Green Roof Property Ltd
256D Kingsway North
Gateshead
NE11 0JS
www.greenroofstructures.com

Gas Protection Strategy Report

Proposed dwelling, Carr Stone Villa, Main Street, Low Hauxley, Northumberland, NE65 0JS

Planning application ref: 23/00403/FUL

By: John McAulay MEng CEng MIStructE

Date: 07/09/23

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1. Scope of Report

This report outlines the proposed ground gas protection measures to be provided for the above scheme. The report details the protective measures required to prevent the ingress of ground gases, including depleted oxygen to the Characterisation Situation 2 standard (CS2) as specified in BS8485:2015.

The report is provided to confirm the requirements as requested by condition no. 12 of the planning permission (ref. above) as follows:

12 Public protection ground gasses

No buildings shall be constructed until a report detailing the proposed protective measures to prevent the ingress of ground gases, including depleted Oxygen (<19%), to the standard required in BS8485:2015+A1:2019 (Code of Practice for the design of protective measures for Methane and Carbon Dioxide ground gases for new buildings), or to a minimum of Characteristic Situation 2 level of protection, has been submitted to and approved in writing by the Local Planning Authority. The report shall specify to the Local Planning Authority's satisfaction how the annulus of service ducts will be sealed to

prevent gas ingress into the living space of the dwelling. The report shall contain full details of the validation and verification assessment to be undertaken on the installed ground gas protection, as detailed in CIRIA C735 (Good practice on the testing and verification of protection systems for buildings against hazardous ground gases)
Reason: In order to prevent any accumulation of ground gas, which may be prejudicial to the health & amenity.

The scheme itself involves the erection of a two-storey timber framed dwelling onto a concrete raft slab foundation at the above location.

2. Background and relevant site information

Planning permission has been granted for the demolition of an existing dwelling and the erection of a 4 bedroomed single dwelling with associated hard and soft landscaping.

The site comprise an existing dwelling and outbuilding which are to be demolished.

A review of available BGS mapping data and record boreholes indicates likely ground conditions as below. An intrusive investigation has been undertaken to confirm there is no risk from legacy coal mining.

The underlying ground conditions can be summarised as follows:

Superficial deposits = till, devensian – diamicton

Bedrock deposits = Pennine middle coal measures formation - mudstone, siltstone and sandstone

Made ground is to be expected below the site given its current developed nature.

Whilst gas monitoring was not undertaken in this investigation, it is a planning requirement as noted above for details of protection against ground gases based on a minimum standard of Characteristic Situation 2 level of protection to be provided.

3. Gas protection measures proposed

BS8485:2015, “Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings” sets out a methodology for determining an appropriate level of protection against ground gases in respect of the Characteristic Situation classification and the proposed building type.

In accordance with Condition 4 of the Planning Consent (23/00435/FUL) document, gas protection measures suitable for a Characteristic Situation 2 (CS2) gas regime are required at the site designed in accordance with BS8485:2015 and validated as detailed in CIRIA 735.
For a Type A building (Private Low-Rise Residential) (Highest Risk) on a CS2 site the Minimum Gas Protection Score is **3.5**.
Appropriate gas protection measures should be incorporated into the proposed development to meet these requirements as described in BS8485:2015.
Based on Tables 5, 6 and 7 in BS8485:2015 a suitable combination of gas protection measures to meet the Gas Protection Score may comprise:

Protection Element / System	Score
Block and Beam Floor or	**0.0** (Table 5)
Cast In-situ ground bearing floor slab. or	**0.5** (Table 5)
Cast in-situ monolithic reinforced ground bearing raft or reinforced cast in-situ suspended floor slab with minimal penetrations.	**1 or 1.5** (Table 5)
Passive subfloor dispersal layer Dispersal layer may be formed by: • Clear void • Polystyrene void former blanket • Geo-composite void former blanket • No-fines gravel layer with gas drains • No fines gravel layer	**1.5** (Table 6) Good performance)
Gas resistant membrane meeting ALL of the following criteria: • Sufficiently impervious to the gases with a methane gas transmission rate <40.0 ml/day/m²/atm (average) for sheet and joints (tested in accordance with BS ISO 15105-1 manometric method); • Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions; • Sufficiently strong to withstand in-service stresses (e.g. settlement if placed below a floor slab); • Sufficiently strong to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools etc.); • Capable, after installation, of providing a complete barrier to the entry of the relevant gas; and • Verified in accordance with Ciria C735.	**2** (Table 7)

Table 1 – example suitable provision of protection

Based on the proposed structural strategy for the building, to be founded on a reinforced concrete raft slab over a min. 300mm granular fill (in 150mm compacted layers), it is advised that the following is provided as per the typical slab detail below:

Cast in-situ monolithic ground bearing raft slab – fully reinforced, minimal penetrations (1.5)
Ground gas membrane (2)
Dispersal layer comprising 300mm no fines gravel passive venting layer (1.5)

Total score = 5

5 > 3.5 therefore adequate level of protection provided.

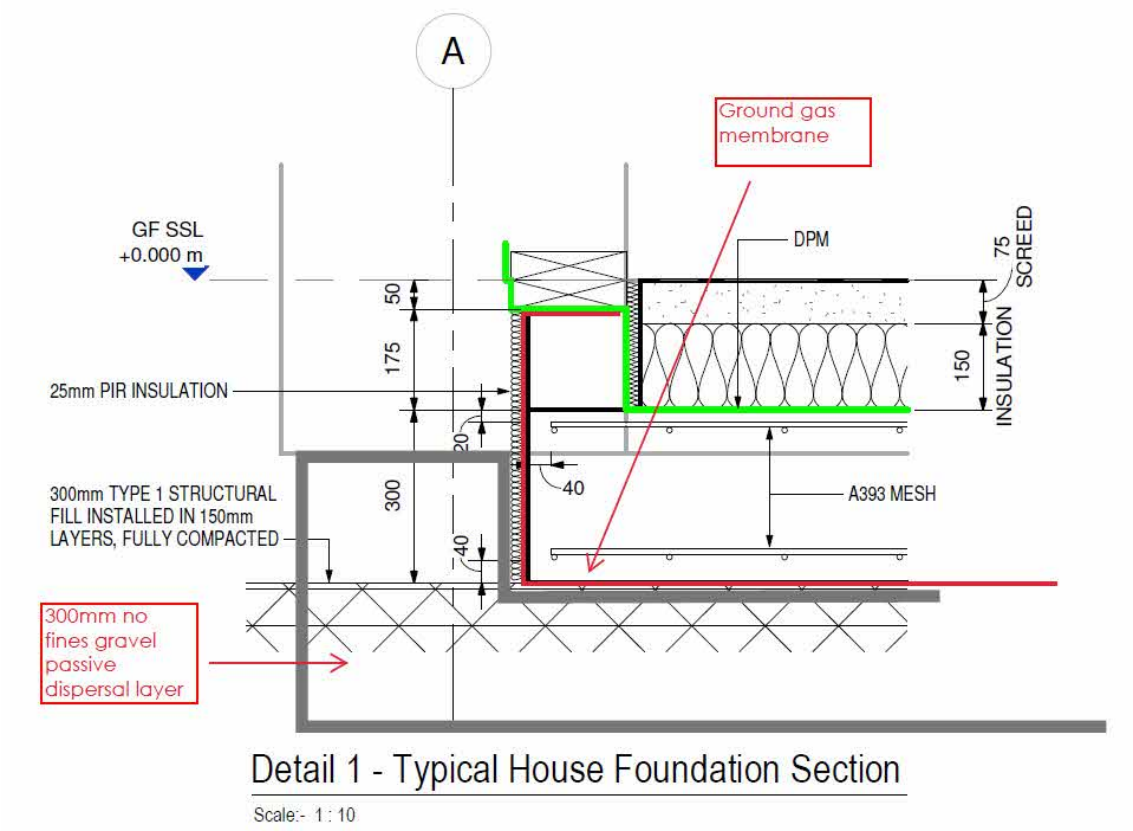

Fig. 1 proposed typical protection detail

Level of Verification Requirement (YALPAG Gas Guidance KP4)

Based on Table A2 within CIRIA report C735 the site is classified as Low Risk assuming a reinforced slab with venting – refer to extract below.

For Low Risk developments the installer may be either a General Builder / Groundworker / Landfill Operative with no relevant qualification or a Qualified and experienced installer with a minimum of 1 operative to hold appropriate qualifications. The level of verification required is subject to the experience of the installer and is as follows:

Table A2 Situation A – all development types except situation B – reinforced slabs (from Wilson et al, 2007)

Gas regime/risk	Slab type	Installer experience	Suggested levels of verification and integrity testing
Low risk CS2 (*with venting) Basic radon protection area	Reinforced All slabs	General builder/ groundworker/ landfill operative (no relevant qualification[1])	Verifier (consultant[4] or qualified and experienced installer[1]) to conduct a thorough verification (visual) inspection prior to all concrete pours. Contractor to supply sign off sheets (verification evidence) including sub grade acceptance forms and photographs to independent verifier.
		Qualified[1] and experienced installer (minimum one operative to hold qualification)	Verifier (consultant[4] or third party qualified and experienced installer[1]) to conduct a thorough verification (visual) inspection prior to 25 per cent concrete pours (min two visits), including vented void, subgrade etc. Installer to supply sign off sheets (verification evidence) including, sub grade acceptance forms, photographs to independent verifier for all other pours.
Intermediate risk CS2 (no venting) or CS3 (*with venting) Full radon protection area		General builder/ groundworker/ landfill operative (no relevant qualification[1])	Verifier (consultant[4] or qualified and experienced installer[1]) to conduct a thorough verification (visual) inspection prior to all concrete pours including vented void, subgrade etc. All joints, pipe penetrations etc independently air lanced to ASTM D4437. Consideration given to the need for and scope of integrity testing (eg initially on say 50 to 25 per cent of pours then falling to 25 to 10 per cent if acceptable results obtained and no concerns raised by visual inspections.
		Qualified[1] and experienced installer (minimum one operative to hold qualification)	Verifier (consultant[4] or third party qualified and experienced installer[1]) to conduct a thorough verification (visual) inspection prior to 50 per cent of concrete pours, including vented void, subgrade etc 25 per cent of joints, pipe penetrations etc independently air lanced to ASTM D4437. Remaining joints, pipe penetrations, corners etc tested to a recognised standard by installer (as detailed in method statement and CQA plan). Installer to supply sign off sheets (verification evidence) including, sub grade acceptance forms, photographs etc to independent verifier for all other pours. Consideration given to need for/scope of integrity testing (eg initially on 10 to 25 per cent of pours then falling to 0 to 10 per cent if acceptable results and no concerns raised by visual inspections).
High risk VOC and hydrocarbons CS3 (no venting) or CS4 and above (*with venting)		Qualified[1] and experienced installer (50 per cent of operatives to hold qualification)	Verifier (consultant[4] or third party qualified and experienced installer[1]) to conduct a thorough verification (visual) inspection prior to all concrete pours including vented void, subgrade etc. All joints, pipe penetrations etc independently air lanced to ASTM D4437. 100 per cent leak detection considered on VOC/ hydrocarbon contaminated sites.. Consideration given to need for/scope of integrity testing (eg initially on 50 to 25 per cent of pours then falling to 25 to 10 per cent if acceptable results obtained and no concerns raised by visual inspections).

Table 2 – extract from Ciria 735 – Table A2

Any non-conformances in the gas protection measures detected during inspections are to be rectified to the satisfaction of the verifier before works may progress. Any non-conformances are to be recorded with details of works required and undertaken to rectify the situation.

On completion of the installation a signed plot-specific statement or certificate will be produced for the development plot by the supervising experienced installer confirming that the gas protection measures were installed as agreed and that the membrane was free from tears and punctures and was lapped and sealed as agreed at joins and around services and sub-floor voids were clear and free from debris. These certificates are to be included within the Verification Report in a format similar to that given in Appendix A5 of CIRIA 735 and replicated in Appendix 5 of the YALPAG guidance on Verification Requirements for Gas Protection Systems.

Plot specific photographs showing the installed membrane will also be included within the Verification Report which will be forwarded to Northumberland County Council to discharge the condition. It should also be noted that verification of the effective seal the annulus on the service duct(s) will be required. The applicant should ensure that as well as the top-hat being secured to the membrane (taped or welded) that the internal annulus of the duct holding each of the service pipes and conduits (water etc.) should be filled with a gas tight sealant. One such suitable sealant (Filoseal) is detailed within the appendix of this report along with specific instructions pertaining to the use of this product. The installation of this sealant will require verification as above - it should be noted that a second verification will be required by
the supervising experienced installer as the installation of services usually takes place after the main gas protection components are installed. The plot specific validation certificate will be withheld until verification of the sealing of service ducts is carried out – including photographic evidence within the certificate.
An appropriate membrane, duct sealant (and specific instructions) that maybe be used at the site is presented in the appendix to this report. The products are indicative and the those selected by the contractor should meet the minimum requirements as outlined in this report.

Appendix

Example suitable gas membrane, duct sealant and relevant instructions

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PRO M1 GROUND GAS BARRIER

Product Code: DMS402

GROUND GAS MEMBRANES

info@deltamembranes.com

www.deltamembranes.com

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The barrier is manufactured by an extrusion/coating process which incorporates a two layer low density polyethylene membrane with a polypropylene reinforcement grid and an ±Ĭł ĵ ǴĜĵ üŅĜĬļ ų å ţĒĵ åĵ Æę ±Ĺ åĜŸåƻƌ ųåĵåĬ5ãåƻ ĜĂĒåüŅų ease of installation and is robust enough to cope with site conditions.

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PRO M1 GROUND GAS BARRIER

Product Code: DMS402

BENEFITS

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- Gas and damproof membrane
- Robust and durable
- Can be heat wielded or tape joined

SPECIFICATION

- NBS F30 Gas Resistant DPC's/Cavity Trays

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- BS:8485:2015+A1:2019 Table 7 Complaint
- Damproof Barrier in accordance with CP:102:1973 Section 2

ASSOCIATED PRODUCTS

- GGM Gas Tape 50/150
- GGM Detailing Tape
- GGM Pro LGB

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PRO M1 GROUND GAS BARRIER

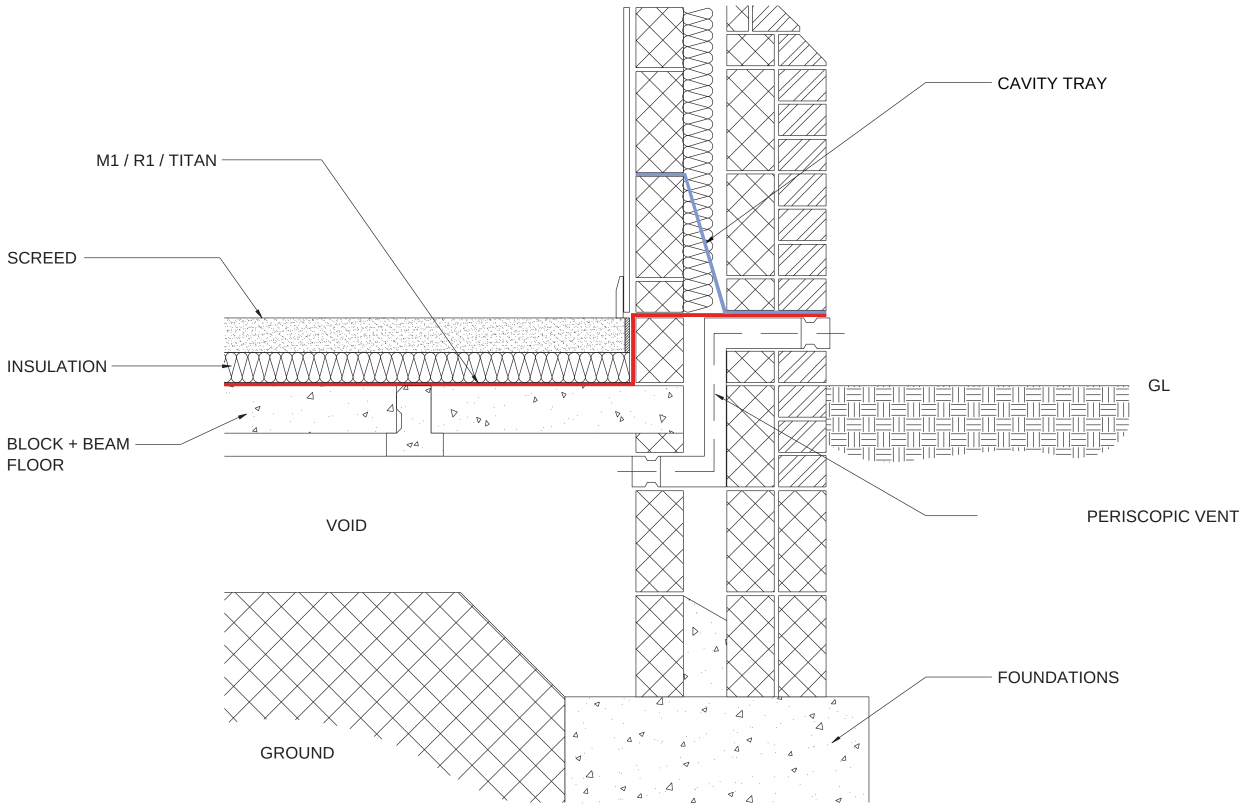
Product Code: DMS402

INSTALLATION

PRO M1 GAS BARRIER and ancillary components should be installed in accordance with the recommendations of Building Research Establishment BRE 414, BRE 211:2015, BS8485:2015+A1:2019 [illegible] cavity; MEMTECH PRO M1 should be taken through the block work and incorporated below the damp proof course/cavity tray in the outer leaf. Laps can be joined t ogether by either using a 50mm Delta Gas Barrier butyl tape or welded by specialist on-site contractors.

JOINTING AND SEALING

PRO M1 GAS BARRIER should be overlapped by at least 100mm and as a minimum, sealed with jointing Tape. The joint should then be secured by removing any trapped air with a 40mm silicone seam roller (any creases or air bubbles in the seam are likely to fail an air lance integrity test to C735 and should therefore be avoided). Ensure that the membrane is clean and dry at the time of jointing. Airtight seals should be formed around all service entry points, stanchions and corners details. Pre-formed, Self-adhesive gas membrane (Delta Koster KSK SY15), or PRO LGB must be used for sealing service entry pipes. Following installation PRO M1 membr ane should be protected from damage by follow on trades, this can be by way insulation, protection board or Delta FM Protection membrane.



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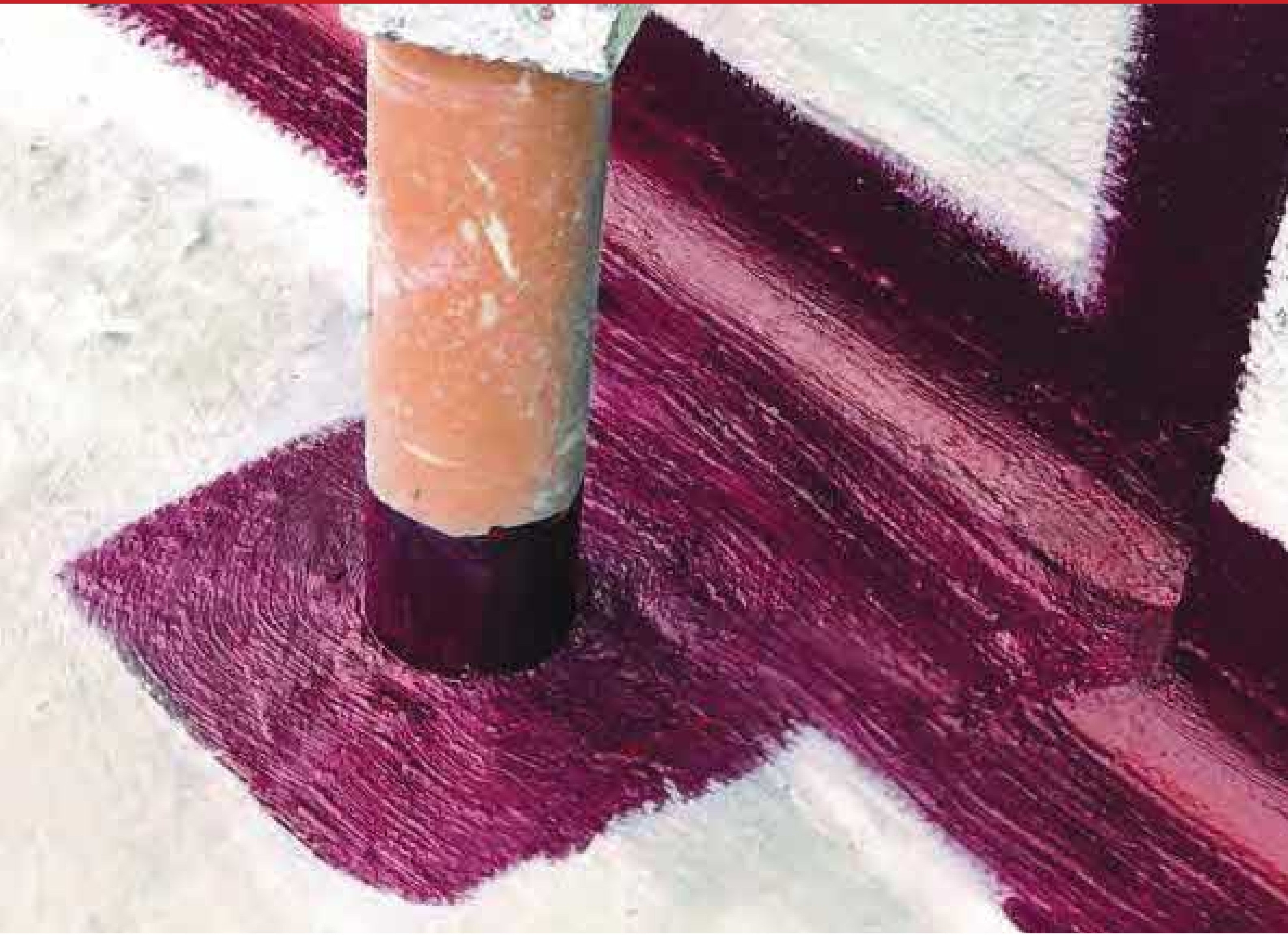
PRO M1 GROUND GAS BARRIER

Product Code: DMS402

PRO M1 - MATERIAL PROPERTIES	
Roll Length	50m
Roll Width	2m
Thickness	0.6mm
Colour	Blue/Grey
Tensile Strength (N per 50m)	
MD	600
CD	20
Elongation	
MD	20
CD	20
Nail Tear Resistance	
MD	330
CD	400
Radon Permeability ($m^2 s^{-1} Pa^{-1}$)	8.0×10^{-15}
Methane Permeability (ml/m²/day/atm)	<0.09 BS EN ISO 15105-1
Carbon Dioxide Permeability (ml/m²/day/atm)	<0.09 BS EN ISO 15105-1

PRODUCT DATA SHEET



GROUND GAS MEMBRANES

PRO LGB is a ready for use specialist styrene butadiene latex based liquid applied gas membrane.

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PRO LIQUID GAS BARRIER

Characteristic	Test Method	Unit	Liquid Gas Barrier
PHYSICAL PROPERTIES			
Applied Thickness			>1.0
Form Supplied			Viscous Liquid
Pack Size			15kg
Colour			Red
Chemical Composition			Advanced SBS with speciality additives
HYDRAULIC PROPERTIES			
Water tightness	EN 1296, EN 1367, EN 1928		PASS
PHYSICAL PROPERTIES			
Methane Permeability	BS EN ISO 15105-1	ml/m²/day/atm	33.00
Radon Permeabilty	Saarland University	mm	>1.0mm applied thickness provides a complete barrier to Radon

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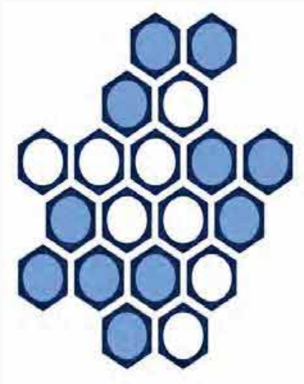

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1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Trade name:
MD+ Sealant

Chemical name : Silicones
CAS-number : Mixture of silicone and fillers
Reach reg.nrs. : -

1.2 Relevant identified uses of the substance or mixture and uses advised against

Use:
Sealing of ducts

Unsuitable use:
-

1.3 Details of the supplier of the safety data sheet

Manufacturer/Supplier:
Filoform B.V.
Postbus 2
NL-4190 CA Geldermalsen

T: +31 (0)345 588220 **E**: info@filoform.com **W**: www.filoform.com

1.4 Emergency telephone number

The UK National Poisons Emergency number is 0870 600 6266

2. Hazards identification

2.1 Classification of the substance or mixture

Classification according to directive (EG) nr. 1272/2008 [CLP]
No dangerous good according to Globally Harmonized System (GHS).

2.2 Label elements

Labeling according (EG) nr. 1272/2008

2.3 Other hazards

Not known

3. Composition/information on ingredients

3.1 Substances

3.2 Mixtures

Contains:

2-butanone O,O',O'' - (ethenylsilylidyne) trioxime Eye Dam. 1, H318; Skin Sens. 1, H317; STOT RE 2, H373	CAS-nummer: 2224-33-1	< 1 %
2-Butanone, O,O',O'' - (methylsilylidyne) trioxime Eye Irrit. 2, H319; Skin Sens. 1, H317; STOT RE 2, H373	CAS-nummer: 22984-54-9	< 1 %

4. First aid measures

4.1 Description of first aid measures

Remove contaminated clothing immediately.

After inhalation:
If symptoms occur supply fresh air and if symptoms persist consult a doctor.

After skin contact:
Immediately wash with water and rinse thoroughly. If symptoms persist consult a doctor.

After eye contact:
Rinse opened eye for 15 minutes under running water. If symptoms persist consult a doctor.

After swallowing:
Immediately rinse mouth and then drink plenty of water, induce vomiting, seek medical attention.

4.2 Most important symptoms and effects, both acute and delayed

Dangers:
No further relevant information available.

Symptoms:
No further relevant information available.

4.3 Indication of any immediate medical attention and special treatment needed

No further relevant information available.

5. Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media:
Water spray, dry powder or foam.

Unsuitable extinguishing media: Not known.

5.2 Special hazards arising from the substance or mixture

Wear self-contained respiratory protective device. Wear fully protective suit.

5.3 Advice for firefighters:

Protective equipment:
Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

General:
Provide adequate ventilation.

When gases/vapours arise:
Wear a respirator.

6.2 Environmental precautions

No special measures required.

6.3 Methods and material for containment and cleaning up

Cleaning / absorption method:
Treating liquids and solids as household waste.

Disposal:
Remove liquids and solids as household waste.

6.4 Reference to other sections food stuff

Information regarding safe handling is located in section 7.
Personal protection and disposal considerations can be found in section 8 and 13.

7. Handling and storage

7.1 Precautions for safe handling

Provide a well ventilated workplace and wear protective equipment.

7.2 Conditions for safe storage, including any incompatibilities

No special requirements.

7.3 Specific end use(s)

Sealing and fixing

8. Exposure controls/personal protection

8.1 Control parameters

The product does not contain any relevant quantities of materials with considering the workplace in terms limits should be monitored.

8.2 Exposure controls

General protection and hygiene measures:

- Avoid contact with skin, eyes and clothing.
- Do not eat, drink or smoke at work.
- Remove contaminated clothing immediately.
- Before breaks and at the end of the working day wash hands thoroughly.
- Keep away from food and drinks.

8.2.1 Appropriate engineering controls

Only use in a well ventilated area.

8.2.2 Individual protection measures, such as personal protective equipment

Respiratory protection:
No personal respiratory protective equipment required if the area is well ventilated.

Hand protection:
Impermeable gloves.

Eye/face protection:
Safety glasses.

Skin protection:
Wear suitable protective clothing.

8.2.3 Environmental exposure controls

Not applicable.

Additional Information
Occupational exposure:
Avoid skin contact.

9. Physical and chemical properties

9.1.1 General properties

Colour:
Red

Form:
Viscous, Pasty

Odour:
Specific mild odor

9.1.2 Information on basic physical and chemical properties

Melting point/freezing point:
Not determined.

Initial boiling point and boiling range:
Not determined

Flash point:
Not dertemined

Evaporation rate:
Not determined.

Flammability (solid, gas):
Not flammable.

Upper/lower flammability or explosive limits:
Not determined.

Ignition temperature:
Not applicable

Vapour pressure at 25ºC:
Not determined.

Relative density af 20 ºC:
1,2 g/cm^3

Partition coefficient: n-octanol/water:
Not determined.

Relative vapour density:
No data available.

Solubility in water:
No insoluble in water.

Viscosity at 25ºC:
High viscosity, pasty

Explosive properties:
No data available.

Oxidising properties:
No date available.

9.2 Other information

Miscibility with water:
Not miscible.
Other information:
If necessary, the information on other physical and chemical parameters listed in this section.

10. Stability and reactivity

10.1 Reactivity

No hazardous reactions if the regulations / notes for storage and handling are followed.

10.2 Chemical stability

The product is stable, if the regulations / notes for storage and handling are followed.

10.3 Possibility of hazardous reactions

No hazardous reactions if the regulations / notes for storage and handling are followed.

10.4 Conditions to avoid

Non, if the regulations / notes for storage and handling are observed.

10.5 Incompatible materials

No further relevant information available.

10.6 Hazardous decomposition products

No hazardous decomposition products, if the regulations / notes for storage and handling are followed

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity:
Not classified.

Skin corrosion/irritation:
Not classified.

Sensibility of the respiratory system and skin:
Not classified.

Germ cell mutagenicity:
Not classified.

Carcinogenicity:
Not classified.

Reproductive toxicity:
Not classified.

STOT-single exposure:
Not classified.

STOT-repeated exposure:
Not classified.

Aspiration hazard:
Not classified.

12. Ecological information

12.1 Toxicity

The product is not considered harmful to aquatic organisms nor to cause long-term adverse effects in the environment.

12.2 Persistence and degradability

No further relevant information available.

12.3 Bio accumulative potential

No further relevant information available.

12.4 Mobility in soil

No further relevant information available.

12.5 Results of PBT and vPvB assessment

No further relevant information available.

12.6 Other adverse effects

No further relevant information available.

13. Disposal considerations

13.1 Waste treatment methods

Liquid product: Let it cure in the open air. *Cured product*: treat as household waste.

14. Transport information

Not classified as a dangerous goods under transport regulations: ADR, RID, ADNR, IMDG/GGVSee, ICAO/IATA.

14.1 UN number

N/A

14.2 UN proper shipping name

N/A

14.3 Transport hazard class(es)

N/A

14.4 Packing group

N/A

14.5 Environmental hazards

N/A

14.6 Special precautions for use

N/A

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

N/A

Special precautions for transport
Hazard map:

No hazard map required.

Hazard symbol:
None

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

If other legal rules that are not mentioned elsewhere in this safety data sheet, then it is described in this subsection.

15.2 Chemical safety assessment

N/A

16. Other information

Legal Disclaimer:
This product is intended for filling, sealing and fixing. Always use the manufacturer's instructions. Local laws and regulations should be the recipient of the product on its own responsibility are met. The above information is believed to be correct but does not purport to be complete. Filoform is not responsible for any damage resulting from handling or contact with the above product.

This safety data is made on 10-01-2017 and prepared in accordance with Regulation (EC) No. 453/2010
Status: final

FILO form

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IMPORTANT POINTS BEFORE YOU BEGIN

[illegible]

1. The duct and cables/pipes must be both clean and dry.
2. [illegible]
3. [illegible]
4. [illegible]

[illegible]

1. [illegible]
2. [illegible] sealant to adhere to.
3. [illegible]
4. [illegible]
5. [illegible]
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FILOform

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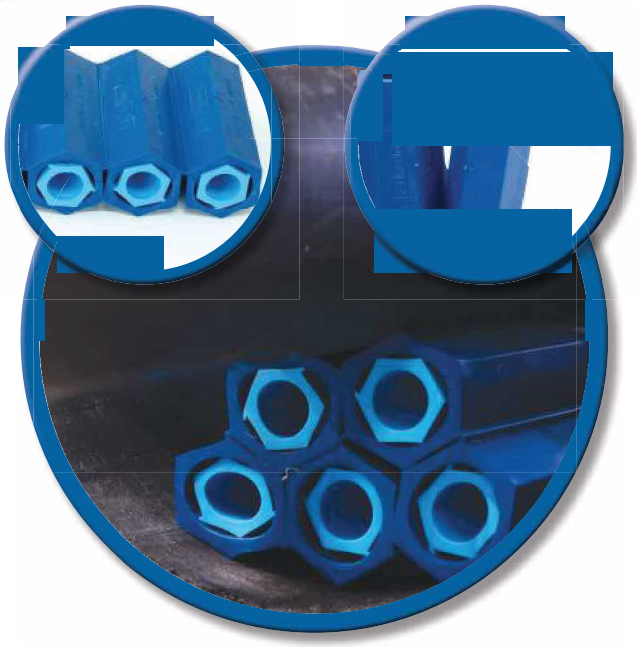

FILOseal+HD

Re-enterable Duct Sealing System







- **Up to 2 bar Pressure Resistance**
- **100Kg pulling Force on the cables when sealed**
- **10xd at 45º, with 1 bar pressure bending test**

FiloSeal+HD provides a strong support system using the hexagonal tubes which builds up like a honeycomb structure.

FiloSeal+HD is suitable for sealing any cable configuration or pipes contained in one duct and also allows easy re-entry of the seal to add or remove cables or pipes as required.

The Filoform duct sealing system FiloSeal+HD uses our MD+ sealant which is easily applied from a skeleton gun. The high quality, one component, flexible sealant “MD+” is based on a silicon compound that cures with air (Humidity).

The unique design of the hexagonal tubes makes positioning and separation of the cables very simple while also providing a strong backing for the MD+ to be applied on.

- High levels of Gas and Water tightness
- Excellent adhesion, applicable to all common building materials
- Shows Fire resistance properties
- Resistant against Water, Alkaline, Chemical agents
- Resistant to Hydrogen Sulphide / Methane and many other Gases (NedLab)
- Non corrosive
- Solvent free
- Shock absorbing
- Non toxic, neutral and almost odourless
- Complies with ATEX regulations
- Suitable for any shaped duct / bore hole / opening
- Quick and easy installation
- Seals all known materials, PVC & PE sheathed cables, PILC, (HD) PE pipes
- Suitable for renovations, can be installed retrospectively
- Resistant to Rats
- Resistant to termites (Mastotermes Darwiniensis) Northern Australian termites

Item number	Description	Maximum duct diameter (mm)
280010	FiloSeal+HD - 75mm > 110mm	Ø 110 max.
280020	FiloSeal+HD - 125mm > 160mm	Ø 160 max.
280030	FiloSeal+HD - 180mm	Ø 180 max.
280040	FiloSeal+HD - 200mm	Ø 200 max.
280050	FiloSeal+HD - 225mm	Ø 225 max.
280060	FiloSeal+HD - 250mm	Ø 250 max.

Other sizes available upon request

THORNE & DERRICK INTERNATIONAL
Thorne & Derrick
+44 (0) 191 410 4292
www.powerandcables.com

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FILOseal+HD

Re-enterable

Duct Sealing System

Test Reports for MD+ (FiloSeal+ & FiloSeal+ HD)

Contents:

Page 1, 2 & 3:
Pressure tests, bending tests, pull strength

Page 4, 5 & 6:
Resistance tests against Chlorine & Methane Gases & Chemicals

Page 7:
Hydrogen Sulphide resistance

Page 8, 9 & 10:
Resistance to Hydrocarbons

Page 11:
Final Conclusion & Summary

Filoform UK, Unit K, Lambs Farm Business Park, Basingstoke Road, Swallowfield, Reading, Berkshire, RG7 1PQ

From: Wim Ipenburg
Date: 19 Feb 2016
Ref.: MD+ with Hexagonal tubes

Introduction:

This test report describes the results for testing the pressure, bending strength and pull strength when using Filoform's hexagonal support system, and finishing with a layer of MD+

Requirements:

- Gas & Water tightness –1 bar long term (10 metres of water)
- Gas & water tightness –2 bar short term (20 metres of water)
- The seal to withstand the cables being bent or stood on
- The seal to withstand pulling forces on the cables

Test Description:

- The test is performed using the following materials:
- PVC Duct –I/D = 150mm
- 3 x 150mm 4 core PVC/XLPE/SWA cables each having an O/D of around 50mm

Installing & preparing the Seal

The duct seal is installed in accordance with the standard Filoform instruction:

1. The cables and duct are cleaned and given a key with some sandpaper
2. The hexagonal tubes are placed around the cables filling up all the gaps, using the large and small hexagonal backers to make the support system nice and tight. They should end up looking like a honeycomb
3. The hexagonal tubes must be installed leaving a 20mm gab at the front which is where the MD+ sealant is applied.
4. Once fully covered using the Filoform sponge to compress the sealant, so some of the sealant gets compressed into the centres of the hexagonal tubes and ensures the sealant is round each cable.
5. The sealant can take from 4 to 20 days to fully cure as it cured with air humidity. The more humidity the quicker its cures. This test was done 4 weeks after installation at: (20ºC and 50% Relative Humidity)

Picture 1

Picture 2

Picture 3

Picture 4

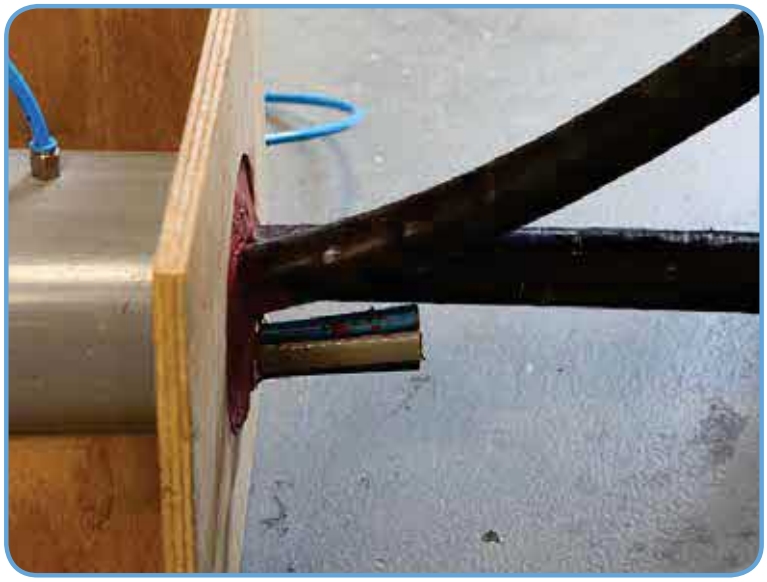
Test Procedures:

Pressure Test

The transit is pressurized from the inside to 1.0 bar for a period of 48 hours, then a final pressure test of 2 bar.

Bending test

The transit is brought to a pressure of 1,0 bar. One cable is bent at a distance of 10xd at an angle of 45º. After 1 minute, the cable is pushed back again into the starting position. This test is repeated in the opposite direction on the same cable. During and after this test, no leak should occur.



Pull out test.

The transit is brought to a pressure of 1.0 bar. The cable is pulled with a force of 1000N (20 Newton x diameter in mm). After 1 minute, the weight is removed. During and after this test, no leakage should occur.

Since the transit seal is sealed both sides the applied force has been doubled to (2000N).

Final pressure test

After completion of the bending and pull strength, the seals are tested at a pressure of 2.0 bars.

Pressure test 1.0 bar: = PASSED
Bending test 45º = PASSED
Pull out test 1000N: = PASSED
Final pressure test 2 bar after the seal has been weekend by bending and pulling: = PASSED

From: Wim Ipenburg
Date: 4th April 2014
Filoform duct sealing material MD+
Ref.: MD+

Introduction:

This report describes tests carried out at the Nedlab laboratory and at the Filoform laboratory in the Netherlands, to examine the Chlorine and Methane gas resistance of the sealing compound MD+ as used in Filoform duct sealing systems FiloSeal+ & FiloSeal+HD.

Background of this requirement is that in and around waste water treatment installations the presence of Chlorine and Methane gas cannot be excluded. It is therefore of vital importance that the duct seals used in such environments should have sufficient resistance against Chlorine and Methane gas.

Description of test:

The vital material used in Filoform's duct sealing system Filoseal+ is the special sealing compound MD+.

Firstly a 600 gram block was fully cured and prepared for the exposure test of Chlorine and Methane gas. 500 grams of the original block was sent to Nedlab (a certified laboratory in the Netherlands with the capability to arrange exposure to Chlorine and Methane gas) NedLab has cut the block in small pieces for the exposure tests.

Nedlab have exposed these blocks to Chlorine and Methane gas as follows:

- Concentration of Chlorine and Methane gas: 100%
- Relative humidity: Wet (100%)
- Temperature during exposure: 23ºC and 90°C
- Duration of exposure: 168 hours (7 days)

After the test, the samples are visually inspected by NedLab and also by Filoform for comparing physical values with the original: Hardness, density, tensile strength and elongation at break.

Test results:

Chlorine

After exposure 7d 23ºC & 7d 90ºC of cured MD+, in a maximum concentration of Chlorine, in a wet environment, some changes on the surface were noticeable of the MD+,

- Colour change - Slight Discolouration
- Surface texture –Slight roughness

Volume –Slightly increased but density remains unaffected and stays within the pass value.

Hardness, density and elongation at break values are within the standard after exposure at room temperature.

After exposure 7d at 90º, hardness, density, elongation and break values are still respectable, see: Report MD+ Methane & Chlorine resistance.

Methane

After exposure 7d 23ºC & 7d 90ºC of cured MD+, in a maximum concentration of Methane, in a wet environment, some changes on the surface were noticeable,

- Colour change - Slight Discolouration
- Surface texture –Slightly smoother

Volume –Slightly increased but density remains unaffected and stays within the pass value.

Hardness, density and elongation at break values are within the standard after exposure at room temperature.

After exposure 7d at 90º, hardness, density, elongation and break values are still respectable, see: Report MD+ Methane & Chlorine resistance.

Conclusions:

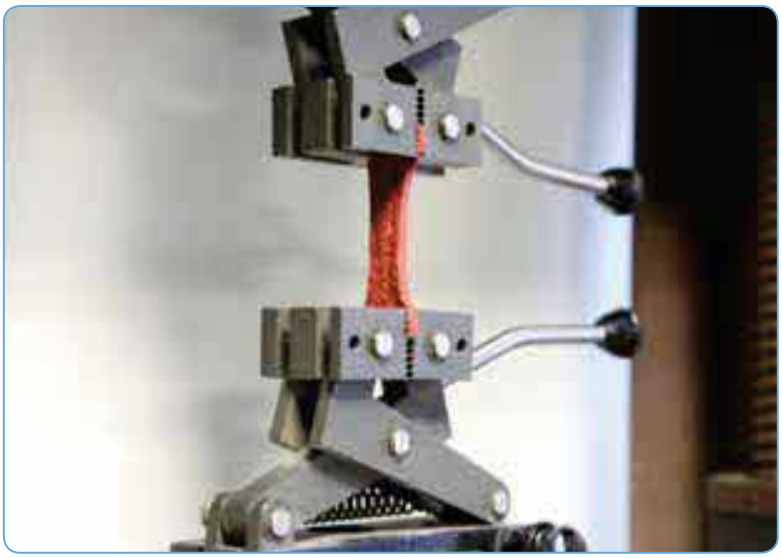
MD + withstands long term exposure to Methane and Chlorine without loss of functionality.

Test results table for resistance against Chlorine & Methane Gas:

		Norm	Measure - Original	Methane 7 days @ 23°C	Methane 7 days @ 90°C	Chlorine 7 days @ 23°C	Chlorine 7 days @ 90°C
Hardness	**Shore A**	30	29	27	21	26	23
Density	**g/cm3**	1.2	1.27	1.27	1.27	1.27	1.27
Elongation	**%**	100	220	217	248	229	176
Tensile Strength	**N/mm2**	0.8	0.82	0.71	0.55	0.81	0.53

Hardness Test

Tensile Strength & Elongation



Full test analysis can be seen of the MD+ from the NEDlab reports however they are in Dutch hence the outline and test results mentioned above. If you require to see the originals please contact your local office.

Additional Chemical resistances for MD+

Chemical	Rating	Chemical	Rating
Citric	1	Ammonium Hydroxide 10%	1
Hydrochloric 3%	1	Potassium Hydroxide	1
Phosphoric dilute	1	ASTM 10.1 Aliphatic 70hrs @ 300ºF	1
Sulphuric 10%	1	Castor Oil 0.1	1
Nitric 7%	1	Diesel	2
Acetic	1	Linseed Oil	1
Anhydrous Ammonia	1	Mineral Oil	1
Sodium Chloride 10%	1	Silicon oil after 70Hrs @ 300ºF	3
Hydrogen Peroxide 3%	1	Acetone	3
Sodium Carbonate 20%	1	Butyl Alcohol	1
Water	1	Jet fuel, JP4	2

Key: 1 = Excellent, 2 = Good (10-25% change), 3 = Fair (25-75% change), 4 = Poor (greater than 75% change), 5 = Complete fail

TEST REPORT

Subject: H2S (Hydrogen Sulphide) resistance

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From: Wim Ipenburg
Date: 28th July 2010
Ref.: MD+ used within FiloSeal+ HD

This report describes tests carried out at the Nedlab laboratory and at the Filoform laboratory in the Netherlands, to examine the H2S resistance of the sealing compound as used in Filoform duct sealing systems FiloSeal+ & FiloSeal+HD.
Background of this requirement is that in and around waste water treatment installations the presence of H2S gas cannot be excluded. It is therefore of vital importance that the duct seals used in such environments should have sufficient resistance against H2S.

Description of test:

Firstly, 6 blocks of each of cured material were prepared to enable exposure to H2S.

After full curing, the weight and dimensions of each block were carefully determined.

Three blocks of the material were sent to Nedlab (a certified laboratory in the Netherlands with the capability to arrange exposure to H2S).

Nedlab have exposed these blocks to H2S as follows:

- Concentration of H2S: 200 ppm
- Relative humidity: 95%
- Temperature during exposure: 40°C
- Duration of exposure: 120 hours (5 days)

The exposed blocks were then returned to Filoform's laboratory for further examination, which included:

- Visual inspection
- Determination of possible change of dimensions
- Determination of possible change of weight
- Determination of possible change of compression resistance
- Determination of tightness by comparing the water absorption between exposed and non exposed blocks

Summary of test results*

Description (before/after exposure)	MD+ Sealant	
Visual Inspection	No change	PASSED
Change of dimensions	No change	PASSED
Change of weight	No change	PASSED
Change of shore hardness	No change	PASSED
Overall result		PASSED

Before exposure to H2S

After exposure to H2S

From: Wim Ipenburg
Date: 19 Feb 2016
Ref.: MD+ used within FiloSeal+ HD

This report describes tests carried out at the Filoform laboratory in the Netherlands, to examine the Hydro Carbon (Fuel) resistance of the sealing compound MD+ (as used in Filoform duct sealing systems FiloSeal+ & FiloSeal+HD).

Background of this requirement is that in and around petrol installations, the presence of Gasoline, Benzin, LPG, Ethanol, and Oils and AdBlue cannot be excluded. It is therefore of vital importance that seals used in such environments should have sufficient resistance against all these Hydro Carbons

Description of test:

The vital material, Filoform's special sealing compound MD+ has fully cured and left for 4 weeks before starting the tests as described below.

Firstly a 200 gram block was prepared for the tests.
The block was cut in 10 small pieces of ca 20 grams for the different exposure tests.

Filoform have exposed / fully immersed 2 blocks for 2 years in:

- Gasoline / Diesel: 100%
- Benzin: 100%
- ASTM Oil: 100%

Filoform have exposed / fully immersed 2 blocks for 6 weeks in:

- Ethanol: 100%
- AdBlue: 100% - 32.5% Urea (Air1)
- LPG is not tested yet, but silicon products are commonly used in LPG environments.

After the immersion period, the samples are visually inspected at first.
For comparing physical values with the original: hardness, density, tensile strength and elongation at break where measured.

All measured values are presented in the table on the following page.

Test results:

Gasoline

After exposure of 2 years at 23ºC of cured MD+, in 100% concentration of Gasoline, changes of the MD+ are as follows,

- Colour change - No
- Surface texture –No remarkable change.
- Volume –No swelling

Hardness, density, elongation and strength - Values have very little change compared to the original values.

AdBlue

After exposure of 3 weeks at 23ºC of cured MD+, in 100% concentration of AdBlue, no changes of the MD+ are noticed.

Benzene

After exposure of 2 years at 23ºC of cured MD+, in 100% concentration of Benzin, changes of the MD+ are as follows,

- Colour change - No
- Surface texture –Slightly rougher on the surface
- Volume –No Swelling
- Hardness and Tensile strength - values are slightly decreased.

Density and Elongation - At break have very little change compared to the original values.

Ethanol

After exposure of 42d at 23ºC of cured MD+, in 100% concentration of Ethanol, changes of the MD+ are as follows,

- Colour change - No
- Surface texture –No change
- Volume –No Swelling
- Hardness, density, elongation and tensile strength values have not changed

ASTM Oil

After exposure of 2 years at 23ºC of cured MD+, in 100% concentration of Oil, changes of the MD+ are as follows,

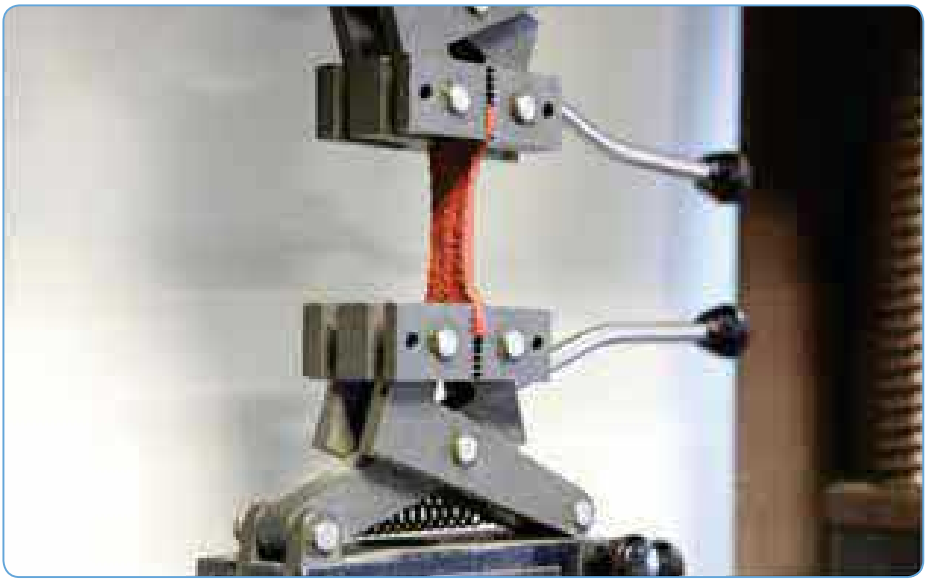
- Colour change - No
- Surface texture –Slightly rougher on the surface
- Volume –No swelling
- Hardness and Tensile strength - Values are slightly decreased.

Density and Elongation - At break have very little change compared to the original values.

		Norm	Measure - Original	Gasoline 2 years @ 23°C	AdBlue 21 days @ 23°C	Benzin 2 years @ 23°C	Ethanol 42 days @ 23°C	ASTM Oil 2 years @ 23°C
Hardness	Shore A	30	29	30	30	22	30	26
Density	g/cm3	1.2	1.27	1.27	1.27	1.26	1.27	1.27
Elongation	%	100	150	140	150	140	150	160
Tensile Strength	N/mm2	0.8	0.77	0.69	0.77	0.53	0.77	0.59

Conclusions:

MD + withstands long term exposure to Hydro Carbons, such as used in petrol stations, without disintegration or loss of functionality.



From: Wim Ipenburg
Date: 03rd March 2016
Ref.: FiloSeal+HD

FINAL CONCLUSION

MD+ has been heavily tested against pressure, pulling forces, chemicals, gases, hydrocarbons, in conjunction with using FiloSeal+HD which uses the hexagonal backing system to support and separate the cables.

From all the tests Filoform have performed, we suggest this product can be used in every business sector where sealing cable ducts is a requirement.

Below I have summarised all the results from all the tests in this report.

Test Description	Measurement	Result	Pass or Fail
Pressure	2.0 Bar	1.0 bar long term, 2 Bar short term	PASSED
Pulling Force	100kg	100kg – 1000 newtons	PASSED
Bend Test	10xd at 45°	10xd at 45°, with 1 bar pressure	PASSED
Chlorine Gas	100% for 7 days	Slight change on colour and texture	PASSED
Methane Gas	100% for 7 days	Slight change on colour and texture	PASSED
Diesel	100% for 2 years	Hardly any change	PASSED
Petrol / Benzene	100% for 2 years	Hardly any change	PASSED
Ethanol	100% for 42 days	Hardly any change	PASSED
AD Blue	100% for 21 days	No Change	PASSED
ASTM Oil	100% for 2 years	Hardly any change	PASSED
Hydrogen Sulphide (H2S)	200ppm for 5 days	Hardly any change	PASSED

The test results given in this report have been done in accordance with our installation instructions, however values achieved in field installations may vary if the instructions are not followed, and results may vary depending on cable and duct tolerances such as size, material, and volume.

Name: Wim Ipenburg

Position: R&D manager

Date: 03rd March 2016

Signature: [redacted]