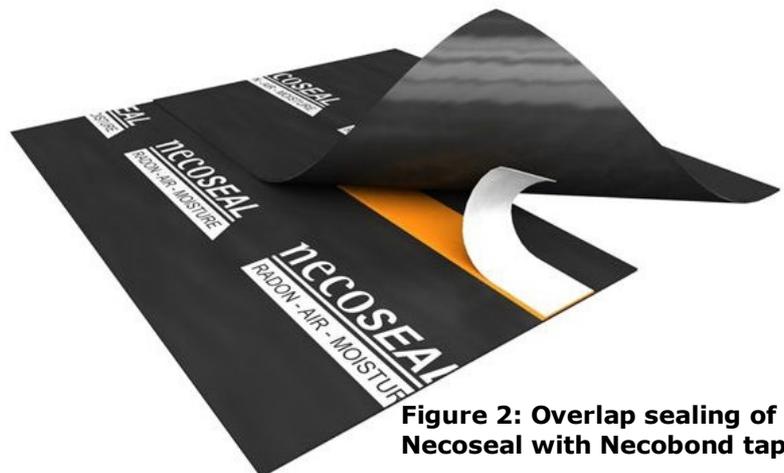
RAC, Reflex Super, RMB400 and RMB350 have reinforcement. RAC and Reflex Super have an additional layer of aluminium foil which increases their resistance to gas.

**Necobond** is a double-sided radon resisting butyl sealant tape designed for sealing joints in Necoseal radon resisting membrane. Place tape on lower sheet approximately 50mm from the edge. Roll firmly with a hand seam roller. Leave the release paper in position until after the next step. Place the top sheet of membrane and overlap the bottom sheet by 150mm. Remove release paper and roll firmly again with roller to complete the seal. Necobond can also be used to bond Necoseal to Easi-Load Radon DPC.

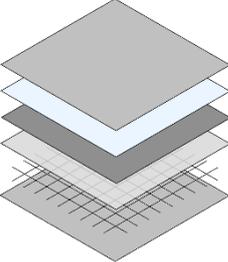
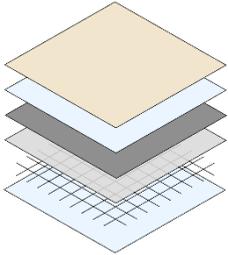
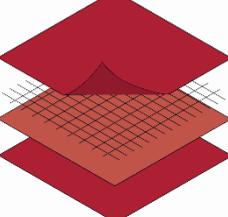
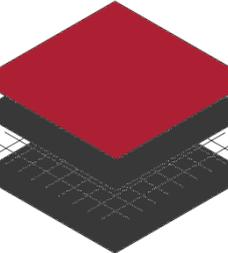
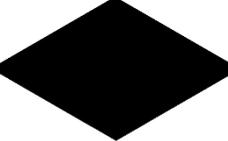
Rolls are 30m x 30m, are buff/orange in colour with white release paper.



**Figure 1: Overlap sealing of RMB350 with Monobond RT tape**



**Figure 2: Overlap sealing of Necoseal with Necobond tape**

<b>Monarflex® Radon, Air &amp; Moisture Protection Membranes</b>	<b>Application Guidance</b>
 <p><b>RAC</b></p>	<ul style="list-style-type: none"> <li>• Heavy-duty reinforced LDPE membrane incorporating 6 layers (including reinforcement and aluminium foil layer).</li> <li>• Very high resistance to radon gas.</li> <li>• Suitable for contaminated sites where volatile organic compounds (VOCs), hydrocarbons (HC) and landfill gases exist e.g. methane and CO<sub>2</sub> – contact supplier for specific guidance.</li> <li>• Can handle heavy foot traffic and certain site machinery.</li> <li>• Suitable for use under heavily reinforced concrete slabs, ground beams and pile-caps where an increased risk of damage exists.</li> </ul>
 <p><b>Reflex Super</b></p>	<ul style="list-style-type: none"> <li>• Robust reinforced membrane incorporating 6 layers (including reinforcement and aluminium foil layer).</li> <li>• Very high resistance to radon gas.</li> <li>• Suitable for contaminated sites where landfill gases exist e.g. methane and CO<sub>2</sub> – contact supplier for specific guidance.</li> <li>• Can handle moderate to heavy foot traffic – both outer layers made from blown LDPE blend which gives excellent resistance to abrasion.</li> <li>• Particularly suitable for medium to large floor areas where an increased risk of damage exists.</li> <li>• Protective layer advised before concrete pour.</li> </ul>
 <p><b>RMB400</b></p>	<ul style="list-style-type: none"> <li>• Robust extra reinforced membrane incorporating 4 layers.</li> <li>• High resistance to radon gas.</li> <li>• Can handle moderate to heavy foot traffic – both outer layers made from blown LDPE blend which gives excellent resistance to abrasion.</li> <li>• Particularly suitable for medium to large floor areas where an increased risk of damage exists.</li> <li>• Protective layer advised before concrete pour.</li> </ul>
 <p><b>RMB350</b></p>	<ul style="list-style-type: none"> <li>• Reinforced membrane incorporating 4 layers.</li> <li>• High resistance to radon gas.</li> <li>• Can handle moderate foot traffic – lower outer layer of blown LDPE blend.</li> <li>• Particularly suitable for small to medium floor areas where insulation or other protective layer is placed shortly after membrane is fitted.</li> <li>• Protective layer required before concrete pour.</li> </ul>
 <p><b>Necoseal</b></p>	<ul style="list-style-type: none"> <li>• Single layer of virgin-blend LDPE.</li> <li>• High resistance to radon gas.</li> <li>• Can handle light foot traffic (as required for installation).</li> <li>• Particularly suitable for buildings with small footprints where insulation or other protective layer is placed immediately after membrane is fitted – the risk of damage is therefore reduced.</li> </ul>

**Table 2: Application Guidance for Monarflex Radon, Air and Moisture Protection Membranes**

**Monobond RT** is a double-sided radon resisting butyl sealant tape designed for sealing joints in RAC, Reflex Super, RMB400, RMB350 radon resisting membranes, and Easi-Load Radon DPC. It can also be used to bond Necoseal joints if desired and is suitable for bonding any of these membranes to Easi-Load Radon DPC. Rolls are 30mm x 30m, are blue in colour with release paper which bears the product name. Follow the same application procedure as described for Necobond.

In some instances installers may elect to use a welding technique to join the sheets of material. In principle, this practice is acceptable however the quality of the joint will be highly dependent on the skill and expertise of the operative. Typical welding methods include: Handheld hot-air weld; Automatic hot-air weld (sometimes referred to as the 'Twinny' method); and Extrusion weld.

Hand welding relies on the use of a hot-air gun and silicone roller. Hot-air guns should be fitted with a potentiometer so that the temperature and flow of

air directed to the gas membrane can be adjusted to ensure that a proper weld will be achieved. The correct settings will be dependent on the climatic conditions encountered and the thickness of the membrane to be installed. Welding of membranes is a specialised process and it is therefore important that operatives receive proper training and have suitable experience before completing work on a live project.

### 2.1.3 Service Penetrations

**Easi-Pour Liquid Radon Sealant** is a two-component bitumen and polymer based liquid sealant. It is pourable, self-levelling and provides effective radon, air and moisture sealing around service penetrations, structural columns and irregular profiles of any shape or diameter. Easi-Pour is supplied in 6kg and 3kg tins. The hardener is contained with the lid assembly.

Once cured, a custom-made seal is formed. Easi-Pour will remain flexible and has a life-cycle of at least 50 years.

**Monarseal MRX Self-Adhesive Radon Flashing** is a multi-purpose radon, air and moisture sealing tape designed for use around thresholds, door end stops, services, structural penetrations and can also be used to carry out fast and effective radon membrane repairs. It has a bituminous self-adhesive layer on one side and a polyethylene backing on the other. Monarseal MRX has excellent initial grab (tack) and is highly malleable making it particularly suitable for a wide range of difficult sealing requirements. Rolls are 1.5mm x 300mm x 20m.

When applying to masonry concrete or steel, surfaces should be primed in advance using Icopal SA primer.

**Monarflex® Top-Hat** is a one-piece, vacuum-formed LDPE collar designed to seal 110mm diameter pipes. In some circumstances it may not be possible to fit the collar over a pipe, if for example there is a socket or bend at the critical point where the pipe penetrates the radon membrane. In these situations, Easi-Pour Liquid Radon Sealant should be used.

### 2.2 MANUFACTURE

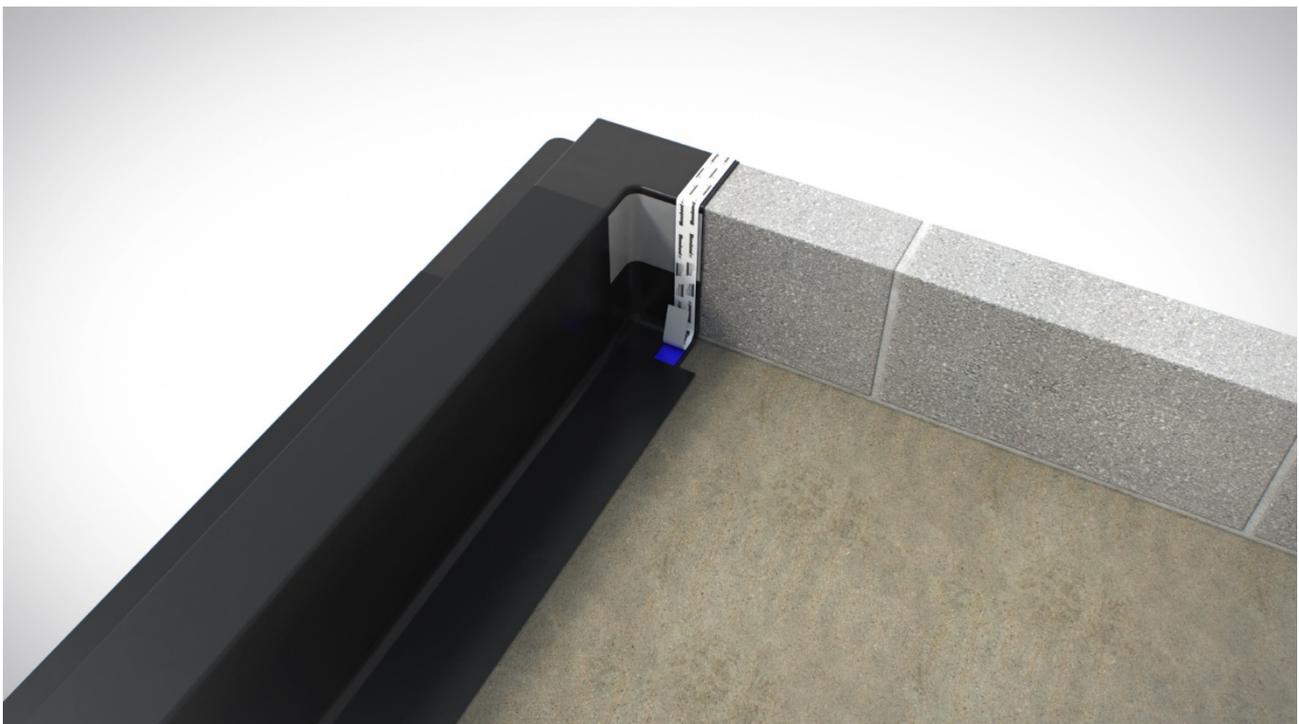
RAC, Reflex Super, RMB400, RMB350 and Necoseal radon resisting membranes and Easi-Load Radon DPC are manufactured using an extrusion process. Easi-Load Radon Corner Assembly and Monarflex® Top-Hats are manufactured using a vacuum-forming process.

#### 2.2.1 Product Quality Control

Quality control checks are carried out on the raw material, during and at the end of production. Checks on the final product include dimensions, tensile strength, tear strength, elongation, puncture resistance and static load. The management systems of the manufacturer have been assessed and registered as meeting the requirements of EN ISO 9001.

### 2.3 DELIVERY, STORAGE AND MARKING

System components are supplied individually or on pallets in wrappers bearing the manufacturer's name and product description, NSAI Agrément identification mark, NSAI Agrément Certificate



**Figure 3: Sealing wall using Easi-Load Radon DPC**

number and essential instructions for storage and installation.

## 2.4 INSTALLATION

### 2.4.1 General

This Certificate does not contain a full set of installation instructions, but an overview of the procedures involved. For a full list of these instructions, refer to the Certificate holder's manuals. Should a conflict arise between this Certificate and the Certificate holder's manuals, this Certificate shall take precedence.

The Necoflex RAM System offers robust detailing solutions for a wide range of ground floor and foundation designs. It facilitates a hybrid approach which combines Easi-Load Radon DPC with any one of 5 radon resisting membrane specifications. Building designers can select the best combination for their project, taking into account the following variables:

- Probability of having elevated indoor radon levels;
- Building use and occupancy rate;
- Number of storeys;
- Floor area and risk of membrane damage when large sections are installed in a single phase;
- Type of floor construction and quality of substrate finish;
- Level of supervision and technical control on site;
- Types of activities being carried out, e.g. placement of steel;
- Levels of activity on membrane after it has been fitted and before insulation or other protective layer is placed.

Traditional methods of using a radon resisting membrane as a DPC may be acceptable, depending on membrane type. When relying upon Monarflex® RAC or Reflex Super to exclude gases other than radon, e.g. methane or carbon dioxide, alumite gas DPC should be used. This has a foil layer and therefore provides an equivalent level of gas resistance at walls and cavities. The Certificate holder should be contacted for project specific design guidance.

Guidance on the design of radon protection systems for new and existing buildings is given in the DHCLG document *Radon in Buildings*, 1995. It is essential that the radon membranes covered by this Certificate are laid in accordance with the recommendations of IS EN 1996-1-1<sup>[3]</sup>, BS 8102<sup>[4]</sup> and with this Certificate.

### 2.4.2 New Work

The Necoflex RAM System can be used in most common ground floor constructions. Some elements of the system are installed in a similar way to damp proof membranes **but with much greater attention to detailing and workmanship**. This system will also perform the same function as DPCs

and membranes (see Construction Detailing figures).

To be fully effective, a radon, air and moisture sealing system must bridge cavities in walls and in doing so should form a cavity tray. Easi-Load Radon DPC should be used to seal walls and cavities. All designed cavities must be properly closed.

To avoid creating slip planes in masonry walls, do not place a radon resisting DPC in direct contact with a membrane (see the recommendations in IS EN 1996-1-1<sup>[3]</sup>). Consideration must be given to the positioning of radon resisting DPCs and membranes in relation to thermal insulation. The recommendations contained in IS EN 1996-1-1<sup>[3]</sup> should be followed.

The integrity of a radon, air and moisture sealing system must be maintained during installation. The risk of damage will vary depending on several factors as outlined above. For these reasons, the radon resisting membrane element of the system should be carefully chosen based on the guidance outlined in Table 2. RAC, Reflex Super, RMB400, RMB350 and Necoseal have different levels of resistance to damage. Where damage occurs this must be repaired by covering with a second layer of membrane sealed to the original using either Necobond or Monobond RT sealant tape, depending on membrane type. Monarseal MRX can also be used to carry out fast and effective membrane repairs.

Installation of the Necoflex RAM System must be in accordance with the recommendations of IS EN 1996-1-1<sup>[3]</sup>, BS 8102<sup>[4]</sup>, and the requirements of this Certificate. Additional guidance on the use of damp proof membrane materials is given in BS 8000-4<sup>[5]</sup>.

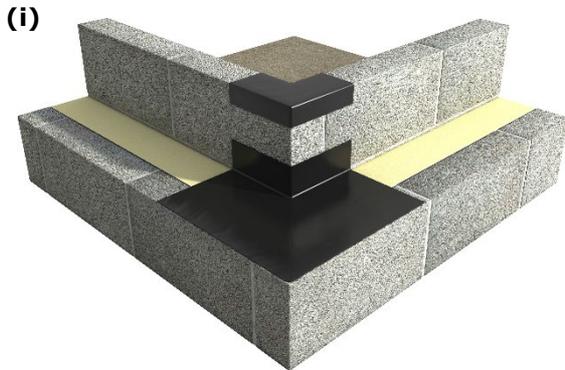
A surface blinding of soft sand (50mm min. thickness) or geo-textile or T3 blinding layer should be used to prevent puncture of the membrane during installation. If placing the membrane directly on top of a concrete sub-floor, it is critical that the surface has a smooth finish and is without any projections that could puncture the membrane when loaded. A further protection over the membrane is afforded by using high density insulation (25 kg/m<sup>3</sup>). Sheets must be clean and free from dirt and grease before application, and in view of the difficulty of achieving gas tight seals under wet or dirty site conditions it is recommended that special care is taken with this aspect of the installation.

### 2.4.3 System Installation Procedures

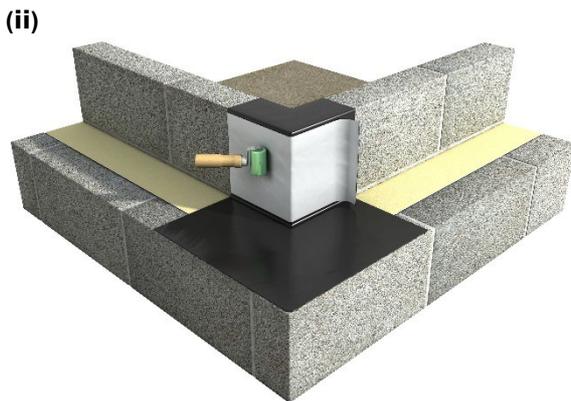
#### Seal Walls, Cavities and Floor Areas

Seal all corners using Easi-Load Radon Corner Assembly Kits. Corner Kits are available to suit 90° corners and T-junctions for either 100mm or 215mm block widths. 90° corners are referred to as L-100 or L-215 radon corners. Each L-100 or L-

215 radon corner assembly kit contains 1 external section, 1 internal section and 1 corner L-cap section. T-100 and T-215 kits contain 1 corner T-cap section and 2 internal sections.



Place the L-cap on top of the blocks and place the external section at the base of the blocks on the outside of the corner (It is not necessary that they overlap).



Cut a section of Monarseal MRX tape to suit the height of the block. Remove backing paper to expose adhesive side and apply to L-cap and external section. Use a hand-roller for a complete seal.



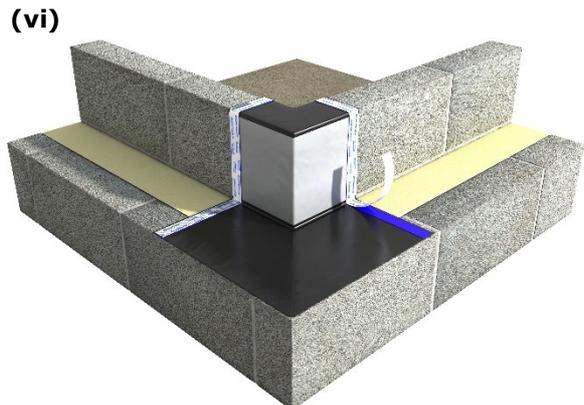
Place the internal corner section neatly into the inside corner.



Cut another section of Monarseal MRX tape to join the L-cap to the internal section (Ensure a lap of 50mm to each piece). Use a hand-roller to complete seal.

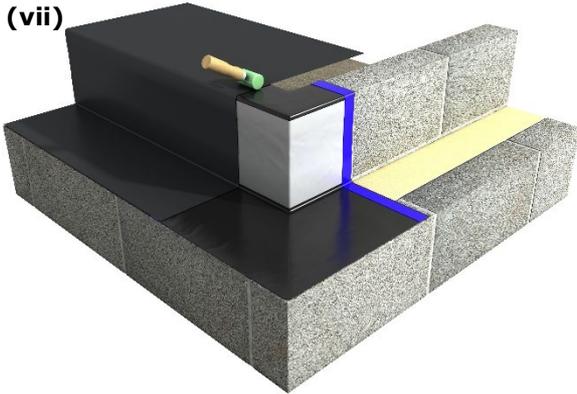


Apply a strip of Monobond RT double-sided tape to each edge of the corner assembly.



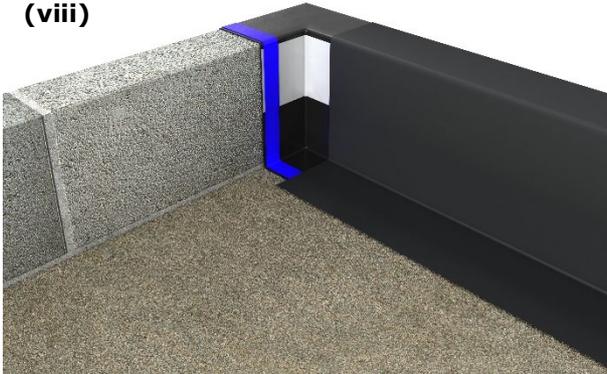
Continue the same strip of Monobond RT over the entire block and fully across the external corner section. Use a hand-roller to ensure continuous adhesion.

**(vii)**



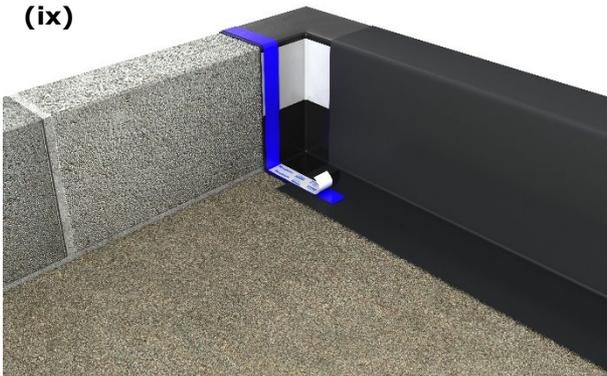
Cut a roll of Easi-Load Radon DPC to suit wall dimensions (and cavity if applicable).

**(viii)**



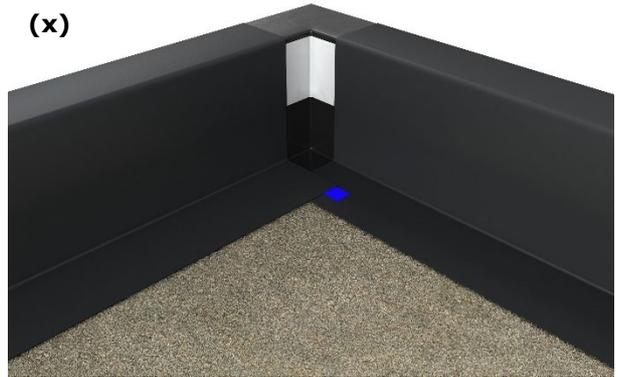
After removing the backing paper from the Monobond RT double-sided tape, carefully apply the Easi-Load Radon DPC, ensuring the tape is fully covered.

**(ix)**



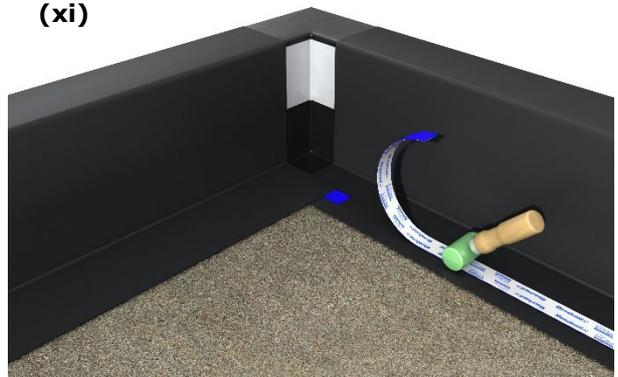
Apply an additional 150mm long strip of Monobond RT to the top of the Easi-Load Radon DPC and lap to the previously applied Monobond RT.

**(x)**

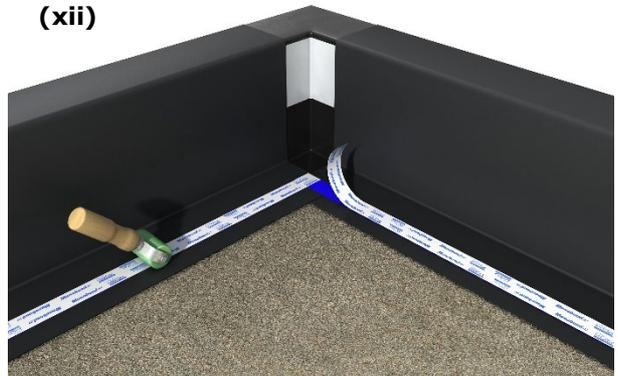


Apply another section of Easi-Load Radon DPC leaving 50mm of Monobond RT exposed.

**(xi)**

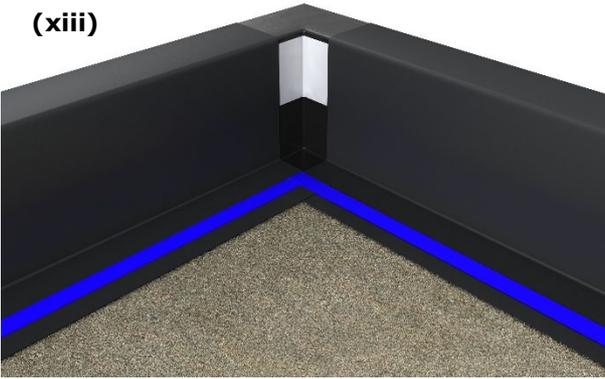


**(xii)**



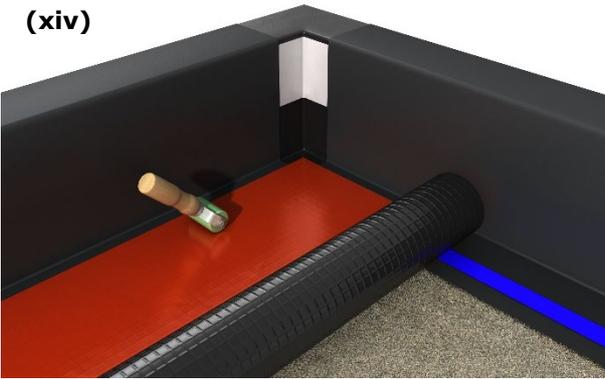
In preparation for the main field area of Monarflex radon membrane apply Monobond RT tape around the entire perimeter strip of Easi-Load Radon DPC. To avoid gaps pay particular attention to overlap with the previously applied strip of Monobond RT (50mm of which should be visible).

(xiii)



Remove release paper from Monobond RT.

(xiv)



Carefully join a section of Monarflex radon membrane to the Easi-Load Radon DPC using a hand-roller to ensure a continuous seal.

It is preferable that membranes are protected as soon as possible after installation to reduce the risk of damage that may be caused by following trades and/or during the concrete pour. The degree of risk will vary depending on the construction method being used and the level of supervision and technical control on site. General guidance on membrane selection can be found in Table 2.

#### Seal Service and Structural Penetrations

Seal all service and structural penetrations using the most appropriate method as outlined below:

- (a) Monarflex Top-Hat units with retention clips are available to seal 110mm diameter pipes and ducts. Radon, air and moisture resistant joints are effected using Monobond RT.
- (b) Monarseal MRX Self-Adhesive Radon Flashing can be used for a wide range of sealing applications. Prepare steel and concrete substrates using Icopal SA primer. Cut sections of Monarseal MRX Self-Adhesive Radon Flashing to the required length. Remove the protective release film and apply the self-adhesive side onto the prepared surface. Lap 150mm to the Monarflex membrane and the remaining 150mm to the steel or concrete (roll width is 300mm). The laps should be well rolled

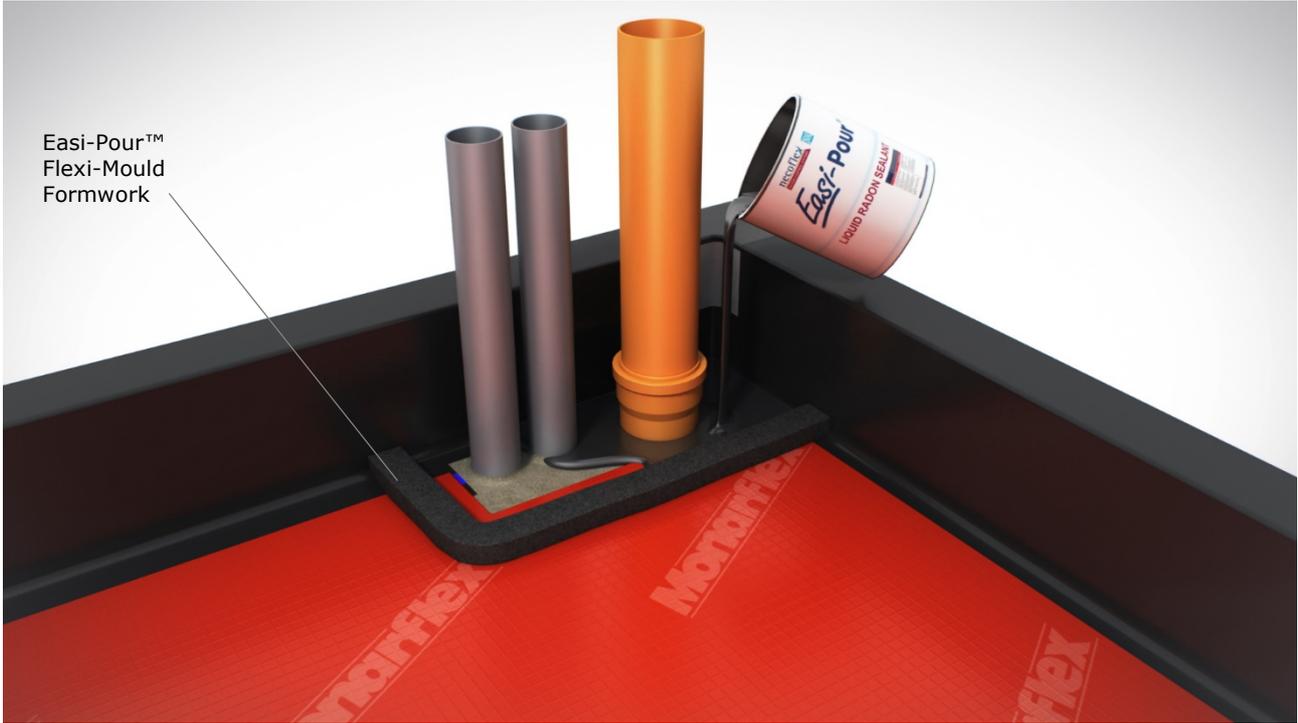
with a firm pressure to ensure complete adhesion and continuity.

(c) Easi-Pour Liquid Radon Sealant is recommended for sealing service penetrations, structural columns and irregular profiles of any shape or diameter. It is particularly suitable for multiple pipe penetrations, corrugated twin-wall ducts, and long radius bends.

(i) Ensure that the substrate has been well compacted before dressing the Monarflex radon, air and moisture protection membrane around the penetration(s) to be sealed. A 30mm space should be left between penetrations. Where possible, cut the membrane close to the penetration to help contain the sealant until it has cured. Gaps can be closed if required using Monarseal MRX Self-Adhesive Radon Flashing.

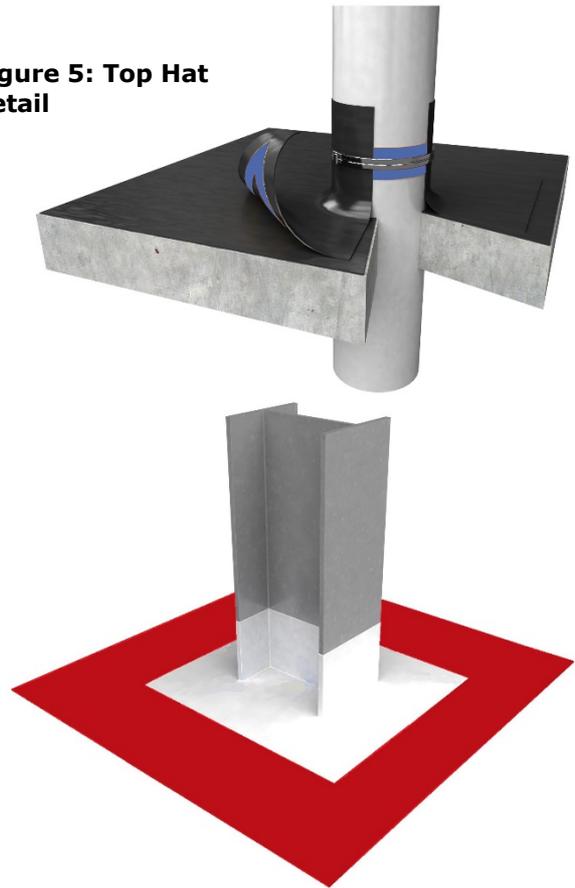
(ii) Remove any moisture or dirt from the surface of the membrane and penetrations before sticking the Easi-Pour Flexi-Mould formwork in place. The formwork is flexible and has a pre-applied self-adhesive tape to facilitate bonding to the top of the radon membrane. Carefully position the formwork around the services, maintaining uniform spacing and ensuring at least 30mm of radon membrane will be covered by the Easi-Pour Liquid Radon Sealant.

(iii) After preparing all services and penetrations in advance, mix the Easi-Pour Liquid Radon Sealant as directed on the container and fill the formwork to a depth of at least 30mm. No trowelling is required as the sealant will flow around the penetration and find its own level. Working time is approximately 15 minutes. Curing time is approximately 24 hours at 20°C ambient temperature. The sealant should be protected from rain until it has cured and should always be covered by a concrete or screed layer. The Flexi-Mould formwork is permanent.

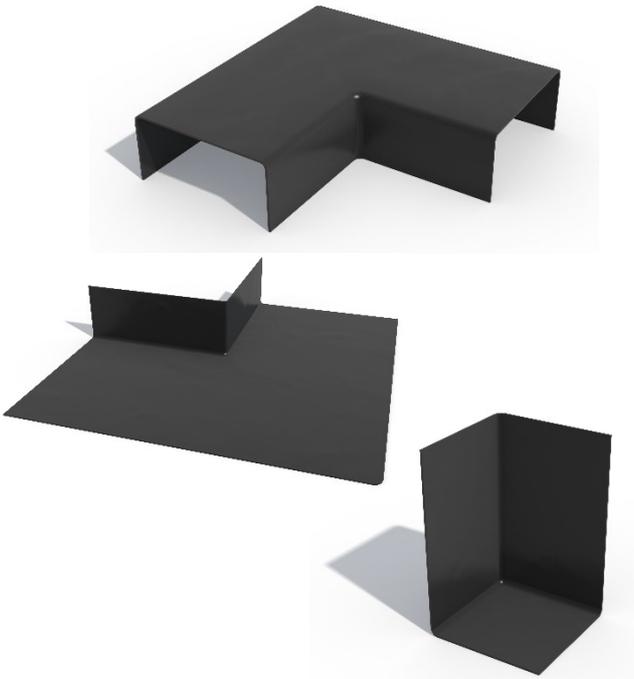


**Figure 4: Sealing of pipes and ducts using Easi-Pour Liquid Radon Sealant**

**Figure 5: Top Hat detail**



**Figure 7: Monarseal MRX Self-Adhesive Radon Flashing (Easi-Pour™ Liquid Radon Sealant may also be used in this application)**

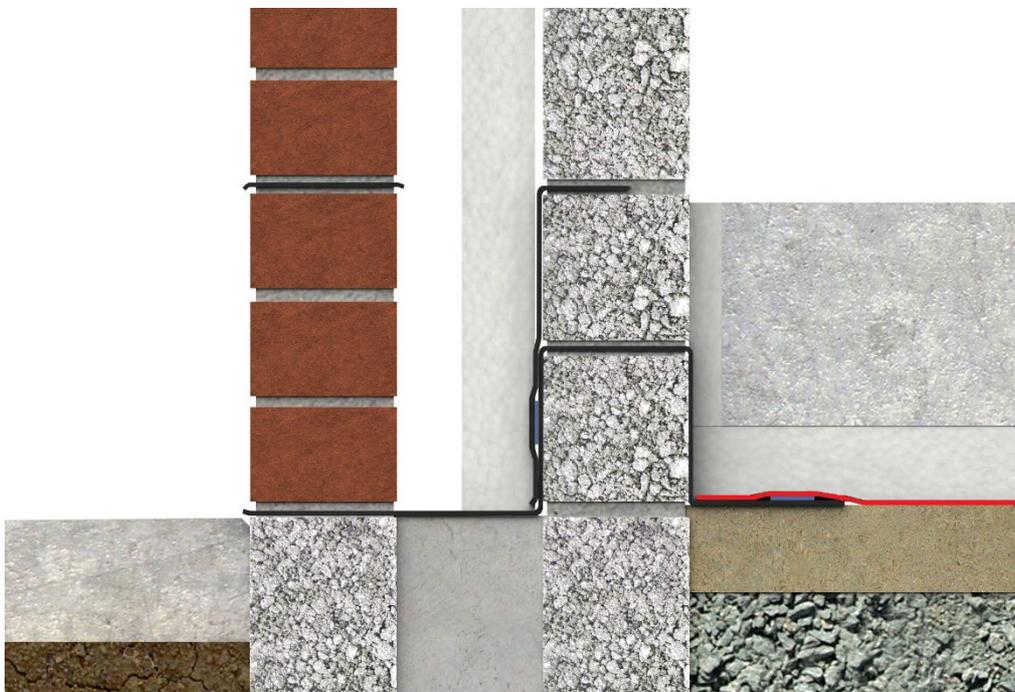


**Figure 6: Easi-Load™ Radon Corner Assembly (L-100)**

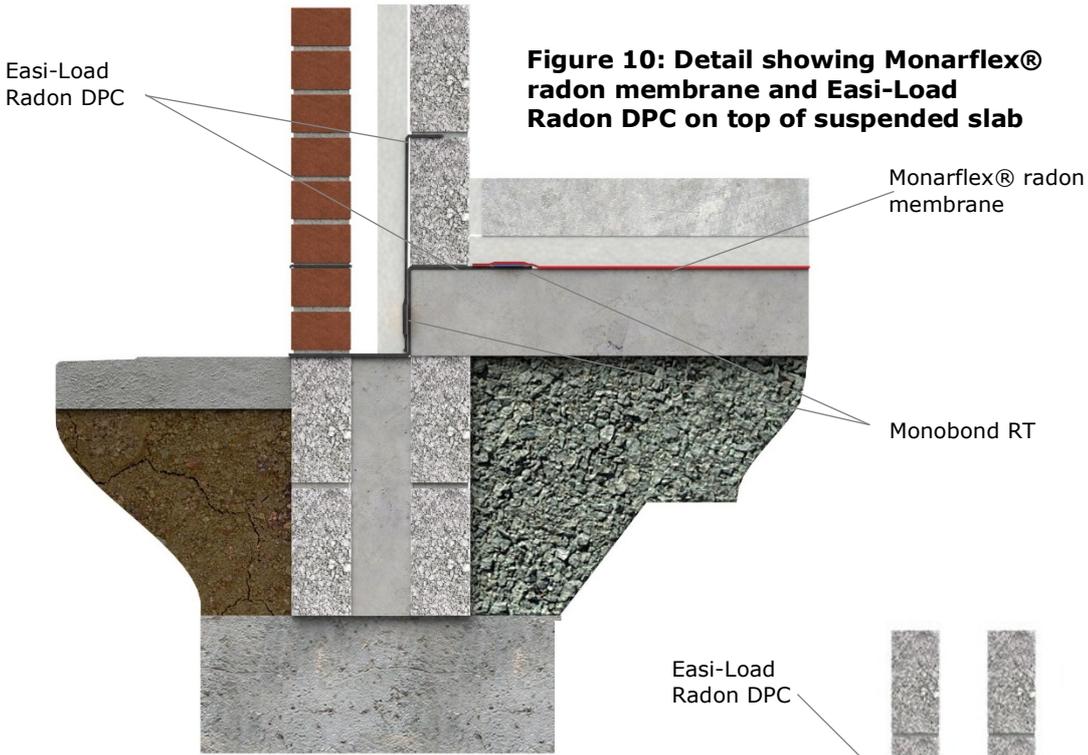
**Note:** Illustrations show placement of Monarflex® radon membrane, Easi-Load Radon DPC and Monobond RT – insulation to meet the requirements of the Acceptable Construction Details (ACDs) is outside the scope of this Certificate.



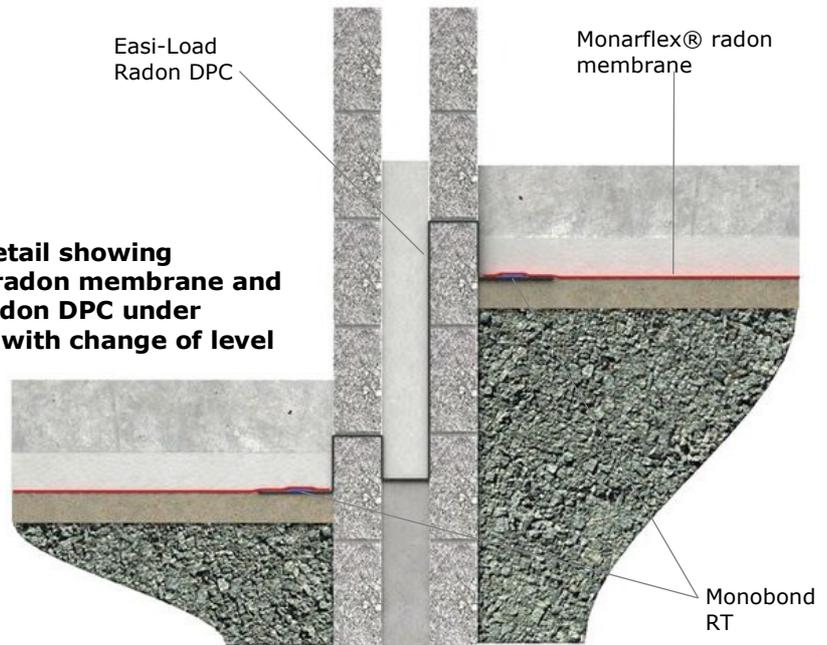
**Figure 8: Detail showing Monarflex® radon membrane and Easi-Load under floating slab**



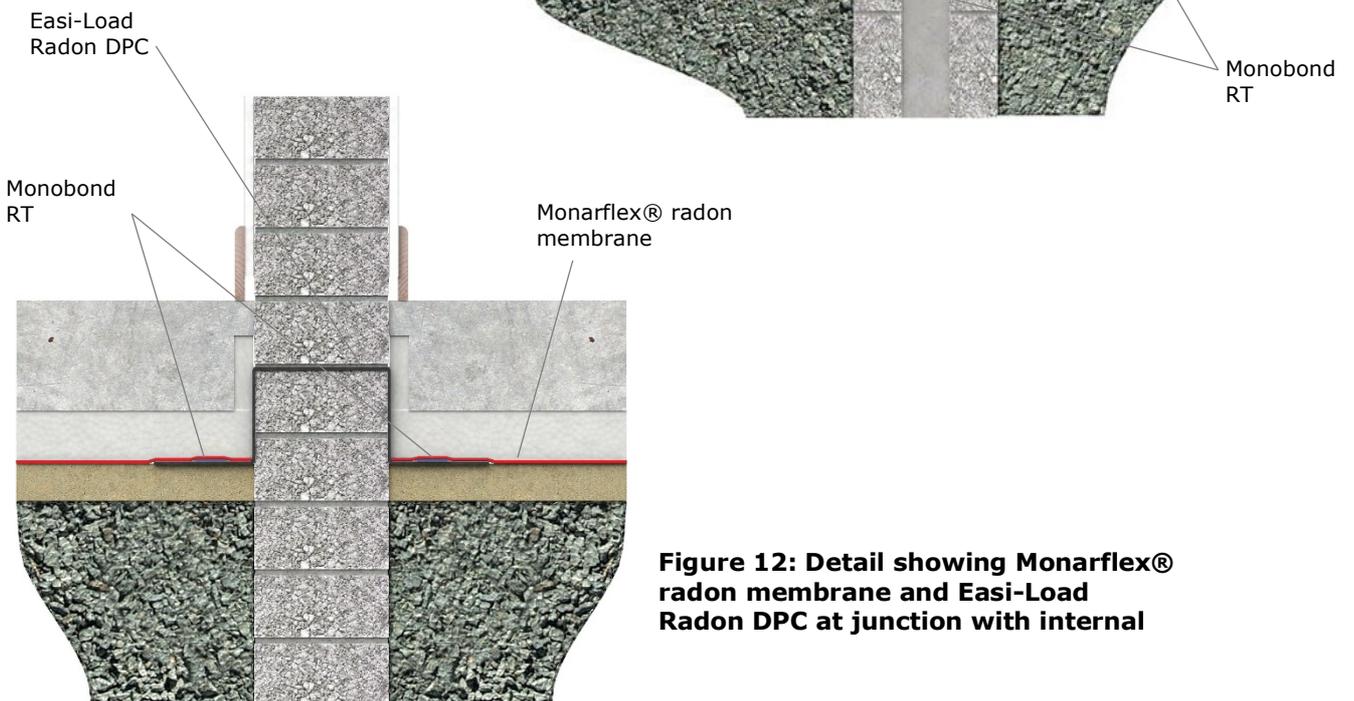
**Figure 9: Detail showing floating slab**



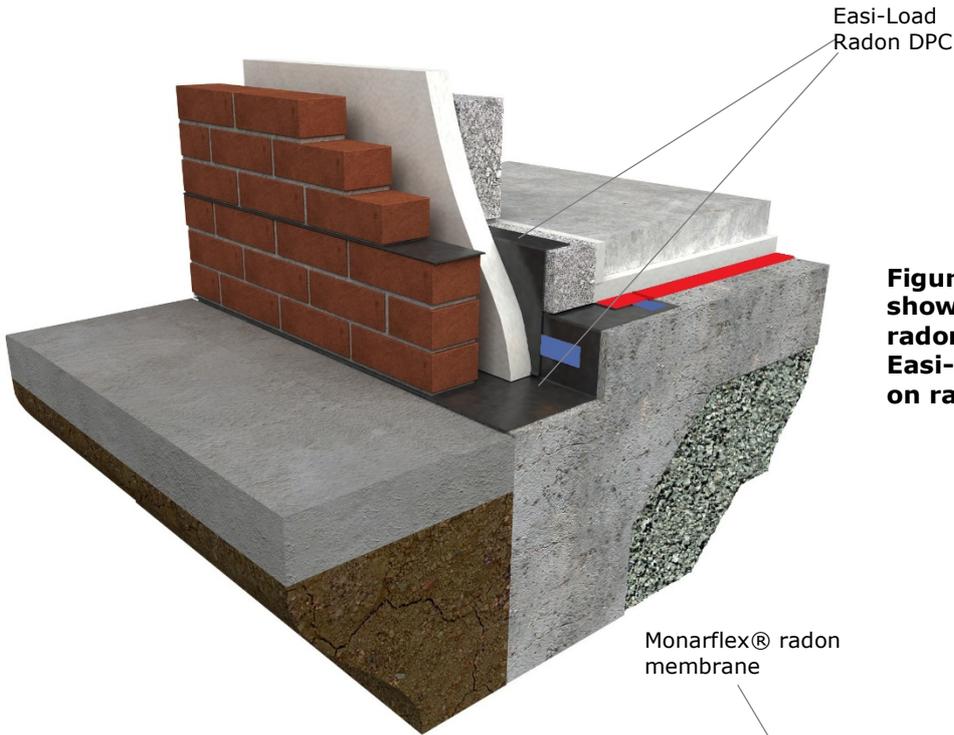
**Figure 10: Detail showing Monarflex® radon membrane and Easi-Load Radon DPC on top of suspended slab**



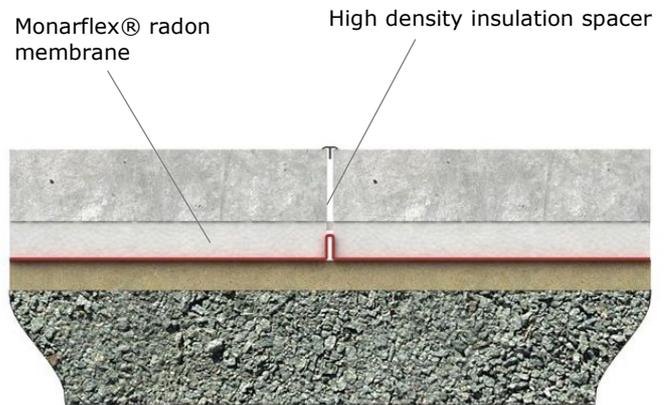
**Figure 11: Detail showing Monarflex® radon membrane and Easi-Load Radon DPC under floating slab with change of level**



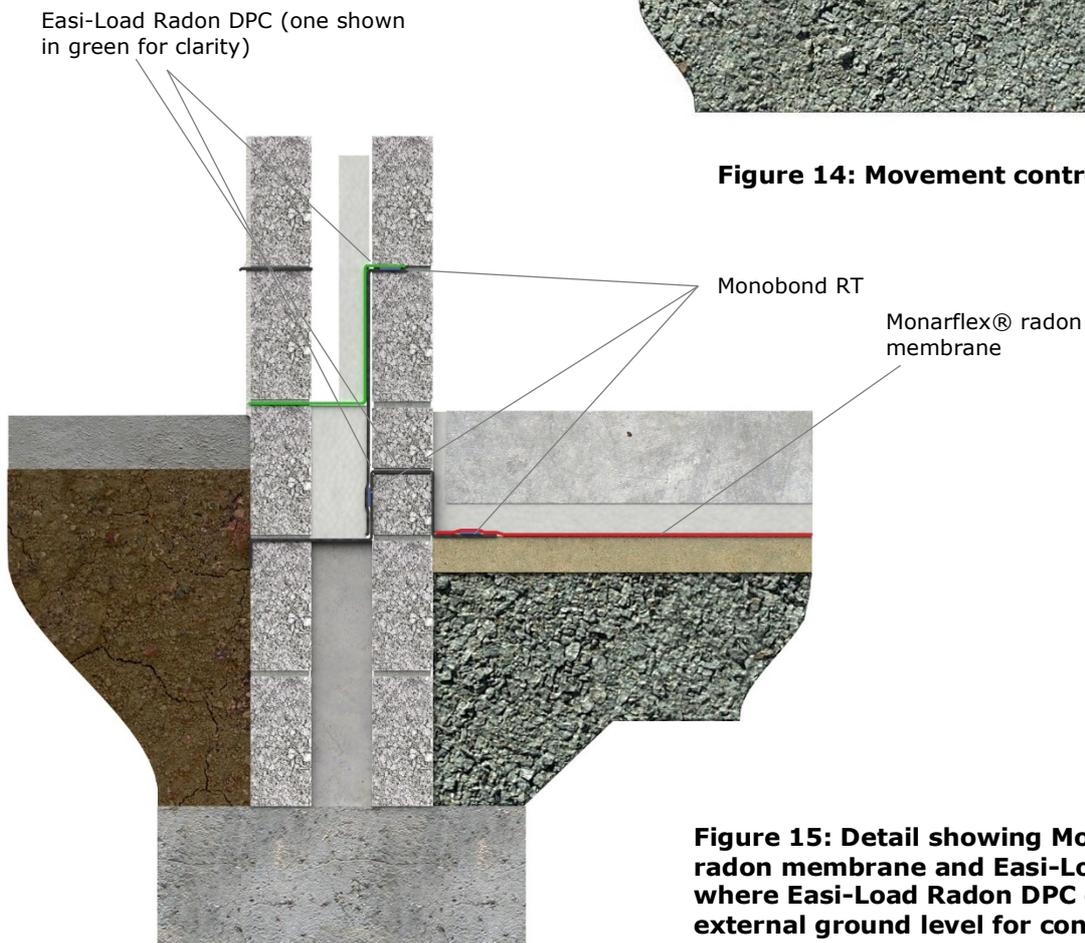
**Figure 12: Detail showing Monarflex® radon membrane and Easi-Load Radon DPC at junction with internal**



**Figure 13: Detail showing Monarflex® radon membrane and Easi-Load™ Radon DPC on raft foundation**



**Figure 14: Movement control joint**



**Figure 15: Detail showing Monarflex® radon membrane and Easi-Load Radon DPC where Easi-Load Radon DPC exits below external ground level for concrete floors not subject to hydrostatic pressure**

### 3.1 GENERAL

The Necoflex RAM - Radon, Air and Moisture Protection System is suitable for use in concrete floors not subject to hydrostatic pressure, in accordance with the relevant clauses of IS EN 1996-1-1<sup>[3]</sup> and BS 8102<sup>[4]</sup>. The membranes can be installed either between a blinded hardcore bed and the base concrete, or between the base concrete and screed. RAC can be installed below ground beams and pile-caps.

#### 3.1.1 Resistance to water and water vapour

The membranes and the methods of jointing provide an effective barrier to the passage of radon gas, air, liquid water and water vapour from the ground.

#### 3.1.2 Resistance to tear

The Necoflex RAM System provides a high level of resistance to tear and can be adapted to suit a wide range of site conditions. Care should be taken during installation, particularly when handling building materials and equipment over the surface and when placing concrete or screeds, since the membranes can be punctured by sharp objects. High density insulation (25kg/m<sup>3</sup>) is an effective protection after laying.

#### 3.1.3 Site conditions

The system may be installed in all conditions normal to ground floor slab construction. Where there is a risk of ground becoming waterlogged, sub-soil drainage must be provided in accordance with IS EN 1996-1-1<sup>[3]</sup> and BS 8102<sup>[4]</sup>.

#### 3.1.4 Underfloor heating

When used in accordance with the conditions set out in this Certificate, there will be no adverse effect on the membranes from underfloor heating under normal conditions. The Certificate holder's advice should also be sought for project specific details.

### 3.2 CONSTRUCTION DETAILING

To reduce radon, air and moisture ingress into buildings the following guidelines should be followed:

- design for controlled movement of construction (see IS EN 1996-1-1<sup>[3]</sup>);
- ensure that all designed cavities are effectively closed to interior spaces;
- design for grouping of services with effective gas seal of ground slab openings and penetrations.

### 3.3 CONSTRUCTION SETTLEMENT

Consideration should be given to differential and/or relative settlement of ground floor construction during the full life cycle of the building. Where special installation detailing is introduced, i.e. folding of a radon resisting membrane at critical construction points, an elongation capability for the membrane itself may not be required. Where high concentrations of radon are likely and where a building is properly designed, detailed and constructed to take account of settlement, the installation of the Necoflex RAM System offers an effective measure against radon health hazards. It is important to note that following any elongation in a membrane, a reduction in its radon gas resistance performance will occur.

### CONSTRUCTION DETAILING – PROVISION FOR SETTLEMENT

#### Situation A:

If it can be predicted with certainty that there will be no actual/real relative or differential settlement during the entire cycle of a building, Easi-Load Radon DPC, RAC, Reflex Super, RMB400 and RMB350 may be installed as shown:



#### Situation B:

If it can be predicted with certainty that the actual/real relative or differential settlement during the entire life cycle of a building will not exceed 8mm, Easi-Load Radon DPC, RMB400 and RMB350 may be installed with an upstand as shown:



#### Situation C:

If it cannot be predicted with certainty what the actual/real relative or differential settlement will be during the entire life cycle of a building, Easi-Load Radon DPC, RAC, Reflex Super, RMB400 and RMB350 should be installed with folds as shown:



#### 4.1 TESTS / ASSESSMENTS

Various technical investigations were carried out on the NecoFlex RAM - Radon, Air and Moisture Protection System. Typical results are shown in Table 1.

#### 4.2 DURABILITY

When installed in accordance with this Certificate and subject to normal conditions of use, the system will provide an effective barrier which will be substantially impervious to the transmission of radon gas, air, liquid water and water vapour for the life of the building. Long periods of exposure to UV light can reduce the effectiveness of a membrane. However, during storage, and when installed in accordance with this Certificate, the membranes will be protected from such exposure.

It is important to note that alterations to the building structure subsequent to the installation of a radon protection system must take into account the integrity of the system.

#### 4.3 REUSE AND RECYCLABILITY

The membranes contain polymer materials which can be recycled.

#### 4.4 OTHER INVESTIGATIONS

(i) Existing data on product properties in relation to fire, toxicity and environmental impact were assessed. When stored with normal care on site prior to installation these membranes do not present a significant fire or health hazard.

(ii) The manufacturing process was examined including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

**5.1** National Standards Authority of Ireland ("NSAI") following consultation with NSAI Agrément has assessed the performance and method of installation of the product/process and the quality of the materials used in its manufacture and certifies the product/process to be fit for the use for which it is certified provided that it is manufactured, installed, used and maintained in accordance with the descriptions and specifications set out in this Certificate and in accordance with the manufacturer's instructions and usual trade practice. This Certificate shall remain valid for five years from date of latest revision so long as:

- (a) the specification of the product is unchanged.
- (b) the Building Regulations 1997 to 2021 and any other regulation or standard applicable to the product/process, its use or installation remains unchanged.
- (c) the product continues to be assessed for the quality of its manufacture and marking by NSAI.

(d) no new information becomes available which in the opinion of the NSAI, would preclude the granting of the Certificate.

(e) the product or process continues to be manufactured, installed, used and maintained in accordance with the description, specifications and safety recommendations set out in this certificate.

(f) the registration and/or surveillance fees due to NSAI Agrément are paid.

**5.2** The NSAI Agrément mark and certification number may only be used on or in relation to product/processes in respect of which a valid Certificate exists. If the Certificate becomes invalid the Certificate holder must not use the NSAI Agrément mark and certification number and must remove them from the products already marked.

**5.3** In granting Certification, the NSAI makes no representation as to;

- (a) the absence or presence of patent rights subsisting in the product/process; or

(b) the legal right of the Certificate holder to market, install or maintain the product/process; or

(c) whether individual products have been manufactured or installed by the Certificate holder in accordance with the descriptions and specifications set out in this Certificate.

**5.4** This Certificate does not comprise installation instructions and does not replace the manufacturer's directions or any professional or trade advice relating to use and installation which may be appropriate.

**5.5** Any recommendations contained in this Certificate relating to the safe use of the certified product/process are preconditions to the validity of the Certificate. However the NSAI does not certify that the manufacture or installation of the certified product or process in accordance with the descriptions and specifications set out in this Certificate will satisfy the requirements of the Safety, Health and Welfare at Work Act, or of any other current or future common law duty of care owed by the manufacturer or by the Certificate holder.

**5.6** The NSAI is not responsible to any person or body for loss or damage including personal injury arising as a direct or indirect result of the use of this product or process.

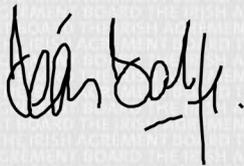
**5.7** Where reference is made in this Certificate to any Act of the Oireachtas, Regulation made thereunder, Statutory Instrument, Code of Practice, National Standards, manufacturer's instructions, or similar publication, it shall be construed as reference to such publication in the form in which it is in force at the date of this Certification.

## NSAI Agrément

This Certificate No. **09/0328** is accordingly granted by the NSAI to **Necoflex Ltd.** on behalf of NSAI Agrément.

Date of Issue: **March 2009**

Signed



**Seán Balfe**  
**Director of NSAI Agrément**

### Revisions:

**November 2009:** Addition of Detail Sheet 1.

**June 2016:** References to Building Regulations and standards updated.

**11<sup>th</sup> January 2022:** References to Building Regulations and standards updated.

Readers may check that the status of this Certificate has not changed by contacting NSAI Agrément, NSAI, 1 Swift Square, Northwood, Santry, Dublin 9, Ireland. Telephone: (01) 807 3800. Fax: (01) 807 3842. [www.n sai.ie](http://www.n sai.ie)

## Bibliography

- [1] IS EN 13967:2012+A1:2017 *Flexible sheets for waterproofing – Plastic and rubber damp sheets including plastic and rubber basement tanking sheet – Definitions and characteristics.*
- [2] IS EN 14909:2012 *Flexible sheets for waterproofing – Plastic and rubber damp proof courses – Definitions and characteristic.*
- [3] IS EN 1996-1-1:2005+A1:2012 *Eurocode 6 – Design of masonry structures – Part 1-1: General rules for reinforced and unreinforced masonry structures (including Irish National Annex).*
- [4] BS 8102:2009 *Code of practice for protection of below ground structures against water from the ground.*
- [5] BS 8000-4:1989 *Workmanship on building sites – Code of practice for waterproofing.*
- [6] IS EN 1401-1:2019 *Plastics piping systems for non-pressure underground drainage and sewerage – Unplasticized polyvinyl chloride (PVC-U) – Part 1: Specifications for pipes, fittings and the system.*
- [7] IS EN 1329-1:2020 *Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure – Unplasticized polyvinyl chloride (PVC-U) – Part 1: Specifications for pipes, fittings and the system.*
- [8] SR 21:2014 *Guidance on the use of I.S. EN 13242:2007+A1:2007 – Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction.*



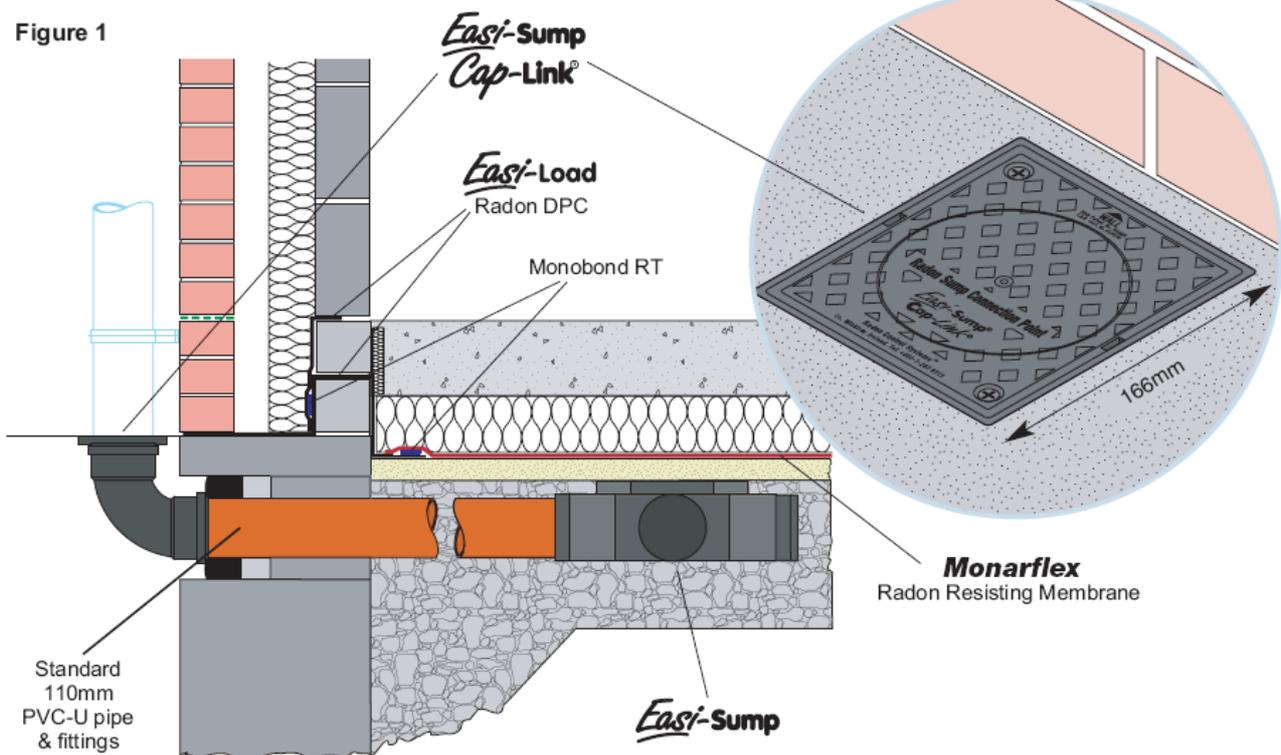
# NSAI

Agrément

CERTIFICATE NO. 09/0328  
DETAIL SHEET 1

## Easi-Sump® & Easi-Sump® Cap-Link®

Figure 1



### PRODUCT & ASSEMBLY DESCRIPTION:

This Detail Sheet relates to the *Easi-Sump*® and *Easi-Sump*® *Cap-Link*®. Both products, when assembled, are used as part of a radon protection measure in buildings and enable sub-floor depressurisation or pressurisation to be introduced with ease, if required at a later date.

This Detail Sheet replaces NSAI Certificate No.01/0130.

### SUPPLY, MANUFACTURE & MARKETING:

Both products are supplied and marketed by:  
**Necoflex Ltd., Unit 36 Airways Industrial Estate,**  
**Viscount Avenue, Cloghran,**  
**Dublin, D17 CD96.**  
**T: +353 (0)1 802 3333, F: +353 (0)1 803 6060**

*Easi-Sump*® is manufactured under contract by:  
**Kingspan Water & Energy Ltd.**

*Easi-Sump*® *Cap-Link*® is manufactured under contract by:  
**MFP Plastics Ltd., Lucan, Co. Dublin.**

In the opinion of NSAI, the *Easi-Sump*® and *Easi-Sump*® *Cap-Link*®, as described in this Detail Sheet, comply with the requirements of the Building Regulations 1997 to 2021.

### INTENDED USE:

Radon (incl. Rn-222, Rn-220, RnD) is a naturally occurring radioactive gas which enters buildings from the underlying soil. The gas can accumulate within a building to such a concentration as to constitute a health hazard.

Radon is excluded from buildings using passive and active systems. The provision of an active sub-floor radon soil gas control system, designed and installed by competent personnel, will further reduce the risk of a building having radon activity above a recommended target health level of 10-40 Bq/m<sup>3</sup> (USA).

All new buildings should be designed and constructed with features which facilitate post-construction radon removal from interior spaces and superstructure construction cavities (see Figure 1). Should radon levels increase, because of time-dependent or other factors during the

lifecycle of a building, the *Easi-Sump* and *Easi-Sump Cap-Link* Assembly is specifically designed to be converted, with ease, into an active protection measure.

The most important passive radon protection measure consists of a properly installed radon resisting membrane extending across the whole of a building, including the ground floor and all walls. This measure also ensures a necessary degree of separation in a floor construction, so that:

- a) prior to activation of the sub-floor radon soil gas control system, the likelihood of radon entry into the building is not increased due to the presence of a gas permeable layer at foundation level;
- b) in the event that the control system is activated, there will be no effects on heat producing appliances or the patterns of natural ventilation in interior spaces, and heat losses will not be increased.

The *Easi-Sump* and *Easi-Sump Cap-Link* Assembly is not intended to deal with:

- (i) soil gases other than radon, e.g. volatile organic compounds from underground storage tanks, or the range of gases from landfill sites;
- (ii) radon activity in a building which is caused by radon emissions from the building's water supply, or from construction products used in the building's superstructure.

## **Part D – Materials and Workmanship**

### **D1 – Materials and Workmanship**

#### **D3 – Proper Materials**

The *Easi-Sump* and *Easi-Sump Cap-Link* Assembly are comprised of 'proper materials' i.e materials which are fit for their intended use and for the conditions in which they are to be used.

Buildings incorporating the *Easi-Sump* and *Easi-Sump Cap-Link* Assembly can be designed to meet the following clauses of the Building Regulations 1997 to 2021:

### **Part A – Structure**

#### **A1 – Loading**

#### **A2 – Ground Movement**

### **Part B – Fire Safety**

#### **Part B Vol 2 – Fire Safety**

#### **B3 & B8 – Internal Fire Spread (Structure)**

#### **B4 & B9 – External Fire Spread**

### **Part C – Site Preparation and Resistance to Moisture**

#### **C3 – Dangerous Substances**

#### **C4 – Resistance to Weather and Ground Moisture**

### **Part F – Ventilation**

#### **F1 – Means of Ventilation**

### **Part L – Conservation of Fuel and Energy**

#### **L1 – Conservation of Fuel and Energy**

## **1 HEALTH & SAFETY LEGISLATION**

When activated in an occupied building, the *Easi-Sump* and *Easi-Sump Cap-Link* Assembly, as certified in this Detail Sheet, meets the relevant requirements of the following legislation:

- Safety, Health & Welfare at Work Act, 2005;
- Regulations made under the above Act which implement the 'safety at work' European Directives;
- S.I. 30 Radiological Protection Act, 1991 (Ionising Radiation) Regulations 2019.

## 2.1 PRODUCT DESCRIPTION

This Detail Sheet relates to the *Easi-Sump* and *Easi-Sump Cap-Link* Assembly. The *Easi-Sump* is a robust, medium density polyethylene product. The *Easi-Sump Cap-Link*, and standard drainage pipes and fittings, are all unplasticized polyvinyl chloride products. General descriptions of the *Easi-Sump*, the *Easi-Sump Cap-Link*, and drainage pipes and fittings are provided below.

The *Easi-Sump* is a three-dimensional, shallow, octagonal, and hollow product; it has a solid roof, with an upstand; it has solid sides, with projecting spigots from four opposing sides (each suitable for the insertion of 110mm diameter drainage pipe); and it has an open base. The *Easi-Sump* is supplied with one spigot open and three blanked-off, but a clearly visible groove in each spigot shaft guides cutting for easy removal of additional blanks on site, as required. See Figure 3.

The *Easi-Sump Cap-Link* is a compact product with two functions:

- it 'caps' the sub-floor network at an appropriate external location, facilitating a gas tight connection with a standard 100mm diameter pipe;
- it 'links' the *Easi-Sump* and *Easi-Sump Cap-Link* Assembly, with ease and convenience at any later time in the lifecycle of a building, to a system activation kit.

For security, the *Easi-Sump Cap-Link* cover is retained in position with stainless steel screw fixings.

Standard drainage pipe (PVC-U), which has a nominal diameter of 110mm, is used throughout. Standard pipe fittings complete the assembly.

### *Easi-Sump*:

(See Figure 3 and Table 1 for more information)

Product Weight: 1.85 kg  
 Colour: black

### *Easi-Sump Cap-Link*:

(See Figure 2 for a detailed specification)

Product Weight: ESCL01 0.61kg  
 ESCL02 0.92kg  
 Colour: black

### Drainage Pipes and Fittings:

Underground, the drainage pipes and fittings used in this assembly must be manufactured in accordance with IS EN 1401-1<sup>[6]</sup>.

Above ground, pipes and fittings used for system activation must be manufactured in accordance with IS EN 1329-1<sup>[7]</sup>.

## 2.2 MANUFACTURE

The *Easi-Sump* is manufactured by a rotational moulding process from medium density polyethylene.

The *Easi-Sump Cap-Link* is manufactured by an injection moulding process from unplasticized polyvinyl chloride (PVC-U).

### 2.2.1 Quality Assurance & Product Quality Control

Appropriate quality assurance procedures, which conform to EN ISO 9001, are operated by both manufacturers.

#### *Easi-Sump*

Quality control checks are carried out on raw materials, during production, and on the final products where appearance, colour, dimensions, thickness, weight, and freedom from defects are continually checked.

#### *Easi-Sump Cap-Link*

Quality control checks are carried out on raw materials, during production, and on the final products where appearance, colour, dimensions, freedom from defects, impact strength, and water tightness are continually checked.

## 2.3 DELIVERY, STORAGE AND MARKING

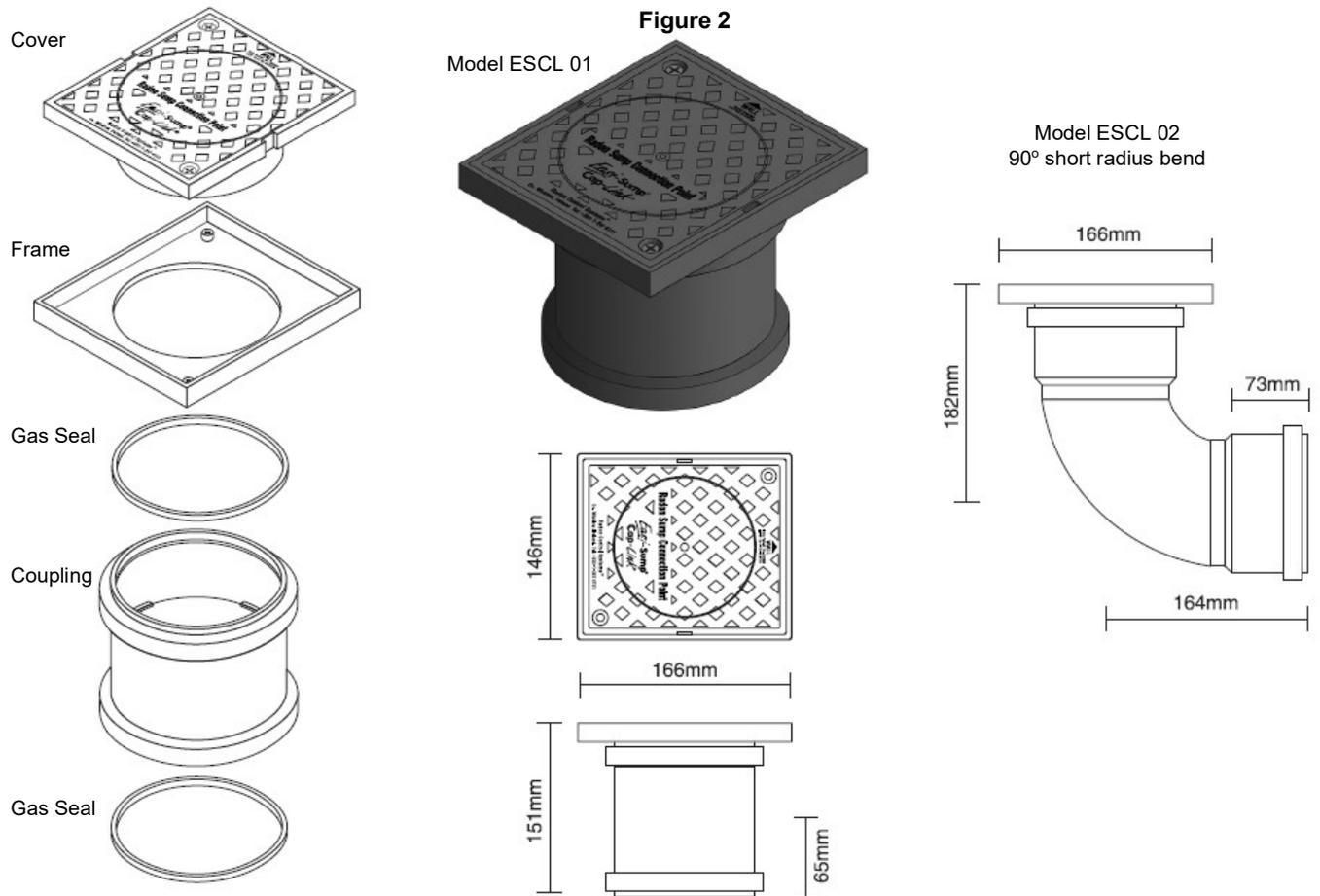
The *Easi-Sump* is supplied on pallets. The product name, supplier's name, address and contact information, together with the NSAI Agrément Certificate Number, recycle logo, material code and production batch code are moulded into the polyethylene. Each product is supplied with an installation instruction leaflet.

The *Easi-Sump Cap-Link* is supplied in boxes. The product name, supplier's name, address, and contact information, together with the NSAI Agrément Certificate Number are moulded into the cover. Each product is supplied with an installation instruction leaflet.

Standard drainage pipes and fittings are supplied from hardware suppliers and builders' merchants throughout Ireland.

*Easi-Sump* and *Easi-Sump Cap-Link* should be stored in clean, dry conditions, and within an ambient temperature range of -10°C to +35°C. They should also be protected from extended exposure to ultraviolet light, i.e. sunlight.

## Easi-Sump Cap-Link



### 2.4 ASSEMBLY INSTALLATION PROCEDURES

#### 2.4.1 General

Installation of the *Easi-Sump* and *Easi-Sump Cap-Link* Assembly should be strictly in accordance with this Certificate, and with the supplier's instructions. The design and installation of a Radon Soil Gas Control System should be carried out, supervised and controlled by competent personnel only.

Installation should include the following tasks:

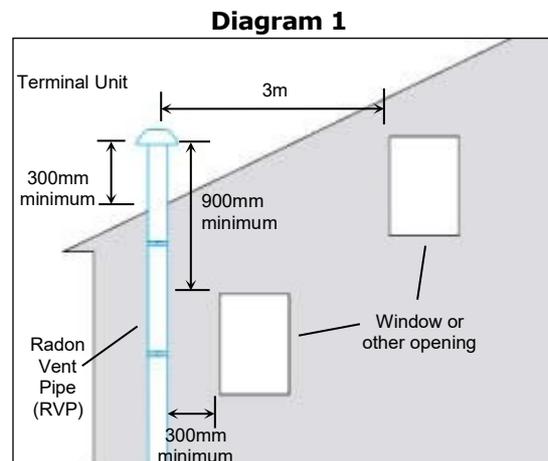
**Task No.1:** When deciding on an appropriate external location for an *Easi-Sump Cap-Link*, it is essential to avoid re-entry of radon gas into interior spaces should a Radon Vent Pipe (RVP) be installed at a later time in the building's lifecycle. The following constraints would apply when a Radon Soil Gas Control System is activated:

1. There should be no openings into a building, e.g. windows, vents, or vertical control joints, less than 300mm from any part of the RVP.
2. The terminal unit of the radon vent pipe should be positioned at least 300mm above the surface of the roof and 900mm above any window or other opening into the building. It should be located at least 3m away from any

window or opening that is less than 900mm below the terminal unit. See Diagram 1.

3. All exposed and visible vertical radon vent pipes should be clearly identified.

**Task No.2:** The sump must be surrounded by selected hardcore Type B material (gas permeable unbound granular fill) as defined in SR 21<sup>[8]</sup>(4/40 G<sub>c</sub>:80/20 G<sub>TNR</sub> as per Table 3 of SR 21<sup>[8]</sup>). It should be made firm immediately after placing and be protected from site traffic before the floor slab has been laid.



The *Easi-Sump* is placed within this hardcore layer. See Figure 1 on the front cover of this Detail Sheet.

Each *Easi-Sump* should be placed centrally in an area of hardcore. In buildings where there may be many foundation compartments, a short length of 110mm diameter pipe (or a gap of similar size) should be inserted in all internal foundation rising walls, at centres not exceeding 1m and at approximately the same level as the *Easi-Sump*. This will ensure that the permeability of the hardcore layer remains effective throughout the extent of the building's foundations. See Figure 4.

In the event that a sub-floor radon soil gas control system is activated, it is important that heat producing appliances and the patterns of natural ventilation in interior building spaces should not be affected, or that heat losses be increased. To ensure a necessary degree of separation in the construction of a ground floor, a Radon Resisting Membrane should always be installed by competent personnel.

The *Easi-Sump* has four spigots, intended for the insertion of 110mm diameter drainage pipes. See Figure 3. Typically, one of these pipes should be laid, in accordance with standard drainage pipe installation procedures, to connect with the *Easi-Sump Cap-Link*, which is located just outside the external wall of the building. The other blanked-off spigots should be opened, as required, to accept pipe inserts coming from another part of the building's foundation, and/or another *Easi-Sump*. For reasons of condensation control, falls in pipework should be towards the *Easi-Sump*.

Depending on the quality of ground floor specification, whether or not it is accurately followed on site, the quality of workmanship, and level of technical control during this critical phase of construction, the effective pressure field of the *Easi-Sump* may extend well beyond an area of 250m<sup>2</sup>, or fall below 50m<sup>2</sup>.

As a general rule:

- with Category A Construction Execution, allow for one *Easi-Sump* to service an area not greater than 200m<sup>2</sup>;
- with Category B Construction Execution, allow for one *Easi-Sump* to service an area not greater than 100m<sup>2</sup>;
- with Category C Construction Execution, allow for one *Easi-Sump* to service an area not greater than 50m<sup>2</sup>.

**(See Clause 3.3 for classification of categories).**

Extra *Easi-Sump*'s may be added, or interlinked, to a sub-floor network in order to service larger areas.

**Task No.3:** Before connecting the *Easi-Sump* to an *Easi-Sump Cap-Link*, however, a 110mm pipe exiting a building must be installed in a masonry opening which should:

- a) be of sufficient size – to accommodate any reasonable construction settlement during the building's lifecycle which might interfere with the pipe;
- b) have adequate structural support above the opening – in order to prevent any damage being caused to the pipe from masonry loading overhead;
- c) have an approved flexible seal between the pipe and masonry – in order to avoid the possibility of drawing in air from the exterior thereby reducing the effectiveness of an activated radon soil gas control system. Provide 50mm to 60mm clearance around the pipe to allow for sealing.

Beyond this exit point from the building, all pipework must be gastight.

**Task No.4:** Complete installation by connecting the *Easi-Sump Cap-Link* to the 110mm pipe leading from the *Easi-Sump*.

The cover of the *Easi-Sump Cap-Link* is supplied already in position, with stainless steel screws pre-fixed. This is to prevent:

- (i) tampering and/or unauthorised interference;
- (ii) rain penetration and/or vermin entry into the sub-floor network of the building.

When a Radon Soil Gas Control System is being activated, a circular section of the cover is removed to install a Radon Vent Pipe. This section is of sufficient size to accept a 110mm PVC-U pipe, with a small clearance all around. A central drill locator mark in the cover facilitates removal on site.

#### **Existing Buildings**

Should the installation of an activated radon soil gas control system (with a resulting alteration to sub-floor pressure) ever be considered in an existing building, it must always be established, prior to the commencement of any works, that there is sufficient separation between the sub-floor construction and interior spaces and superstructure construction cavities. Depending on age, an existing building may or may not have a ground floor Radon Resisting Membrane, or a damp resisting membrane.

Easi-Sump

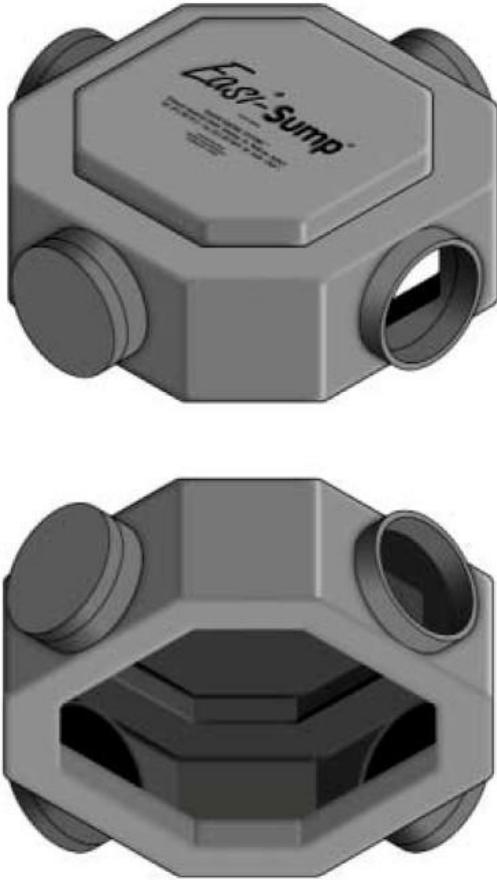
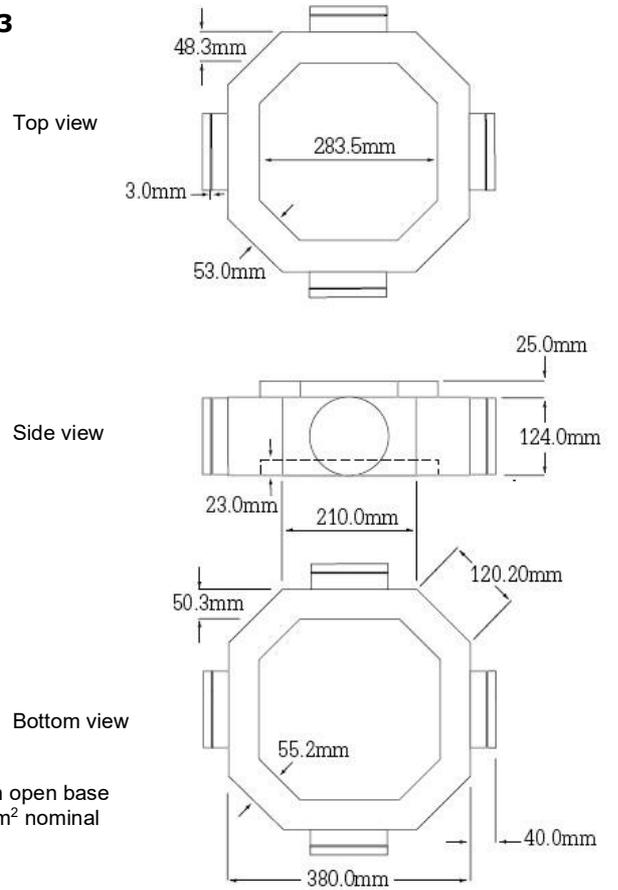
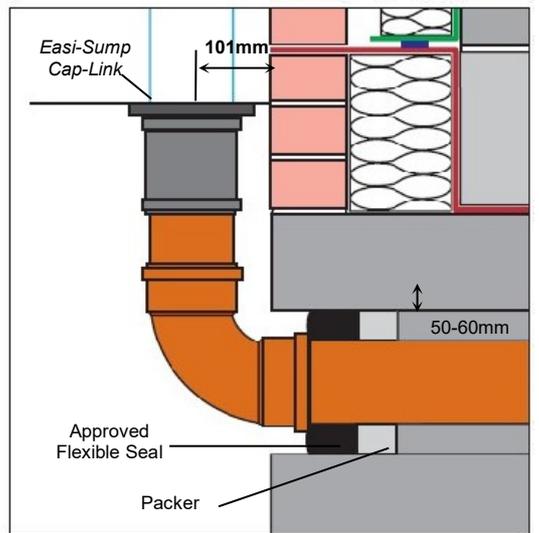
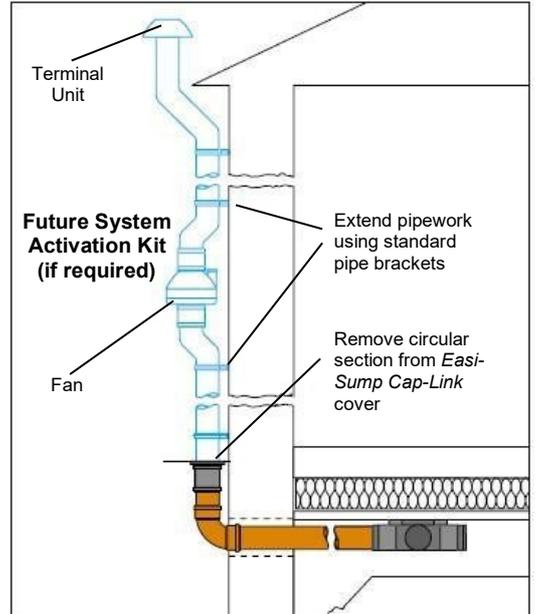
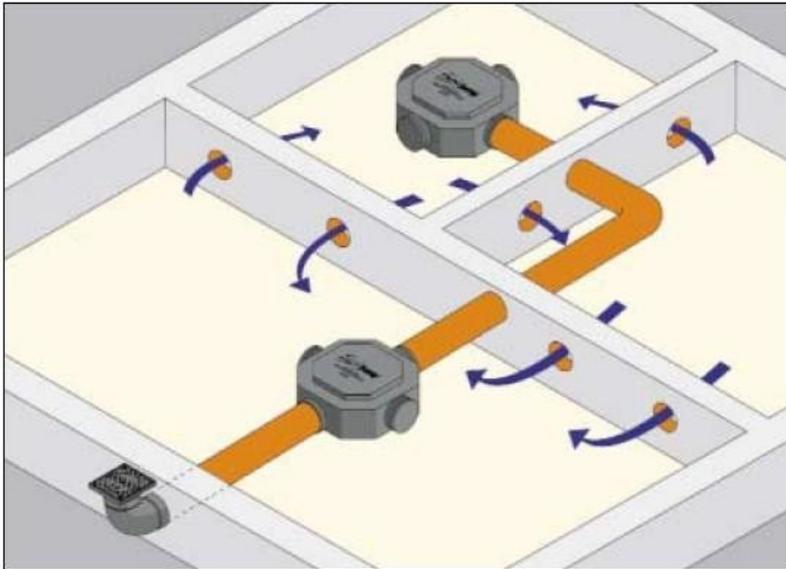
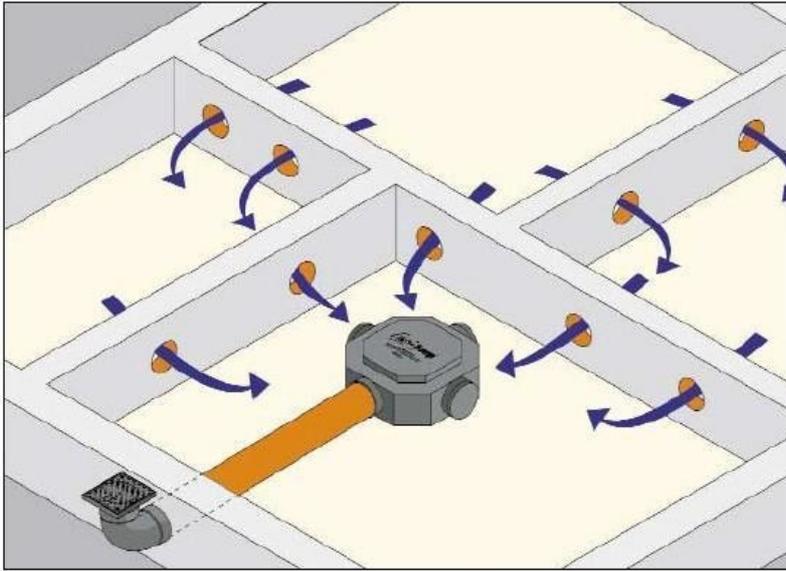


Figure 3



Easi-Sump has an open base area of 72,000mm<sup>2</sup> nominal

**Figure 4**



**Table 1: Easi-Sump Technical Data**

Test	Method	Results	Observations & Comments
Product Material Identification & Properties	Fourier Transform Infra-Red, in transmittance mode	Product matched to a polyethylene-based material	These materials have inherently good chemical resistance, and good low temperature toughness.
Product Relative Density	Density Gradient Column	Mean Density 0.944g/cm <sup>3</sup>	Typical of a medium density polyethylene.
Product Weight	Calibrated Scales	Mean Weight 1856.8g	
Product Wall Thickness	Calibrated Ultrasonic Thickness Gauge	Mean Thickness 4.93mm	All wall thickness measurements above 4mm. Thickness variability typical of a rotationally moulded product.
Short Term Creep – 4 hrs (Compression Test No.5)	Lloyd LR50K Tensometer, using parallel plates	Mean Deflection at 480N (0.48kN/m <sup>2</sup> ) 6.96mm	480N, or 48kg, is equivalent to initial setting of 150mm concrete slab above product.
Compression Test No.2	Lloyd LR50K Tensometer, using parallel plates	Mean Deflection at 10,260N (10.26kN/m <sup>2</sup> ) 27.33mm	Up to 3,420N (3.42kN/m <sup>2</sup> ), there is approximate linear relationship between load and a deflection of 24mm. Above this load, the top section of the product is fully compressed into main body. A tripling of load results in only a further 3mm deflection.
Drop Tests	6 Metre Drop (2 storey height)	Some scratching, and denting (slight deformation of the product contour)	No failures or defects which might affect product performance.
Puncture Tests	Lloyd LR50K Tensometer, using (i) pointed, and (ii) blade type indentors	(i) Puncture at mean 486.5N, with mean deflection of 18.81mm; (ii) Puncture at mean 1899N, with mean deflection of 52.0mm	Product has very good resistance to puncture.

The complete test report may be inspected, upon request to the supplier

### 3.1 GENERAL

It is recommended that the design team of a building should develop a radon protection strategy which is specific to a particular construction site.

Resulting radon activity in the interior spaces and superstructure construction cavities of buildings, including dwellings and workplaces, depends principally on the following factors:-

1. Concentration and pressure of radon activity in the soil;
2. Soil permeability – including moisture conditions (radon is water soluble);
3. Source of hardcore used in building foundation construction;
4. Building design;
5. Quality of building construction;

6. Operation of the completed building by its users, e.g. heating of interiors which causes pressure difference with the exterior or whether or not there is adequate fresh air ventilation;
7. Time-dependent factors, e.g. changes in wind and atmospheric pressures.

There are so many variables, that one radon protection measure, on its own, may not entirely succeed in ensuring an adequate level of human health protection from the hazard of radon. A combination of measures will usually be required. It is for this reason that a properly installed radon resisting membrane should always be considered.

Every new building should also be designed and constructed with features which facilitate further post-construction radon removal from interior

spaces and superstructure construction cavities, in the event that radon levels increase at any period during its lifecycle. The *Easi-Sump* and *Easi-Sump Cap-Link* Assembly are specifically designed to be converted, with ease, into an active protection measure by installing a radon vent pipe and an electrically operated ventilation fan. One Radon Soil Gas Control System is recommended per building. 'Communal' or shared connection of systems from more than one property is not recommended.

### 3.2 SITE CONDITIONS

The *Easi-Sump* and *Easi-Sump Cap-Link* Assembly may be installed in all site conditions considered normal for Ireland. Should a building's foundations be continuously waterlogged for extended periods during the heating season, it may be necessary to install further radon protection measures.

### 3.3 CATEGORIES OF CONSTRUCTION EXECUTION

Category A

- (a) Supervision of the works is exercised by appropriately qualified and experienced personnel from the principal construction organisation.
- (b) Regular inspections, by appropriately qualified and experienced personnel familiar with the design and independent of the construction organisation(s), are carried out to verify that the works are being executed in accordance with the design.

Category B

Supervision of the works is exercised by appropriately qualified and experienced personnel from the principal construction organisation.

Category C

This level of construction execution is assumed when the requirements for Category A and Category B are not met.

### 3.4 POST-CONSTRUCTION TESTING FOR RADON

Upon completion of a building and again, at least, after a period of 12 months following completion, it is recommended that indoor radon levels be reliably tested in order to ensure the continued effectiveness of the radon protection strategy.

### 3.5 ACCESSIBILITY FOR PEOPLE WITH ACTIVITY LIMITATIONS

In detailing a ground floor construction for any building, special consideration should be given to accessibility (see Part M, Building Regulations 1997 to 2021) of entrances and fire exits for people with activity limitations. See Figure 15 in the main Certificate.

### 4.1 TESTS / ASSESSMENTS

The following is a summary of the technical investigations carried out on the *Easi-Sump* and *Easi-Sump Cap-Link* Assembly. Detailed results from the *Easi-Sump* Test Programme are shown in Table 1.

### 4.2 MAINTENANCE

When installed in accordance with this Detail Sheet, no maintenance of the *Easi-Sump* and *Easi-Sump Cap-Link* Assembly is required.

### 4.3 DURABILITY

When installed in accordance with this Detail Sheet, the lifecycle of the *Easi-Sump* and *Easi-Sump Cap-Link* Assembly will match that of the building.

When installed in accordance with this Detail Sheet, the *Easi-Sump* and *Easi-Sump Cap-Link* Assembly is protected from ultraviolet light. The cover of the *Easi-Sump Cap-Link* is adequately resistant to ultraviolet light.

### 4.4 BEHAVIOUR IN FIRE

When installed in accordance with this Detail Sheet, the *Easi-Sump* and *Easi-Sump Cap-Link* Assembly is completely separated from the internal spaces, superstructure construction cavities and the external surfaces of a building; it will, therefore, not contribute to the growth and development stages of a fire, or present a smoke/toxic gas hazard. As a precaution against tampering and unauthorised interference, the cover of the *Easi-Sump Cap-Link* is secured with stainless steel screw fixings.

### 4.5 OTHER INVESTIGATIONS

- a) Data on properties of the Assembly's component products, in relation to strength and toxicity, were assessed;
- b) The manufacturing processes were examined, including the procedures adopted for quality assurance and control. Information was obtained on the quality and composition of product component materials.