

## Icopal Limited

Barton Dock Road  
Stretford  
Manchester M32 0YL  
Tel: 0161-865 4444 Fax: 0161-866 9859  
e-mail: marketing.uk@icopal.com  
website: www.icopal.co.uk



Agrément Certificate  
**10/4739**  
Product Sheet 1

## ICOPAL SINGLE-PLY ROOF WATERPROOFING SYSTEMS

### MONARPLAN FM SINGLE-PLY PVC ROOF WATERPROOFING MEMBRANES

#### PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to Monarplan FM Single-Ply PVC Roof Waterproofing Membranes, for use as mechanically fastened roof waterproofing membranes on flat or pitched roofs with limited access.

#### AGRÉMENT 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

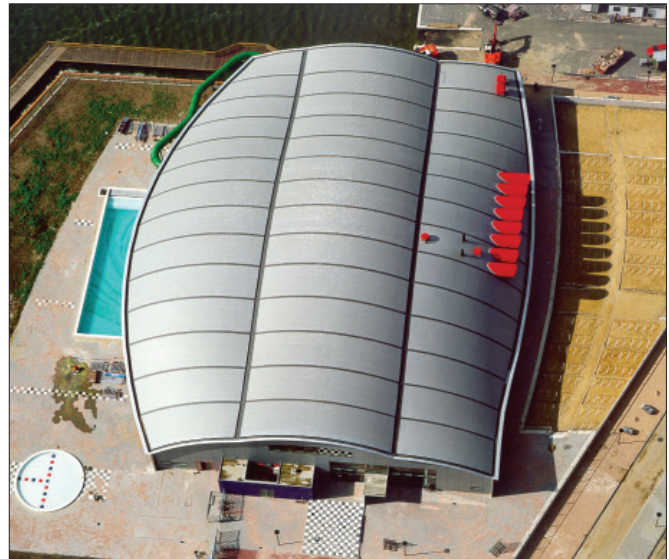
**Weathertightness** — the systems and joints in the systems, when completely sealed and consolidated, will resist the passage of moisture to the interior of the building (see section 5).

**Properties in relation to fire** — results of tests indicate that the systems will enable a roof to be unrestricted under Building Regulations (see section 6).

**Resistance to wind uplift** — the systems will resist the effects of any wind suction likely to occur in practice (see section 7).

**Resistance to foot traffic** — the systems will accept the limited foot traffic and loads associated with installation and maintenance of the system without damage (see section 8).

**Durability** — under normal service conditions the systems will provide a durable waterproof covering with a service life of at least 30 years for fixed systems (see section 10).



The BBA has awarded this Agrément Certificate to the company named above for the products described herein. The products have been assessed by the BBA as being fit for their intended use provided they are installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Simon Wroe  
Head of Approvals — Materials

Greg Cooper  
Chief Executive

Date of First issue: 9 March 2010

*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](http://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.*

British Board of Agrément  
Bucknalls Lane  
Garston, Watford  
Herts WD25 9BA

tel: 01923 665300  
fax: 01923 665301  
e-mail: [mail@bba.star.co.uk](mailto:mail@bba.star.co.uk)  
website: [www.bbacerts.co.uk](http://www.bbacerts.co.uk)

©2010

# Regulations

In the opinion of the BBA, Monarplan FM Single-Ply PVC Roof Waterproofing Membranes, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations:



## The Building Regulations 2000 (as amended) (England and Wales)

<b>Requirement:</b> B4(2)	<b>External fire spread</b>
<b>Comment:</b>	Test data obtained from tests to BS 476-3 : 1958 indicate that on suitable non-combustible substructures the use of the membranes will enable a roof to be unrestricted under this Requirement. See sections 6.1 and 6.2 of this Certificate.
<b>Requirement:</b> C2(b)	<b>Resistance to moisture</b>
<b>Comment:</b>	Data for water resistance on the membranes, including joints, indicate that the membranes meet this Requirement. See section 5.1 of this Certificate.
<b>Requirement:</b> Regulation 7	<b>Materials and workmanship</b>
<b>Comment:</b>	The membranes are acceptable materials. See sections 10.1 and 10.2 and the <i>Installation</i> part of this Certificate.



## The Building (Scotland) Regulations 2004 (as amended)

<b>Regulation:</b> 8(1)(2)	<b>Fitness and durability of materials and workmanship</b>
<b>Comment:</b>	The membranes can contribute to a construction satisfying this Regulation. See sections 9, 10.1 and 10.2 and the <i>Installation</i> part of this Certificate.
<b>Regulation:</b> 9	<b>Building standards — construction</b>
<b>Standard:</b> 2.8	<b>Spread from neighbouring buildings</b>
<b>Comment:</b>	Test data to BS 476-3 : 1958 indicate that on suitable non-combustible substructures the use of the membranes will be unrestricted by the requirements of clause 2.8.1 <sup>(1)(2)</sup> of this Standard. See sections 6.1 and 6.2 of this Certificate.
<b>Standard:</b> 3.10	<b>Precipitation</b>
<b>Comment:</b>	Data examined for water resistance on the membranes, including joints, indicate that the use of the membranes can enable a roof to satisfy the requirements of clauses 3.10.1 <sup>(1)(2)</sup> and 3.10.7 <sup>(1)(2)</sup> of this Standard. See section 5.1 of this Certificate.
<b>Regulation:</b> 12	<b>Building standards — conversions</b>
<b>Comment:</b>	All comments given for these membranes under Regulation 9, also apply to this Regulation, with reference to clause 0.12.1 <sup>(1)(2)</sup> and Schedule 6 <sup>(1)(2)</sup> . (1) Technical Handbook (Domestic). (2) Technical Handbook (Non-Domestic).



## The Building Regulations (Northern Ireland) 2000 (as amended)

<b>Regulation:</b> B2	<b>Fitness of materials and workmanship</b>
<b>Comment:</b>	The membranes are acceptable materials. See sections 10.1 and 10.2 and the <i>Installation</i> part of this Certificate.
<b>Regulation:</b> B3(2)	<b>Suitability of certain materials</b>
<b>Comment:</b>	The membranes are acceptable. See section 9 of this Certificate.
<b>Regulation:</b> C4(b)	<b>Resistance to ground moisture and weather</b>
<b>Comment:</b>	Data for water resistance on the membranes, including joints, indicate that the use of the membranes can enable a roof to satisfy the requirements of this Regulation. See section 5.1 of this Certificate.
<b>Regulation:</b> E5(b)	<b>External fire spread</b>
<b>Comment:</b>	Test data to BS 476-3 : 1958 indicate that on suitable non-combustible substructures the use of the membranes will be unrestricted by the requirements of this Regulation. See sections 6.1 to 6.2 of this Certificate.

## Construction (Design and Management) Regulations 2007

## Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

See sections: 1 *Description* (1.2) and 2 *Delivery and site handling* (2.3).

# Non-regulatory Information

## NHBC Standards 2008

NHBC accepts the use of Monarplan FM Single-Ply PVC Roof Waterproofing Membranes, when installed and used in accordance with this Certificate, as meeting Technical Requirement R3 in relation to *NHBC Standards*, Chapter 7.1 *Flat roofs and balconies* and Chapter 7.2 *Pitched roofs*.

## General

This Certificate is a Confirmation of a Dutch Agrément CTG 009/9 issued by Intron Certificate B.V. to Icopal Synthetic Membranes B.V. (previously known as Van Besouw Kunststoffen B.V.).

## Technical Specification

### 1 Description

1.1 Monarplan FM Single-Ply PVC Roof Waterproofing Membranes are polyester reinforced, flexible, polyvinyl chloride (PVC) single-ply roof waterproofing membranes, manufactured by calendaring.

1.2 The nominal characteristics of the membranes are:

thickness (mm)	1.2, 1.5 and 1.8
width (m)	1.50 and 2.12
length (m)	15 and 20
mass per unit area (kg·m <sup>-2</sup> )	1.575 (1.2 mm), 1.95 (1.5 mm) and 2.34 (1.8 mm)
colour	
lower side	standard grey (RAL 7001)
upper side	standard grey (RAL 7001), anthracite grey (RAL 7015), stone red (RAL 3011), white (RAL 9010), blue (RAL 5005), green (RAL 6004) and turquoise green (RAL 5018).

1.3 Ancillary items for use with the systems include:

- PVC coated metal — a 0.6 mm galvanized steel sheet, coated with 0.6 mm of Monarplan PVC compound for use in detailing
- Monarplan PVC internal and external corners — prefabricated corner units
- polyester fleeces 120 and 300 g·m<sup>-2</sup> — for use as a separation layer for mechanical and chemical protection
- glass fleece 120 g·m<sup>-2</sup> — for use as a separation layer between the membrane and EPS insulation boards
- mechanical fasteners and tubular washers.

1.4 Quality control checks are carried out during production and on the final product. Checks on the final product include:

- dimensions
- tensile strength and elongation
- tear resistance
- dimensional stability
- joint peel
- interlaminar strength
- low-temperature foldability.

### 2 Delivery and site handling

2.1 The membranes are delivered to site in rolls wrapped in plastic. The wrapper bears the product name, manufacturer's name, product dimensions, article number and batch number.

2.2 Rolls should be stored horizontally undercover and on a clean, level surface.

# Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Monarplan FM Single-Ply PVC Roof Waterproofing Membranes.

## Design Considerations

### 3 General

- 3.1 Monarplan FM Single-Ply PVC Roof Waterproofing Membranes are satisfactory for use as a mechanically fixed waterproofing layer on flat and pitched roofs with limited access.
- 3.2 Limited access roofs are defined for the purpose of this Certificate as those roofs subjected only to pedestrian traffic for maintenance of the roof covering and cleaning of gutters. Where traffic in excess of this is envisaged, special precautions, such as additional protection to the membrane, must be taken.
- 3.3 Flat roofs are defined for the purpose of this Certificate as those roofs having a minimum finished fall of 1:80. For design purposes, twice the minimum finished fall should be assumed, unless a detailed analysis of the roof is available, including, for example, overall and local deflection and direction of falls. Pitched roofs are defined for the purpose of this Certificate as those having a fall in excess of 1:6.
- 3.4 Decks to which the systems are to be applied must comply with the relevant requirements of BS 6229 : 2003, BS 8217 : 2005 and, where appropriate, *NHBC Standards*, Chapter 7.1.
- 3.5 Insulation materials used in conjunction with the systems must be either:
- as described in BS 8217 : 2005, or
  - the subject of a current BBA Certificate and be used in accordance with, and within the limitations of, that Certificate.
- 3.6 The membranes can be adversely affected by contact with bituminous or coal tar products, or polystyrene insulation boards, and a suitable separating layer must be used. When doubt arises, the advice of the Certificate holder should be sought.

### 4 Practicability of installation

Installation of the membranes must be carried out by trained and approved installers.

### 5 Weathertightness



5.1 Data confirm that the membranes and joints in the membranes, when completely sealed, will adequately resist the passage of moisture to the inside of the building and so meet the requirements of the national Building Regulations:

**England and Wales** — Approved Document C, Requirement C2(b), Section 6

**Scotland** — Mandatory Standard 3.10, clauses 3.10.1 and 3.10.7

**Northern Ireland** — Regulation C4(b).

5.2 The membranes are impervious to water and, when used in one of the systems described, will achieve a weathertight roof capable of accepting minor structural movement without damage.

### 6 Properties in relation to fire



6.1 When tested in accordance with BS 476-3 : 1958, a system comprising a trapezoidal steel deck, a polyethylene vapour control layer, 150 mm thick mineral wool insulation and layer of Monarplan FM 1.2 mm membrane, mechanical fastened, achieved a rating of EXT.F.AB.

6.2 The designation of other specifications (eg when used on combustible substrates) should be confirmed by:

**England and Wales** — Test or assessment in accordance with Approved Document B, Appendix A, Clause A1

**Scotland** — Test by a UKAS accredited laboratory to conform to Mandatory Standard 2.8, clause 2.8.1

**Northern Ireland** — Test or assessment carried out by a UKAS accredited laboratory or an independent consultant with appropriate experience.

### 7 Resistance to wind uplift

7.1 The resistance to wind uplift of the membranes is provided by mechanical fasteners secured to the deck and passing through the membrane. The number of fixings will depend on a number of factors, including:

- wind uplift forces to be resisted
- pull-out strength of fasteners
- elastic limit of the membrane
- appropriate safety factors.

7.2 The number of fixings used should be established by reference to the wind uplift forces calculated in accordance with BS 6399-2 : 1997 on the basis of maximum permissible loads of 0.6 kN per fixing.

## 8 Resistance to foot traffic

8.1 Data indicate that the systems can withstand, without damage, the limited foot traffic and light concentrated loads associated with the installation and maintenance operations. However, reasonable care should be taken to avoid sharp objects or concentrated loads (see Table for *Physical properties – general*).

8.2 In a situation where regular traffic is envisaged (ie maintenance of lift equipment) a walkway should be provided using concrete slabs supported on bearing pads or an anti-slip walkway with or without a protection sheet. The advice of the Certificate holder should be sought on the most appropriate method to be used with the amount of traffic involved.

## 9 Maintenance



Roofs covered with the membranes should be the subject of annual inspections, as is good practice with waterproofing systems.

## 10 Durability



10.1 Accelerated weathering tests and evidence from long-term existing sites confirm that satisfactory retention of physical properties is achieved. Available evidence indicates that the mechanically fixed system will have a life in excess of 30 years.

10.2 In environments where the membranes are in contact with organic solvents, the life expectancy of the membranes may be reduced. In cases of doubt, the advice of the Certificate holder should be sought.

# Installation

## 11 General

11.1 Installation of Monarplan FM Single-Ply PVC Roof Waterproofing Membranes must be carried out in accordance with the relevant Clauses of the Certificate holder's instructions, BS 8000-4 : 1989 and this Certificate.

11.2 Conditions on site should be those for normal roof waterproofing work. Deck surfaces must be dry, clean and free from sharp projections such as nail heads and concrete nibs. When used over a rough substrate, a suitable protection layer should be placed over the substrate.

11.3 Installation should not be carried out during wet weather (eg rain, fog, snow) nor when the temperature is below 0°C unless suitable precautions against surface condensation are taken in accordance with the Certificate holder's instructions.

11.4 When used over bitumen, bitumen-bound insulation products, coal tar, pitch or oil-based products, a separation layer must be interposed between the substrate and the membrane. In cases of doubt, the advice of the Certificate holder should be sought.

## 12 Procedure

12.1 The membranes are unrolled onto the substrate without undulations, with 110 mm minimum side laps and 60 mm minimum end laps.

12.2 The membranes are fixed to the deck (through insulation boards, where appropriate) in the joint overlaps prior to welding of the seams in accordance with the Certificate holder's instructions.

12.3 The membranes are to be fixed at the edges by either mechanically fastening using flatbar, PVC coated metal or by welding.

### Hot-air welding

12.4 Joints are made using either automatic or hand-operated machines with the temperature set in accordance with the Certificate holder's instructions.

12.5 The lap area must be dry and clean. If the membrane in the weld area has become contaminated, it must be cleaned in accordance with the Certificate holder's instructions.

12.6 The welded width of the joint must be a minimum of 40 mm for field welds and detailing. Care should be taken that overheating of the membrane does not occur, possible impairment of the membrane may result.

12.7 Flashings are to be formed in accordance with the Certificate holder's instructions.

12.8 The seam is tested with a metal probe to highlight poorly-welded areas. Any such areas must be made good using hot-air welding.

## 13 Repair

In the event of accidental damage, repairs can be carried out by cleaning around the damaged area and applying a patch of the appropriate membrane in accordance with the Certificate holder's instructions.

## 14 Tests

Data from tests on Monarplan FM conducted by BDA Keuringsinstituut B.V. and the BBA are summarised in Tables 1 to 3.

*Table 1 Physical properties — directional*

Test (units)	Mean results		Method <sup>(1)</sup>
	Longitudinal	Transverse	
Tensile strength (N per 50 mm)	1205	1205	EN 12311-2
Elongation at break (%)	20.0	20.5	EN 12311-2
Dimensional stability (%)	-0.6	0.0	EN 1107-2
Low temperature foldability (°C)			EN 495-5
control	<-40	<-35	
heat aged 168 days at 70°C	<-35	<-35	
1000 hours UVA ageing	<-35	<-35	
Shear strength of joints (N per 50 mm)			EN 12317-2
control	715	877	
1 week at 60°C	748	905	
4 weeks at 80°C	807	1028	
Peel strength (N·mm <sup>-1</sup> )			EN 12316-2
control	282	278	
1 week at 60°C	229	270	
4 weeks at 80°C	307	278	
Interlaminar peel strength (N per 50 mm)	146	198	EN 12316-2

(1) The test documents are detailed in the *Bibliography*. Numbers in the table refer to the sections of the various documents.

*Table 2 Physical properties — general*

Test (units)	Mean results	Method <sup>(1)</sup>
Wind loading <sup>(2)</sup> (N per fastener)		ETAG 006
corrected result		
system 1 <sup>(3)</sup>	600	
system 2 <sup>(4)</sup>	600	
system 3 <sup>(5)</sup>	780	
system 4 <sup>(6)</sup>	660	
Static indentation		MOAT 65 : 4.3.8
concrete	L <sub>20</sub>	
EPS (20 kg·m <sup>-3</sup> )	L <sub>20</sub>	
Dynamic indentation		MOAT 65 : 4.3.9
perlite	I <sub>10</sub>	
EPS (20 kg·m <sup>-3</sup> )	I <sub>10</sub>	
Dynamic indentation (mm)		EN 12691
EPS 150	2000	
aluminium	800	
Water vapour transmission (g·m <sup>-2</sup> ·day <sup>-1</sup> ) (25°C/75% RH)	1.81	BS 3177
Vapour resistance (MN·s·g <sup>-1</sup> ) (25°C/75% RH)	113	BS 3177
Resistance to water pressure at 10 kPa	pass	EN 1928
Percentage weight loss (%)		MOAT 65
heat aged 168 days at 70°C	0.01	
UV ageing 1000 hours UVA	0.02	
Water absorption (%)	0	MOAT 65 : 4.3.13
Capillarity (mm)	2	MOAT 65 : 4.3.15
Percentage plasticiser (%)		MOAT 65 : 4.2.7
unaged	28.4	
28 day water soak at 23°C	27.8	

(1) The test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents.

(2) Mechanically fastened system on a metal deck.

(3) Sample tested was a 0.75 mm thick profiled steel deck, 100 mm of mineral wool insulation fastened with two fasteners per board with 1.2 mm Monarplan FM, width 1060 mm, mechanically fastened at 250 mm centres using 4.8 mm x 140 mm fasteners and 82 mm x 40 mm metal plates.

(4) Sample tested was a 0.75 mm thick profiled steel deck, 100 mm of mineral wool insulation fastened with two fasteners per board with 1.2 mm Monarplan FM, width 1060 mm, mechanically fastened at 250 mm centres using 4.8 mm x 140 mm fasteners and plastic plates.

(5) Sample tested was a 0.75 mm thick profiled steel deck, 100 mm of mineral wool insulation fastened with two fasteners per board with 1.2 mm Monarplan FM, width 1500 mm, mechanically fastened at 250 mm centres using 4.8 mm x 140 mm fasteners and 82 mm x 40 mm metal plates.

(6) Sample tested was a 0.75 mm thick profiled steel deck, 100 mm of mineral wool insulation fastened with two fasteners per board with 1.2 mm Monarplan FM, width 1500 mm, mechanically fastened at 250 mm centres using 4.8 mm x 140 mm fasteners and plastic plates.



Table 3 Tests on 1.2 mm Monarplan FM site samples by the BBA<sup>(1)</sup>

Test (units)	Mean results	Method <sup>(2)</sup>
Nail tear (N)		EN 12310-1
longitudinal direction	515	
transverse direction	637	
Thickness (mm)	0.99	EN 1849-2
Mass per unit area (k·gm <sup>-2</sup> )	1.288	EN 1849-2

(1) Sample taken from a 23-year-old site.

(2) The test documents are detailed in the Bibliography.

## 15 Investigations

15.1 Existing data on fire performance to BS 476-3 : 1958 was assessed.

15.2 Existing data on fire performance to ENV 1187, Test 3 was assessed. The classification to EN 13501-5 : 2005 is B<sub>ROOF</sub>(t3).

15.3 Visits to existing sites installed during 1969 and 1981 were carried out and samples were taken to assess the durability of the product under normal service conditions.

## Bibliography

- BS 476-3 : 1958 *Fire tests on building materials and structures — External fire exposure roof test*
- BS 3177 : 1959 *Method for determining the permeability to water vapour of flexible sheet materials used for packaging*
- BS 6229 : 2003 *Flat roofs with continuously supported coverings — Code of practice*
- BS 6399-2 : 1997 *Loading for buildings — Code of practice for wind loads*
- BS 8000-4 : 1989 *Workmanship on building sites — Code of practice for waterproofing*
- BS 8217 : 2005 *Reinforced bitumen membranes for roofing — Code of practice*
- EN 495-5 : 2000 *Flexible sheets for waterproofing — Determination of foldability at low temperature — Plastic and rubber sheet for roof waterproofing*
- EN 1107-2 : 2001 *Flexible sheets for waterproofing — Determination of dimensional stability — Plastic and rubber sheet for roof waterproofing*
- EN 1928 : 2000 *Flexible sheets for waterproofing — Bitumen, plastic and rubber sheets for roof waterproofing — Determination of watertightness*
- EN 1849-2 : 2001 *Flexible sheets for waterproofing — Determination of thickness and mass per unit area — Plastic and rubber sheets for roof waterproofing*
- EN 12310-1 : 1999 *Flexible sheets for waterproofing — Bitumen sheets for roof waterproofing — Determination of resistance to tearing (nail shank)*
- EN 12311-2 : 2000 *Flexible sheets for waterproofing — Determination of tensile properties — Plastic and rubber sheets for roof waterproofing*
- EN 12316-2 : 2000 *Flexible sheets for waterproofing — Determination of peel resistance of joints — Plastic and rubber sheets for roof waterproofing*
- EN 12317-2 : 2000 *Flexible sheets for waterproofing — Determination of shear resistance of joints — Plastic and rubber sheets for roof waterproofing*
- EN 12691 : 2006 *Flexible sheets for waterproofing — Bitumen, plastic and rubber sheets for roof waterproofing — Determination of resistance to impact*
- EN 13501-5 : 2005 *Fire classification of construction products and building elements — Classification using data from external fire exposure to roof tests*
- ENV 1187 : 2002 *Test methods for external fire exposure to roofs*
- ETAG 006 : 2000 *Systems of Mechanically Fastened Flexible Roof Waterproofing Membranes*
- MOAT No 65 : 2001 *UEAtc Technical Guide for the Assessment of Non-Reinforced, Reinforced and/or Backed Roof Waterproofing Systems made of PVC*

## 16 Conditions

16.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is granted only to the company, firm or person named on the front page — no other company, firm or person may hold or claim any entitlement to this Certificate
- 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.

16.2 Publications and documents referred to in this Certificate are those that the BBA deems to be relevant at the date of issue or re-issue of this Certificate and include any: Act of Parliament; Statutory Instrument; Directive; Regulation; British, European or International Standard; Code of Practice; manufacturers' instructions; or any other publication or document similar or related to the aforementioned.

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

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- remain covered by a valid Dutch Agrément; and
- are reviewed by the BBA as and when it considers appropriate.

16.4 In granting this Certificate, the BBA is not responsible for:

- 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
- individual installations of the product/system, including the nature, design, methods and workmanship of or related to the installation
- the actual works in which the product/system is installed, used and maintained, including the nature, design, methods and workmanship of such works.

16.5 Any information relating to the manufacture, supply, installation, use and maintenance 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 and maintained. It does not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date 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. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the manufacture, supply, installation, use and maintenance of this product/system.