### MEMTECH GROUND GAS PROTECTION SYSTEMS HELPING DEVELOPERS RECLAIM UNUSED LAND Date: October 2018



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# A DELTA SOLUTION

Delta Membrane Systems Limited is the leading Type C Cavity Drain Membrane Manufacturer in the United Kingdom. We offer a comprehensive range of ground gas protection solutions along with our structural waterproofing solutions. From our MemTech ground gas membranes to waterproofing systems, our product range is designed to deal with all ground gases, contaminants and waterproofing related projects.

#### GROUND GAS PROTECTION SYSTEMS

Gas protection is a technical solution to prevent or to control gas penetration into properties and structures. Gas protection systems are critical in projects constructed on land affected by permanent ground gas and/or volatile organic compound (VOC) contamination.

Greater emphasis on appropriate gas protection measures have been brought about by the issue of BS 8485: 2015 – Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Gases for New Buildings. All ground gas (Methane, Carbon Dioxide, Radon, VOC's, along with others) protection systems should be designed in accordance with the most up to date Guidance and Regulations. Attention is drawn to CIRIA C665, C716, C735, C748 and BS 8485:2015. In addition, there are specific requirements for building warranty providers such as NHBC.





A full range of data sheets and installation guides are available on all our products.

### SERVICES

Delta Membrane Systems Limited provides a full range of ground gas protection and waterproofing solutions suitable for all new, retrofit and refurbishment construction. With over 125 years of manufacturing experience Delta is an impeccable partner on every project. Our skills have been master through experience in the waterproofing industry. Delta's trusted Technical Team will offer assistance from concept to completion. Our hands on approach and knowledge is what sets us apart.



#### **DESIGN SUPPORT**

- Architecture knowledge
- Concept solutions
- Advice on design and best practice
- Custom solutions, as
  each project is unique in
  requirements



#### SPECIFICATION SUPPORT

- Detailed drawings including CAD
- Watertight and locking down structure concepts
- Specifications
- BIM
- NBS Plus
- RIBA Product Selector



#### SITE SUPPORT

- Training and guidance offered at every step
- Technical Team attendance at site meetings
- Knowledge and experience
- Troubleshooting solutions





### GROUND GASES EXPLAINED

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#### HYDROCARBONS

Hydrocarbons derive from the petrol chemistry industry and are highly toxic. The majority of Hydrocarbons have the potential to cause cancer.

#### METHANE

An odourless flammable gas that is explosive when released into the atmosphere at levels as low as 5% and exposed to a source of ignition. Methane is formed where there is below ground degradation of organic substances e.g. landfill sites, sewage treatment areas, mining operations and peat bogs.

#### CARBON DIOXIDE

Carbon Dioxide is a odourless and colourless toxic gas. In high concentrations can result in asphyxiation. The gas is formed by the oxidation of carbon compounds such as that which occurs in landfill sites. When Carbon Dioxide levels reach a concentration of 3%, symptoms of headaches and shortness of breath will occur, becoming severe at 5% between 7-10% will cause suffocation.

#### RADON

Radon occurs naturally in the environment, this radioactive gas is, colourless, odourless and tasteless. Radon can migrate into any building that is built over a source. If it accumulates in a building, it increases the risk of lung cancer for occupants. Radon is the cause of 15% of lung cancers worldwide (World Health Organisation 'WHO' 2009).

#### VOLATILE ORGANIC COMPOUNDS (VOCS)

Volatile Organic Compounds (VOCs) are organic compounds that easily volatise under normal atmospheric conditions/environments to become vapours or gases. Along with carbon, they contain elements such as hydrogen, oxygen, fluorine, chlorine, bromine, sulphur or nitrogen. Typical VOCs encountered on brownfield and industrial sites include: Petroleum, benzene, toluene, butylbenzenes, chlorinated ethenes, Nitrogen, sulphur and tetrahydrofuran. VOCs in the air react with oxides of nitrogen in the presence of sunlight to form ozone.

### HOW RADON ENTERS A HOUSE



### PROTECTING BUILDINGS AND STRUCTURES ON CONTAMINATED LAND

MemTech Ground Gas Protection Membranes and Venting Systems allows for construction on contaminated land such as brownfield and historical industrial sites (including petrol stations). Ground Gas Protection Systems are critical for developments constructed on sites affected by ground gas and/or volatile organic compound (VOC) contamination.

Ground Gas Protection Systems should be designed with one focus 'Reducing Risk and Prevention of Hazardous Gases'.

Methodology, legislations and advisory documentation should be incorporated into the design of a Ground Gas Protection System. Consideration and attention should be given to gaps around service pipes, construction joints, wall cavities and cracks in walls and ground slabs to form an integrated system.

A Ground Gas Protection Membrane should also perform the function of a damp proof membrane and waterproof membrane for below ground structures.

Our range of reinforced gas barriers are complemented with a variety of sealing tapes, self adhesive flashings and gas resistant damp proof courses.



#### A GROUND GAS PROTECTION SYSTEM SHOULD COVER:

- Structural barrier (floor & substructure design)
- Ventilation protection (floor slab type)
- Membranes
- Monitoring and detection
- Pathway intervention





#### **BSI Standards Publication**

Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings





# LEGISLATION AND ADVISORY DOCUMENTATION

Recent years have seen numerous changes to legislation in relation to affected sites by permanent ground gases and VOC contamination. Up to date guidance is available through British Standards (BSi) and the CIRIA suite of documents relating to contamination.



#### PERMANENT GROUND GAS

**CIRIA C665 (2007)** refers to 'permanent gas' and assessing risks posed by hazardous ground gases to buildings. Reference to gases such as Carbon Dioxide, Methane or landfill gases fall within the 'permanent gas' category. **CIRCA C665 (2007)** offers an introduction to gas screening value calculations, allowing sites to be characterised between 1-6. Gas screening value calculations are also used in **British Standard 8485:2015**. Gas screening values factor in building type and characteristic situations which are paired to give a point score to achieve relevant protection. Points are allotted dependent on system used to protect a structure (structural barrier, ventilation protection and the selected membrane).

Housing and public buildings require a higher point score than industrial and commercial structures due to higher risk to the receptor.

Emphasis is not only on the quality of materials used, but also on the design performance of ventilation systems, together with their installation and verification. **CIRCA C665 (2007)** seeks for assessment of risk along with the selection of options for remediation.

**BS8485:2015, CIEH Ground Gas Handbook (2009)** and **CIRIA C735 (2014)** set out the requirements for independent validation and integrity testing by independent 3rd party verification specialists.

Good practice on the testing and verification of protection systems for buildings against hazardous ground gases





Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

#### RADON (RN)

**BRE 211 (2015)** sets out protection from Radon. The current 2015 edition of BR211 covers the whole of the UK and replaces three earlier guidance documents:

- BRE Report BR211 Radon: guidance on protective measures for new buildings originally introduced in 1991 and amended in 1992, 1999 and 2007 covering England and Wales.
- BRE Report BR376 Radon: guidance on protective measures for new dwellings in Scotland introduced in 1999. (Please note that whilst this guide has been superseded it is still referred to in Scottish Technical Handbook guidance.)
- BRE Report BR413 Radon: guidance on protective measures for new dwellings in Northern Ireland introduced in 2001. (Please note that whilst this guide has been superseded it is still cited for Building Regulations purposes)

**BR211 (2015)** includes guidance for all building types including extensions, conversions and refurbishment. The report identifies the areas of England, Wales, Scotland and Northern Ireland where measures should be taken to provide protection against Radon and offers extensive guidance on the technical solutions that are required to satisfy Building Regulations requirements.

**THE RADON COUNCIL** formed in 1990, is an Independent non-profit making self-regulatory body for the radon protection industry. The Radon Council has produced a 'Best Practice Guidance: Radon Protection and Remediation' document detailing its recommendations for how radon should be managed in both new and existing buildings.

#### VOLATILE ORGANIC COMPOUNDS (VOCS)

**CIRIA C716 (2012)** makes recommendations for sites with VOC issues and the required remediation. CIRIA C716 (2012) offers guidance through the three stages of remediation risk:

- Development of remediation strategy
- Design and implementation of remediation strategy
- Verification of the remediation strategy (including long term maintenance and monitoring).

BS8576:2013 Guidance on Investigations for Ground Gas – Permanent gases and Volatile Organic Compounds (VOCs) has been created through the collaboration of experts within the field such as the Chartered Institute of Environmental Health, Environment Agency and the Institution of Civil Engineers. BS8576:2013 provides good advice, practice and practicality that current effective and efficient site investigations require, regarding the monitoring and sampling of permanent gases – Carbon Dioxide, Methane, Oxygen, and Volatile Organic Compounds (VOCs).

**CIRIA C748 (2014)** offers guidance on the use of plastic membranes as VOC vapour barriers

Independent validation stipulates this as a requirement for sites with VOC contamination.





# MEMTECH PRO R1

MemTech PRO R1 Gas Barrier is a flexible, loose laid proprietary gas barrier for use on sites with Radon (RN) ground gas. R1 is a three layer, low density polyethylene membrane reinforced with a polypropylene reinforcement grid. MemTech PRO R1 gas barrier membrane has a distinct Red (top) and Grey (bottom) as standard.

Radon is a naturally occurring radioactive gas which is odourless, tasteless and colourless. Radon is formed from rocks and soil and can be found everywhere in the United Kingdom. Radon will resettle into any building or structure which is built over the source. High levels of radon and exposure to Radon can cause lung cancer.



#### SPECIFICATION

- Complies with CIRIA C748, BRE211:2015 and BS8485:2015
- Exceptional chemical resistance
- Lightweight, three layer, low density, flexible polyethylene membrane to ease installation on site
- Gas resistant
- BBA Certified
- High resistance to puncturing
- Suitable for new and existing structures
- Also acts as a Damp Proof Membrane
- Robust to cope with all site conditions

#### ANCILLARIES

- MemTech Pro Gas Tape
- MemTech Pro Gas Overtape
- MemTech Pro LGB
- MemTech Pro Radon Sump
- MemTech Pro Void Vent 25
- Periscope Vents

#### TECHNICAL DATA

Material:	Low Density Polyethylene
Roll Size:	3m x 50m
Radon Permeability (m²/sec)	4.3 × 10- <sup>12</sup>
Methane Permeability*	<514
Carbon Dioxide Permeability*	<514

\* ml/m²/day/atm BS EN ISO 15105-1

#### INSTALLATION

MemTech PRO R1 offers 2 application choices; tape jointed or thermal welding ensuring a secure, watertight joint. MemTech PRO R1 Gas Membrane should be laid on either: Concrete or sand blinding, MemTech Protech Geotextile Protection fleece or a smooth concrete finish.



### MEMTECH PRO M1 MEMBRANE

MemTech Pro M1 is a flexible, loose laid Ground Gas Barrier Membrane made from low-density polythene with a foil core layer. MemTech Pro M1 can be used as a gas barrier and high performance damp proof membrane for application on concrete ground floors, above and below the slab (not subject to hydrostatic pressure), to protect a structure against moisture, radon, methane and carbon dioxide contaminates from the ground. MemTech Pro M1 complies with BS 8485:2015. Suitable for use on brownfield sites that require protection from dangerous contaminants such as hydrocarbons. MemTech Pro M1 has been developed to ease installation on site due to the flexibility of the membrane. MemTech Pro M1 will protect against the ingress of hydrocarbon vapours where is it separated from the ground (e.g. above a block and beam floor).



#### **SPECIFICATION**

- Complies with BRE211:2015 and BS8485:2015
- Exceptional chemical resistance
- Gas resistant
- Flexible membrane to ease installation on site
- Robust & durable multi-layer
  membrane
- High resistance to puncturing
- Suitable for new and existing structures
- 3rd Party accredited
- Independently testedBBA Certified
- Also acts as a Damp Proof
  Membrane

#### ANCILLARIES

- MemTech Gas Tape
- MemTech Gas Overtape
  - MemTech 300 Detailing Strip
  - MemTech LGB

#### TECHNICAL DATA

Material:	2 Layer Polyethylene with reinforcing and foil core layer
Roll Size:	2m x 50m
Radon Permeability	
Methane Permeability*	<0.09
Carbon Dioxide Permeability*	<0.09
*ml/m²/day/atm BS EN ISO 15105-1	



#### INSTALLATION

MemTech Pro M1 offers 2 application choices; tape jointed or thermal welding ensuring a secure, watertight joint. MemTech Pro M1 Gas Membrane should be laid on either: concrete or sand blinding, MemTech Protech Geotextile Protection fleece or a smooth concrete finish.



# MEMTECH PRO TITAN

MemTech Pro Titan ground gas membrane offers a safe solution for the protection of buildings, structures and occupiers against all levels of hydrocarbons, methane, carbon dioxide and radon gas ingress.

MemTech Pro Titan is a hydrocarbon barrier gas membrane. This multi-layered, flexible membrane has a unique core component which is designed and manufactured to provide a barrier to the most aggressive chemicals and to comply with current guidance on Hydrocarbons.

MemTech's Pro Titan is suitable in applications that are affected by Hydrocarbons. There is a common misconception that monolithic polyolefin barriers, such as HDPE and LLDPE are effective barriers to resist Hydrocarbons. This is an incorrect assumption, as Hydrocarbons will readily permeate through monolithic polyolefin barriers.



#### SPECIFICATION

- Complies with BRE211:2015, CIRIA C665, C716, C735, C748 and BS8485:2015 and CIEH guide to Ground Gas.
- Exceptional chemical resistance Flexible membrane to ease installation on site
- Gas resistant
- High resistance to puncturing
- Suitable for new and existing structures
- Also acts as a Damp Proof Membrane
- Robust to cope with all site conditions

#### ANCILLARIES

- MemTech Pro LGB
- MemTech Pro Titan
  Detailing Strip
- MemTech Pro Titan Bond External Tape
- Koster Repair Mortar Plus

FECHNICAL DATA
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Material:	Multi Layer Polyethylene membrane with Polymer core
Roll Size:	2m x 50m
Methane Permeability*	0.13
Carbon Dioxide Permeability*	3.01
Transmission Rate Vinyl Chloride Gas*	25mm
Radon Permeability m²/sec**	3.0 X 10 - <sup>12</sup>

\*ml/m²/day/atm EN ISO 15101-1 \*\*SP Method 3873

#### INSTALLATION

MemTech PRO Titan should be jointed by thermal welding ensuring a secure, watertight joint. MemTech Pro Titan Hydrocarbon and VOC Gas Membrane should be laid on either: Concrete or sand blinding, MemTech Protech Geotextile Protection fleece or a smooth concrete finish.

### MEMTECH PRO TITAN BOND

MemTech Pro Titan Bond pre applied waterproof and ground gas membrane offers a safe solution for the protection of buildings, structures and occupiers against all levels of Hydrocarbons, Methane, Carbon Dioxide and Radon gas ingress.

MemTech Pro Titan Bond is a pre applied waterproof and hydrocarbon barrier gas membrane. This multi-layered, flexible membrane has a unique core component, with a bonded textile for pre applied applications which is designed and manufactured to provide a barrier to the most aggressive chemicals and ground water and to comply with current guidance on Hydrocarbons.

MemTech's Pro Titan Bond is suitable in applications that are affected by Hydrocarbons and groundwater. There is a common misconception that monolithic polyolefin barriers, such as HDPE and LLDPE are effective barriers to resist Hydrocarbons. This is an incorrect assumption, as Hydrocarbons will readily permeate through monolithic polyolefin barriers.



#### SPECIFICATION

- Complies with BRE211:2015, CIRIA C665, C716, C735, C748 and BS8485:2015 and CIEH guide to Ground Gas.
- Complies with BS 8102 (2009)
  Type A barrier Protection
- Exceptional chemical resistance
- Waterproof
- Flexible membrane to ease
  installation on site
- Gas resistant
- High resistance to puncturing
- Suitable for new build basements, Tunnels and concrete structures below ground
- Also acts as a Damp Proof
  Membrane
- Robust to cope with all site conditions

#### ANCILLARIES

- MemTech LGB
- MemTech Pro Titan
  Detailing Strip
- MemTech Pro Titan Bond External Tape
- Koster Repair Mortar Plus

#### **TECHNICAL DATA**

Material:	Multi Layer Polyethylene membrane with Polymer core
Roll Size:	2m x 50m
Methane Permeability*	0.13
Carbon Dioxide Permeability*	3.01
Transmission Rate Vinyl Chloride Gas*	25mm

#### INSTALLATION

MemTech PRO Titan Bond should be joined by thermal welding ensuring a secure, watertight joint. MemTech PRO Titan Bond Hydrocarbon and VOC Gas Membrane should be laid on either: Concrete or sand blinding, MemTech Protech Geotextile Protection fleece or a smooth concrete finish.

## MEMTECH PRO TITAN TANK

MemTech Pro Titan Tank post applied waterproof and ground gas membrane offers a safe solution for the protection of buildings, structures and occupiers against all levels of Hydrocarbons, Methane, Carbon Dioxide and Radon gas ingress.



MemTech Pro Titan Tank is a post applied waterproof and hydrocarbon barrier gas membrane. This multi-layered, flexible membrane has a unique core component, with a specialist all weather adhesive backing for post applied applications which is designed and manufactured to provide a barrier to the most aggressive chemicals and ground water and to comply with current guidance on Hydrocarbons.

MemTech Pro Titan Tank is suitable in applications that are affected by Hydrocarbons and groundwater. There is a common misconception that monolithic polyolefin barriers, such as HDPE and LLDPE are effective barriers to resist Hydrocarbons. This is an incorrect assumption, as Hydrocarbons will readily permeate through monolithic polyolefin barriers.

#### TECHNICAL DATA

Material:	Multi Layer Polyethylene membrane with Polymer core
Roll Size:	2m x 25m
Methane Permeability*	0.13
Carbon Dioxide Permeability*	3.01
Transmission Rate Vinyl Chloride Gas*	25mm
Radon Permeability m²/sec**	3.0 × 10 - <sup>12</sup>

\*ml/m²/day/atm ISO EN 15105-1 \*\* SP Method 3873

#### INSTALLATION

MemTech Pro Titan Tank should be jointed by sealing tapes or thermal welding ensuring a secure, watertight joint. MemTech Pro Titan Tank Hydrocarbon and VOC Gas Membrane should be laid on either: Concrete or sand blinding. MemTech Protech Geotextile Protection fleece or a smooth concrete finish. When applied to vertical surface the MemTech Pro Titan Tank should be applied to a Delta Bitumen Primer primed surface.

#### SPECIFICATION

- Complies with BRE211:2015, CIRIA C665, C716, C735, C748 and BS8485:2015 and CIEH guide to Ground Gas.
- Complies with BS 8102 (2009) Type A barrier Protection
- Exceptional chemical resistanceWaterproof
- Flexible membrane to ease installation on site
- Gas resistant
- High resistance to puncturing
- Suitable for new build basements, Tunnels and concrete structures below ground
- Also acts as a Damp Proof Membrane
- Robust to cope with all site conditions

#### ANCILLARIES

- MemTech Pro LGB
- Delta Bitumen Primer
- MemTech Pro Titan Bond External Tape
- MemTech Pro Titan Detailing Strip
- Koster Repair Mortar Plus

### MEMTECH PRO LIQUID GAS BARRIER (LGB) MEMBRANE

MemTech Pro Liquid Gas Barrier (LGB) is a liquid applied Gas Barrier Membrane. MemTech Pro Liquid Gas Membrane is a distinctive green or red, ready for use specialist styrene butadiene latex based liquid applied gas membrane. It offers a simple, continuous passive gas prevention barrier against the ingress of Methane, Carbon Dioxide, Radon, Ground Gas, VOC, air and Moisture into buildings. MemTech Pro LGB also acts as a waterproofing membrane complying with the requirement C2 and C4 schedule 1 of the Building Regulations 1991 for England and Wales.



#### SPECIFICATION

- Complies with C2 and C4, Schedule 1 of Building Regulations, BRE211:2015 and BS8485:2015
- Exceptional chemical resistance
- Gas resistant
- Flexible membrane to ease installation on site
- High resistance to puncturing
- Suitable for new and existing structures
- 3rd Party accredited Independently tested
- Also acts as a Damp Proof Membrane

#### ANCILLARIES

- MemTech Pro LGB Joint Tape
- Koster Repair Mortar Plus

#### TECHNICAL DATA

Material:	Styrene butadiene latex based
Pack Size:	15Kg
Water Tightness	PASS
Radon Permeability*	>1mm applied thickness provides complete barrier
Methane Permeability**	0.01



\*EN1296, EN1367, EN1928 \*\*ml/m²/day/atm BS EN ISO 15105-1

#### INSTALLATION

MemTech Pro Liquid Gas Membrane is easily applied using a brush, roller or airless spray. A minimum 2 coat application providing a minimum dry coated thickness of 1.0mm is required to provide a suitable gas barrier.

# MEMTECH PRO VOID VENT 25

MemTech Pro Void Vent 25 offers a passive venting solution which facilitates the dispersal and dilution of dangerous gases. MemTech's Pro Void Vent 25 has been specially designed to provide for high levels of air and/or gas flow.

MemTech Pro Void Vent 25 is a cuspated HDPE (High Density Polyethylene) Membrane with a geotextile filter/separator. Void Vent 25 has been designed to be installed with the geotextile filter side of the product to be in contact with the ground to allow for air and/or gas flow. Void Vent 25 is available in either a 25mm or 40mm depth. MemTech PRO Void Vent 25 complies with the latest codes of practice (BRE, CIRIA and NHBC).



#### SPECIFICATION

- Complies with BRE211:2015 and BS8485:2015
  - Exceptional chemical resistance
- Lightweight, flexible membrane to ease installation on site
- High gas flow capacity
- Creates a de-pressurisation zone for collection of ground gases
- Gas resistant
- Independently tested by UKAS
- High resistance to puncturing
- Suitable for new and existing structures
- Also acts as a Damp Proof Membrane

#### ANCILLARIES

- MemTech Pro Rectangular
  Vent Unit
- MemTech Pro Circular Vent
- MemTech Pro Gas Vent Mat Connector to Periscope
- MemTech Pro Adjustable Periscope Vent
- MemTech Pro Vent Bollard
- MemTech Pro Solid Connector Pipe

#### TECHNICAL DATA

Material:	HDPE Core & Bonded Geotextile Filter
Roll Size:	900mm x 50m
Compressive Strength*	300 kPa
Gas Flow Capacity (composite)	0.024 m <sup>3</sup> /s
Depth"	25mm
* EN ISO 25619-2	

"40mm depth available on request

MemTech Pro Void Vent 25 provides a means of ventilation system when used in conjunction with:

- MemTech Pro Liquid Gas Barrier
- MemTech Pro M1
- MemTech Pro R1
- MemTech Pro Titan

#### INSTALLATION

MemTech PRO Void Vent is laid on sand or concrete blinding layer under the ground floor slab below the MemTech gas barrier membrane to provide passive ventilation in accordance with BS 8485:2015. MemTech PRO Void Vent can be laid in strips at 6m centres or across the entire footprint of the building depending on CS classification and dimensions of the building to provide the appropriate level of ventilation in accordance with BS 8485:2015.

# MEMTECH PRO ANCILLARIES

#### JOINTING AND SEALING

MemTech Gas Protection membranes come with a range of sealing tapes, detailing strips and ventilation accessories to optimise their installation. Generally where possible and practical joints between the MemTech Pro Membranes should be heat welded, where this is not possible or practical we recommend the use of MemTech sealing tapes and detailing strips.



#### MEMTECH GAS TAPE

50mm x 25m Butyl double sided sealing tape for sealing lap joints in MemTech membranes. MEMTECH GAS OVERTAPE 150

150mm x 30m Butyl overtape with an aluminium foil backing to provide a secondary seal to MemTech Membrane joints and for detailing around service penetrations.

#### MEMTECH PRO TITAN EXTERNAL TAPE

300mm x 20m under tape for use with MemTech PRO Titan Bond pre applied waterproof and VOC/ Hydrocarbon Membrane.

#### MEMTECH PRO TITAN DETAILING STRIP

1m x 25m Specially designed narrow width roll of MemTech or MemTech PRO Titan Bond for use on kicker details and transition areas from horizontal to vertical.



MEMTECH PRO TITAN TAPE

100mm x 15m Extruded Butyle

for jointing MemTech PRO Titan

double sided tape designed

Membranes.

#### PASSIVE VENTILATION

MemTech gas protection system comes with a comprehensive range of ventilation ancillaries and components for use with the MemTech PRO Void Vent 25 passive ventilation mat.

The range includes vent boxes which provide a practical and aesthetic method for venting to external atmosphere. Adjustable periscopic vents, radon sumps, slotted carrier pipes along with connectors and T – Pieces.

