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Agrément Certificate

19/5681

Product Sheet 1

SIKAPLAN WATERPROOFING, GAS AND HYDROCARBON MEMBRANES

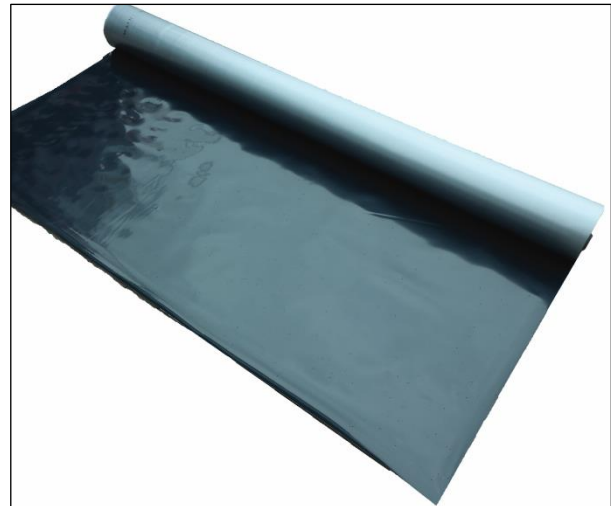
SIKAPLAN 1651 LOOSE VOC GAS BARRIER

This Agrément Certificate Product Sheet⁽¹⁾ relates to Sikaplan 1651 Loose VOC Gas Barrier, a multilayer thermoplastic membrane with a core layer that is resistant to ground gases, hydrocarbons and volatile organic compounds (VOCs). The product is for use to protect the building from the ingress of water vapour, radon, methane and carbon dioxide, hydrocarbons and VOCs.

(1) Hereinafter referred to as 'Certificate'.

CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.



KEY FACTORS ASSESSED

Resistance to water and water vapour — the product, including joints, will provide an effective barrier to the passage of moisture from the ground (see section 6).

Resistance to underground gases — the product is capable of restricting the ingress of radon, methane and carbon dioxide into the structure (see section 7).

Resistance to chemicals — the product is chemically resistant and will reduce the transmission of VOCs (see section 8).

Resistance to damage — the product has satisfactory resistance to damage (see section 9).

Durability — under normal service conditions, the product will remain effective against the ingress of water and water vapour, and will restrict the ingress of radon, methane, carbon dioxide and VOC vapours for the lifetime of the structure in which they are installed (see section 11).



The BBA has awarded this Certificate to the company named above for the product described herein. This product have has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate

On behalf of the British Board of Agrément

Date of First issue: 2 August 2019

John Albon
Chief Scientific Officer

Claire Curtis-Thomas
Chief Executive

The BBA is a UKAS accredited certification body – Number 113.

The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk
Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

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Regulations

In the opinion of the BBA, Sikaplan 1651 Loose VOC Gas Barrier, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):



The Building Regulations 2010 (England and Wales) (as amended)

Requirement:	C1(2)	Site preparation and resistance to contaminants
Comment:		The product will contribute to a construction satisfying this Requirement. See sections 7.1, 7.2 and 8 of this Certificate.
Requirement:	C2(a)	Resistance to moisture
Comment:		The product, including joints, will enable a structure to satisfy this Requirement. See section 6 of this Certificate.
Regulation:	7	Materials and workmanship (applicable to Wales only)
Regulation:	7(1)	Materials and workmanship (applicable to England only)
Comment:		The product is acceptable. See section 11.1 and the <i>Installation</i> part of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)	Durability, workmanship and fitness of materials
Comment:		The use of the product satisfies the requirements of this Regulation. See section 11.1 and the <i>Installation</i> part of this Certificate.
Regulation:	9	Building standards applicable to construction
Standard:	3.1	Site preparation – harmful and dangerous substances
Standard:	3.2	Site preparation – protection from radon gas
Comment:		When properly installed in a correctly designed structure, the product will form an effective barrier to the movement of radon, methane, carbon dioxide and VOC vapours enabling compliance with these Standards, with reference to clauses 3.1.2 ⁽¹⁾⁽²⁾ , 3.1.6 ⁽¹⁾⁽²⁾ , 3.1.7 ⁽¹⁾⁽²⁾ and 3.2.2 ⁽¹⁾⁽²⁾ . See sections 7.1, 7.2 and 8 of this Certificate.
Standard:	3.4	Moisture from the ground
Comment:		The product, including joints, will enable a structure to satisfy the requirements of this Standard, with reference to clauses 3.4.2 ⁽¹⁾⁽²⁾ , 3.4.4 ⁽¹⁾⁽²⁾ 3.4.6 ⁽¹⁾⁽²⁾ . See section 6 of this Certificate.
Standard:	7.1(a)	Statement of sustainability
Comment:		The product can contribute to meeting the relevant requirements of Regulation 9, Standards 1 to 6 and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard.
Regulation:	12	Building standards applicable to conversions
Comment:		Comments in relation to the product under Regulation 9, Standards 1 to 6 also apply to this Regulation, with reference to clause 0.12.1 ⁽¹⁾⁽²⁾ and Schedule 6 ⁽¹⁾⁽²⁾ .

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).



The Building Regulations (Northern Ireland) 2012 (as amended)

Regulation:	23(a)(i)	Fitness of materials and workmanship
Comment:	(iii)(b)(i)	The product is acceptable. See section 11.1 and the <i>Installation</i> part of this Certificate.

Regulation:	26(1)(b)	Site preparation and resistance to contaminants
Comment:	26(2)	The product will contribute to a construction satisfying the requirements of this Regulation. See sections 7.1, 7.2 and 8 of this Certificate.
Regulation:	28(a)	Resistance to moisture and weather
Comment:		The product, including joints, will enable a structure to satisfy this Regulation. See section 6 of this Certificate.

Construction (Design and Management) Regulations 2015 Construction (Design and Management) Regulations (Northern Ireland) 2016

Information in this Certificate may assist the client, designer (including Principal Designer) and contractor (including Principal Contractor) to address their obligations under these Regulations.

See section: 3 *Delivery and site handling* of this Certificate.

Additional Information

NHBC Standards 2019

In the opinion of the BBA, Sikaplan 1651 Loose VOC Gas Barrier, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to *NHBC Standards*, Chapters 4.1 *Land quality – managing ground conditions* and 5.1 *Substructure and ground bearing floors*, Clause 5.1.20 *Damp-proofing concrete floors*, for use below the slab and in sandwich constructions.

CE marking

The Certificate holder has taken the responsibility of CE Marking the product in accordance with harmonised European Standard EN 13967 : 2012. An asterisk (*) appearing in this Certificate indicates that data shown are given in the manufacturer's Declaration of Performance.

Technical Specification

1 Description

1.1 Sikaplan 1651 Loose VOC Gas Barrier is a multilayer polyethylene waterproofing membrane with a gas and VOC resistant core.

1.2 The product is available in black/silver colour as standard and has the nominal characteristics given in Table 1.

Table 1 Nominal characteristics

Characteristic (unit)	Sikaplan 1651 Loose VOC Gas Barrier
Roll Length (m)	50
Roll Width (m)	2.0
Mass per unit area ($\text{g}\cdot\text{m}^{-2}$)	500
Impact resistance (mm)	≥ 650
Tensile strength* ($\text{N}\cdot 50 \text{ mm}^{-1}$)	
MD	≥ 550
CD	≥ 400
Elongation (%)	≥ 550
Water vapour transmission ($\text{g}\cdot\text{m}^{-2}\cdot\text{day}^{-1}$)	0.11-0.18
Watertightness* (60 kPa)	Pass
Nail tear* (N)	
MD and CD	≥ 300
Resistance to static loading* (kg)	≥ 20

1.3 Other ancillary items for use with the product, but outside the scope of this Certificate, include:

- fleece-backed acrylic sealing tape for use over joints to provide additional protection and a smooth finish
- pre-fabricated corner units and top hats
- specialised sealants and liquid-applied membranes for sealing around penetrations and pile caps.

The Certificate holder should be consulted for suitable products.

2 Manufacture

2.1 The product is manufactured by extrusion and laminating processes.

2.2 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

3 Delivery and site handling

3.1 The product is delivered to site in 50 x 2 m rolls wrapped in polyethylene film on pallets. Other roll sizes are available on request. Pallets include a maximum of 25 rolls. Pallets are shrink-wrapped for transportation.

3.2 The 50 x 2 m rolls have nominal weights of 50 kg

3.3 The Certificate holder has taken the responsibility of classifying and labelling the products under the *CLP Regulation (EC) No 1272/2008 on the classification, labelling and packaging of substances and mixtures*. Users must refer to the relevant Safety Data Sheet(s).

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Sikaplan 1651 Loose VOC Gas Barrier.

4 Use

4.1 Sikaplan 1651 Loose VOC Gas Barrier is satisfactory for use as gas-resistant barriers to restrict the ingress of radon, methane, carbon dioxide and VOCs into buildings from landfill and naturally occurring sources. The product is chemically resistant when in contact with hydrocarbons, see section 8.

4.2 Buildings in areas at risk from radon, methane or carbon dioxide should be constructed in accordance with the recommendations of BRE Report BR 211 : 2015, and following the guidance set out in BS 8485 : 2015.

4.3 When used in buildings in areas at risk from VOCs, the guidance given in CIRIA Report C748 : 2014 should be followed.

4.4 The product should be fully protected immediately after it is installed, in accordance with the Certificate holder's instructions.

5 Practicability of installation

The product should only be installed by installers who have been trained and approved by the Certificate holder. The Certificate holder must be consulted for suitable installers.

6 Resistance to water and water vapour



6.1 The product, including joints, when completely sealed and consolidated, will resist the passage of moisture from the ground and so satisfy the relevant requirements of the national Building Regulations.

6.2 When installed in accordance with the following documents, the membrane will comply with the minimum sheet thickness detailed in the national Building Regulations:

England and Wales — Approved document C, Requirements C2(a), Section 4.8

Scotland — Mandatory Standard 3.4, Technical Handbook⁽¹⁾⁽²⁾ (clauses 3.4.2, 3.4.4 and 3.4.6)

Northern Ireland — Technical Booklet C, Regulation 28(a), section 5.5.

(1) Technical Handbook – Domestic.

(2) Technical Handbook – Non-domestic.

7 Resistance to underground gases



7.1 The product, including hot air welded joints, will restrict the ingress of radon, methane and carbon dioxide into buildings from landfill and naturally occurring sources, and satisfy the performance for a gas-resistant membrane as defined in BS 8485 : 2015.

7.2 Measured gas permeability/diffusion values on Sikaplan 1651 Loose VOC Gas Barrier are given in Table 2.

Table 2 Measured gas transmission rates and radon diffusion coefficient of Sikaplan 1651 Loose VOC Gas Barrier

Gas	Method	Result
Methane	ISO 15105-1	
membrane without joint ⁽¹⁾		0.13 ml·m ⁻² ·day ⁻¹ ·atm ⁻¹
membrane with joint ⁽²⁾		≤ 1 ml·m ⁻² ·day ⁻¹ ·atm ⁻¹
Carbon dioxide (membrane without joint) ⁽¹⁾	ISO 15105-1	3.01 ml·m ⁻² ·day ⁻¹ ·atm ⁻¹
Radon	Czech University (method K124/02/95)	1.0 x 10 ⁻¹² m ² ·s ⁻¹

(1) 0.50 mm thick Sikaplan 1651 Loose VOC Gas Barrier tested.

(2) Hot air welded joint tested.

7.3 BRE Report BR 211 : 2015 recommends a 300 µm thick polyethylene sheet as a minimum required thickness for a radon gas-resistant membrane. It is generally accepted that other materials with comparable or higher gas-resistance are suitable, provided they can withstand the construction process. In the opinion of the BBA, the products satisfy these criteria.

8 Resistance to chemicals



8.1 The product, including hot air welded joints, is resistant to the chemicals commonly found on construction sites. The results of immersion tests on a range of chemicals, including hydrocarbons, are given in Table 4. Site-specific examination and assessment should be carried out on a case by case basis to establish the suitability for any specific application and the need for additional testing.

Table 3 Resistance to chemicals of Sikaplan 1651 Loose VOC Gas Barrier

Test method	Exposure chemical(s)	Retained Tensile strength/elongation (%)	Result
BS EN 14414 : Method A	Sulphuric acid (10% solution)	MD 108/117 CD 118/123	Pass
BS EN 14414 : Method B	Calcium hydroxide solution (saturated)	MD 108/118 CD 107/122	Pass
BS EN 14414 : Method C	Diesel, paraffin, lubricating oil mixture	MD 86/97 CD 80/92	Pass
BS EN 14414 : Method D	Synthetic leachate comprising a mixture of organic acids, glucose, chlorides, sulfates and phosphate	MD 101/103 CD 96/101	Pass
BS EN 14414	Benzene (saturated solution in water)	MD 95/101 CD 102/104	Pass
	Toluene (saturated solution in water)	MD 94/103 CD 91/96	Pass
	Ethyl benzene (saturated solution in water)	MD 99/100 CD 97/95	Pass
	m,p,o-Xylenes (saturated solution in water)	MD 91/93 CD 106/103	Pass
	Tetrachloroethene (PCE) (saturated solution in water)	MD 93/97 CD 102/104	Pass
	Trichloroethene (TCE) (saturated solution in water)	MD 99/102 CD 93/100	Pass
	Hexane (saturated solution in water)	MD 99/100 CD 104/99	Pass
	Napthalene (saturated solution in water)	MD 101/101 CD 93/99	Pass

8.2 Measured vapour transmission rates for a range of VOCs are given in Table 4. A site-specific risk assessment should be carried out to establish the products' suitability for any specific application.

Table 4 Measured vapour transmission rates of volatile organic compounds for Sikaplan 1651 Loose VOC Gas Barrier⁽¹⁾

Volatile liquid	Method	Result	
		(mg·m ⁻² ·day ⁻¹)	(ml·m ⁻² ·day ⁻¹)
Benzene ⁽²⁾	ISO 15105-2 (Annex B)	3.6	1.04
Toluene ⁽²⁾	ISO 15105-2 (Annex B)	13.8	3.36
Ethyl benzene ⁽²⁾	ISO 15105-2 (annex B)	2.7	0.56
m,p,o-Xylenes ⁽²⁾	ISO 15105-2 (Annex B)	7.7	1.62
Tetrachloroethene (PCE) ⁽²⁾	ISO 15105-2 (Annex B)	26.2	3.54
Trichloroethene (TCE) ⁽²⁾	ISO 15105-2 (Annex B)	54.7	9.32
Napthalene	ISO 15105-2 (Annex B)	< 0.0006	<0.0001
Hexane ⁽²⁾	ISO 15105-2 (Annex B)	0.6	0.15
Vinyl chloride	ISO 15105-2 (Annex B)	< 0.04	0.05 ⁽³⁾
Cis-1,2,-dichloroethene ⁽²⁾	ISO 15105-2 (Annex B)	< 1.1	≤ 0.3
1,1,2,2,-tetrachloroethane ⁽²⁾	ISO 15105-2 (Annex B)	< 0.008	≤ 0.001
1,1,2-trichloroethane ⁽²⁾	ISO 15105-2 (Annex B)	< 0.006	≤ 0.001

(1) Membrane in contact with test gases at saturated vapour pressure unless otherwise noted.

(2) Membrane in contact with the liquid.

(3) 0.05 cm³·m⁻²·day⁻¹·bar⁻¹.

9 Resistance to damage

9.1 The membrane can be punctured by sharp objects; care should be taken when handling building materials and tools over the exposed surface.

9.2 Provided there are no sharp objects present either below the membrane or on the membrane's surface during installation of the membrane and protective layer, the products will not be damaged by normal foot traffic.

10 Maintenance

As the products are confined within the structure and have suitable durability (see section 11), maintenance is not required. However, any damage occurring before enclosure must be repaired (see section 15).

11 Durability



11.1 The products, when fully protected in normal circumstances, will remain effective against the ingress of water and water vapour, and will restrict the ingress of radon, methane, carbon dioxide and VOC vapours for the lifetime of the building.

11.2 The products will not be affected by short term exposure to ultraviolet light to allow for installation. Long periods of exposure may however reduce the effectiveness of the membranes and they should be protected from UV as soon as practicable after they are installed.

12 Reuse and recyclability

The products contain polyethylene, which can be recycled.

Installation

13 General

13.1 Sikaplan 1651 Loose VOC Gas Barrier must be installed in accordance with the Certificate holder's instructions and this Certificate, and following the relevant guidance given in BRE Report BR 211 : 2015, BS 8485 : 2015 and CIRIA Report C748 : 2014.

13.2 The membrane can be installed in all normal site conditions, provided that the air temperature is not below -5°C and the membrane is free from condensation and ice that could affect jointing.

13.3 The surface onto which the membrane is to be laid must be smooth, dry and free from sharp protrusions and debris that could damage the membranes. Brickwork or blockwork must be flush pointed or rendered to provide a smooth surface.

13.4 For chemical and gas resistance applications, it is recommended the membrane is installed with hot air welded joints in accordance with the Certificate holder's instructions.

13.5 For VOC resistance applications, the membrane must be installed with hot air welded joints.

13.6 The membrane must be protected as soon as possible after it is installed to minimise direct foot trafficking. Direct trafficking by vehicles must be avoided.

14 Procedure

Hot air welded joints

14.1 The membrane is rolled out and properly aligned to the structure.

14.2 Side laps and end laps must be a minimum of 100 mm and end laps should be staggered.

14.3 All surfaces must be dry before welding.

14.4 Before welding work is carried out, trials must be completed to determine the 'operating window' for the welding equipment, materials and ambient conditions. Typically, the operating window will be between 180 to 240°C at a rate of 1.5 m/min. In case of doubt, the Certificate holder should be consulted for advice.

14.5 Weld widths must be a minimum of 50 mm and must be checked for integrity after being formed.

14.6 All service penetrations and direction changes should be properly detailed in accordance with the Certificate holder's instructions. Service ducts should be vented to prevent the possibility of gas accumulating in confined spaces.

14.7 The continuity of the gas protection must extend over the footprint of the building, and the gas membrane must be sealed to a compatible gas-resistant damp-proof course. The use of the membranes as damp-proof courses is outside the scope of this Certificate and the Certificate holder must be consulted in these instances.

14.8 The membrane must be protected from UV and mechanical damage as soon as possible after installation.

14.9 For gas and VOC resistance applications, the membrane installation should be subject to third-party independent validation, in accordance with BS 8485 : 2015 and/or CIRIA Report C748 : 2014.

15 Repair

15.1 Any damage to the membrane must be repaired using a patch of the membrane, and laps welded and secured over the edges with a suitable acrylic sealing tape. All patched areas must extend a minimum of 100 mm from the damaged area. For VOC resistance applications, laps must be hot air welded.

15.2 If required, repair work should be confirmed by an independent validation report, as all gas or VOC membrane installations should be subject to third-party validation in accordance with BS 8485 : 2015 and/or CIRIA Report C748 : 2014.

Technical Investigations

16 Tests

Tests were carried out and the results assessed to determine:

- visible defects
- characterisation by thermogravimetric analysis

- width, straightness and flatness
- mass per unit area
- thickness
- foldability at low temperature
- tensile strength and elongation
- airtightness of joints
- shear strength of joints
- dimensional stability
- resistance to static loading
- effect of heat ageing
- effect of water exposure
- effect of exposure to UV.

17 Investigations

17.1 An evaluation was made of the results of independent test data to establish:

- methane gas transmission (on unjointed and jointed membranes)
- carbon dioxide gas transmission
- radon gas diffusion coefficient
- transmission of vapours from VOCs
- tensile strength and elongation
- chemical resistance
- leaching resistance
- resistance to tearing (nail shank)
- resistance to impact
- Watertightness at 196.2 kPa hydrostatic pressure.

17.2 The manufacturing process was evaluated, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

Bibliography

BRE Report BR 211 : 2015 Radon — *Guidance on protective measures for new buildings*

BS 8000-0 : 2014_ Workmanship on construction sites — Introduction and general principles

BS 8000-4 : 1989 Workmanship on building sites — Code of practice for waterproofing

BS 8485 : 2015 *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*

BS EN 14414 : 2004 *Geosynthetics — Screening test method for determining chemical resistance for landfill applications*

BS ISO 15105-1 : 2007 *Plastics — Film and sheeting — Determination of gas-transmission rate — Differential-pressure methods*

BS ISO 15105-2 : 2003 *Plastics — Film and sheeting — Determination of gas-transmission rate — Equal-pressure method*

CIRIA C748 : 2014 *Guidance on the use of plastic membranes as VOC vapour barriers*

CP 102 : 1973 *Code of practice for protection of buildings against water from the ground*

EN 13967 : 2012 + A1 : 2017 *Flexible sheets for waterproofing — Plastic and rubber damp proof sheets including plastic and rubber basement tanking sheet — Definitions and characteristics*

18 Conditions

18.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page – no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- is valid only within the UK
- has to be read, considered and used as a whole document – it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English Law.

18.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

18.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

18.4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

18.5 In issuing this Certificate the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- actual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to CE marking.

18.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.