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BBA BRITISH BOARD OF AGRÉMENT
ASSESSMENT OF PRODUCTS FOR CONSTRUCTION

Designated by Government to issue European Technical Approvals

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Agrément Certificate No 98/3450

STEPOC FOUNDATION BLOCKWORK

Blocs de béton de foundation
Betonvandstein

Product

- *THIS CERTIFICATE RELATES TO STEPOC FOUNDATION BLOCKWORK COMPRISING STEPOC HOLLOW BLOCKS, AVAILABLE IN TWO NOMINAL SIZES AND FILLED WITH UNREINFORCED STRUCTURAL CONCRETE.*
- *Stepoc blockwork has been assessed for use below the damp-proof course in:*

(a) the inner and outer leaves of cavity walls, and

(b) solid external and internal walls.

- *Walls are constructed by laying the Stepoc blocks dry in a one-third running bond and then filling with a structural grade concrete.*

continued

Building Regulations

1 The Building Regulations 1991 (as amended 1994) (England and Wales)

The Secretary of State has agreed with the British Board of Agrément the aspects of performance used by the BBA in assessing the compliance of foundation walls with the Building Regulations. In the opinion of the BBA, Stepoc Foundation Blockwork, if used in accordance with the provisions of this Certificate, will meet the relevant requirements.

Requirement:	A1	Loading
Comment:		Stepoc blockwork has adequate strength and stiffness and therefore meets the requirements of the regulation provided that: (a) it is correctly installed (see section 14 of this Certificate) (b) the design strengths are in accordance with section 8 and Table 2 of this Certificate.
Requirement:	B3(1)	Internal fire spread — structure
Comment:		Stepoc blockwork, without chasing or holes, has a notional period of fire resistance of 2 hours and is therefore satisfactory subject to the requirements of each purpose group as set out in Approved Document. See section 12 of this Certificate.
Requirement:	B3(3)	Internal fire spread — structure
Comment:		The surface of the blocks is designated Class 0. This should be taken into consideration in determining the need for cavity barriers. See section 12 of this Certificate.

continued

continued

• Designers should note that the nominal sizes shown in Figure 1 are also the work sizes as there are no mortar joints.

• Walls should not exceed 10 courses in height before filling with fresh concrete.

• It is essential that Stepoc Foundation Blockwork is constructed in accordance with the conditions set out in the Design Data *and* Installation *parts of this Certificate.*

• This product has previously been the subject of Agrément Certificate No 85/1574.

Requirement:	B3(4)	Internal fire spread — structure
Comment:		Stepoc blockwork is non-combustible and therefore meets the requirement for limited combustibility for separating walls. See section 12 of this Certificate.
Requirement:	B4(1)	External fire spread
Comment:		Stepoc blockwork is non-combustible and designated Class 0 and therefore will not be subject to the limitations of a minimum distance from any point on the boundary. See section 12 of this Certificate.
Requirement:	Regulation 7	Materials and workmanship
Comment:		When required to achieve compliance with relevant requirements of the Building Regulations. Stepoc blockwork is acceptable.

2 The Building Standards (Scotland) Regulations 1990 (as amended)

In the opinion of the BBA, Stepoc Foundation Blockwork, if used in accordance with the provisions of this Certificate, will satisfy the various Regulations as listed below.

Regulation:	10	Fitness of materials
Standard:	B2.1	Selection and use of materials and components
Comment:		Stepoc blockwork is acceptable. See sections 10 and 11 of this Certificate.
Regulation:	11	Structure
Standard:	C2.1	Construction
Comment:		Stepoc blockwork designed to BS 5628 : Part 1 : 1992, using the data given in Table 2 of this Certificate, will sustain and transmit the design load to the foundation without impairing the stability of, or damaging any part of, the building. See section 8 of this Certificate.
Regulation:	12	Structural fire precautions
Standard:	D2.2	Fire resistance
Comment:		Stepoc blockwork, without chasing or holes, has a notional period of fire resistance of 2 hours and may be used in elements of structure subject to the requirements for each occupancy group. See section 12 of this Certificate.
Standard:	D2.3	Non-combustibility
Comment:		Stepoc blockwork is non-combustible and may therefore form part of any wall required to be non-combustible in accordance with the Table to this Regulation. See section 12 of this Certificate.

3 The Building Regulations (Northern Ireland) 1994 (as amended 1995 and 1997)

In the opinion of the BBA, Stepoc Foundation Blockwork, if used in accordance with the provisions of this Certificate, will satisfy the various Building Regulations as listed below.

Regulation:	B2	Fitness of materials and workmanship
Comment:		Stepoc blockwork is acceptable. See sections 10 and 11 of this Certificate.
Regulation:	D1	Loading
Comment:		Stepoc blockwork has adequate strength and stiffness to sustain and transmit the loads to the foundation without impairing the stability of, or damaging any part of, the building provided that: (a) it is correctly installed. See section 14 of this Certificate. (b) when Stepoc blocks are designed to BS 5628 : Part 1 : 1992 the design strengths given in section 8 and Table 2 of this Certificate are taken into account.
Regulation:	E6	Internal fire spread — structure
Comment:		Stepoc blockwork, without chasing or holes, has a notional period of fire resistance of 2 hours and may be used in elements of structure subject to the requirements for each purpose group See section 12 of this Certificate. Stepoc blockwork is designated Class 0 material, and will therefore satisfy the requirements for the surfaces of every purpose group. See section 12 of this Certificate.
Regulation:	E8	External fire spread
Comment:		Stepoc blockwork is non-combustible and designated Class 0, and therefore will not be subject to the limitations of a minimum distance from any point on the boundary. See section 12 of this Certificate.

Technical Specification

4 Description

4.1 Stepoc blocks are manufactured from Portland cement to BS 12 : 1996 and selected aggregates to BS 882 : 1983.

4.2 Stepoc blocks are available in two standard sizes (see Figure 1 and Table 1) and manufactured to the requirements of BS 6073 : Part 1 : 1981. Special blocks of one-third length and full length are available with plain ends for each block type for use in the construction of corners and junctions (see Figures 2, 3 and 4).

4.3 The mean compressive strengths of blocks, when tested in accordance with BS 6073 : Part 1 : 1981 and evaluated in accordance with BS 6073 : Part 2 : 1981, are given in Table 1.

5 Manufacture

5.1 The raw materials for the blocks are fed into a continuous batching plant; measured amounts of the concrete mix are transferred into an extrusion machine that forms the blocks.

5.2 Quality control includes tests on aggregates, monitoring of the batching and mixing process and tests to BS 6073 : 1981 on the finished blocks.

6 Delivery to site

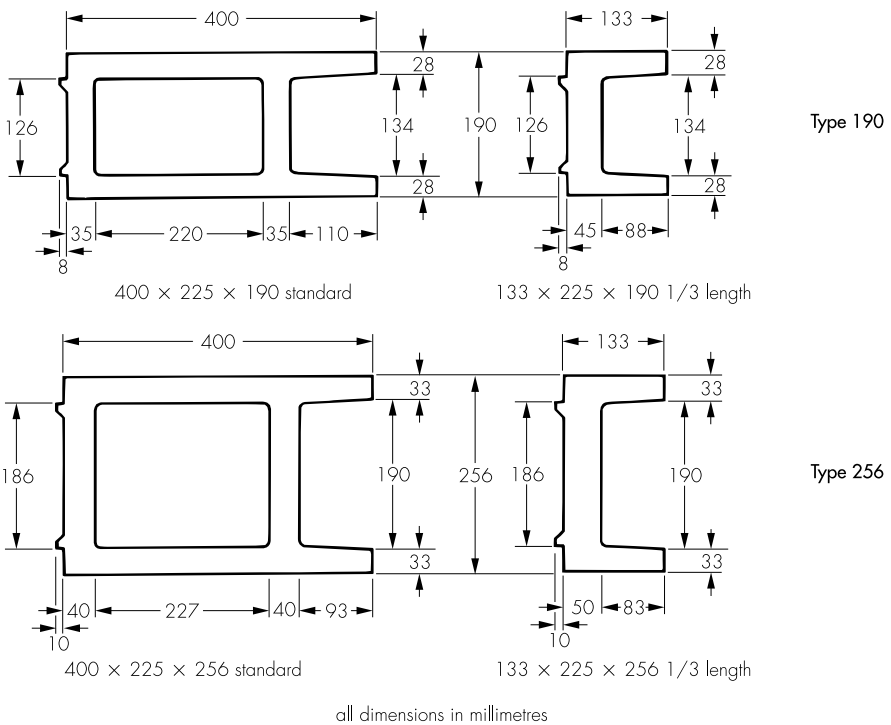
The blocks are supplied in banded cubes on pallets which can be handled by forklift trucks or mechanical grabs. The blocks should be stored on dry, level ground.

Table 1 Characteristic properties

Stepoc block type	Nominal dimensions (mm)	Average weight (kg)	Specified compressive strength* (Nmm^{-2})
190	400 × 225 × 190	16.4	3.5
256	400 × 225 × 256	19.6	3.5

*in accordance with BS 6073 : Part 2 : 1981

Figure 1 Shape and dimensions of Stepoc blocks



Design Data

7 General

7.1 Stepoc Foundation Blockwork is satisfactory for use below the damp-proof course in inner and outer leaves of cavity walls and in solid external and internal walls.

7.2 Special blocks of one-third length and full length are available with plain ends for each type of block for use in the construction of corners and cross and tee junctions (see Figures 2, 3 and 4).

Figure 2 Corner detail

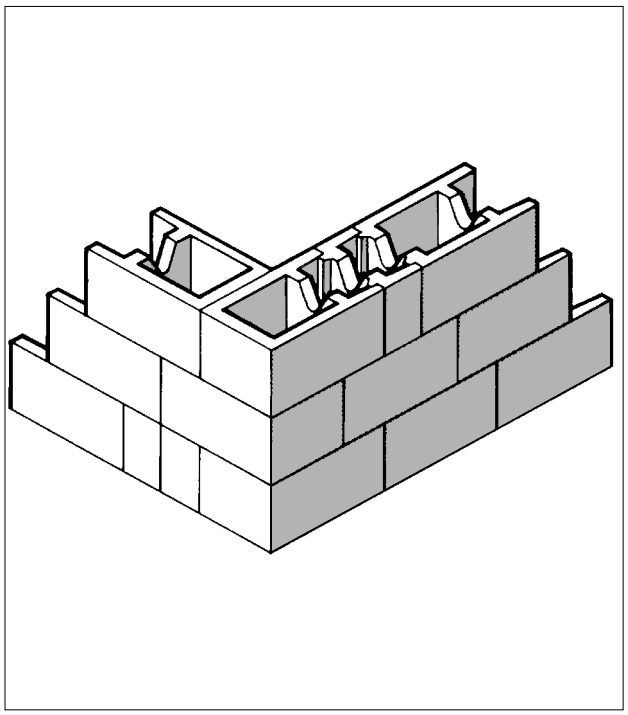


Figure 3 Tee-junction detail

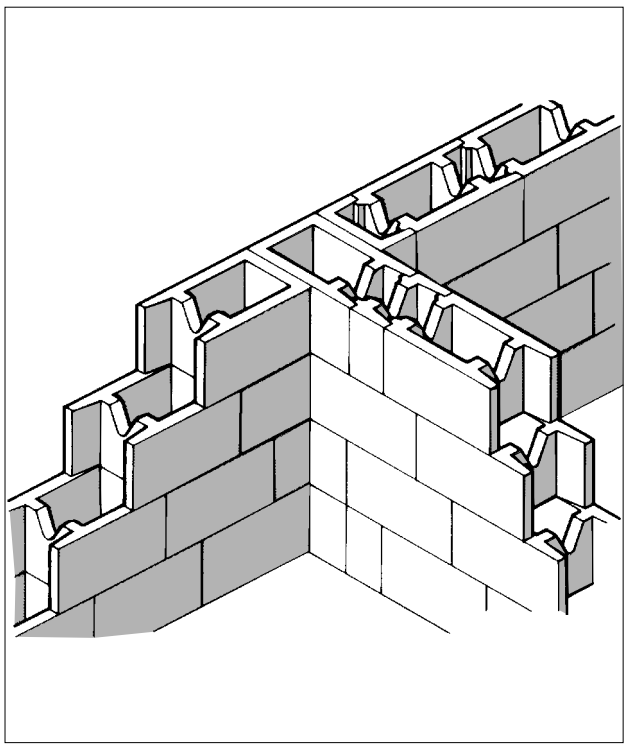
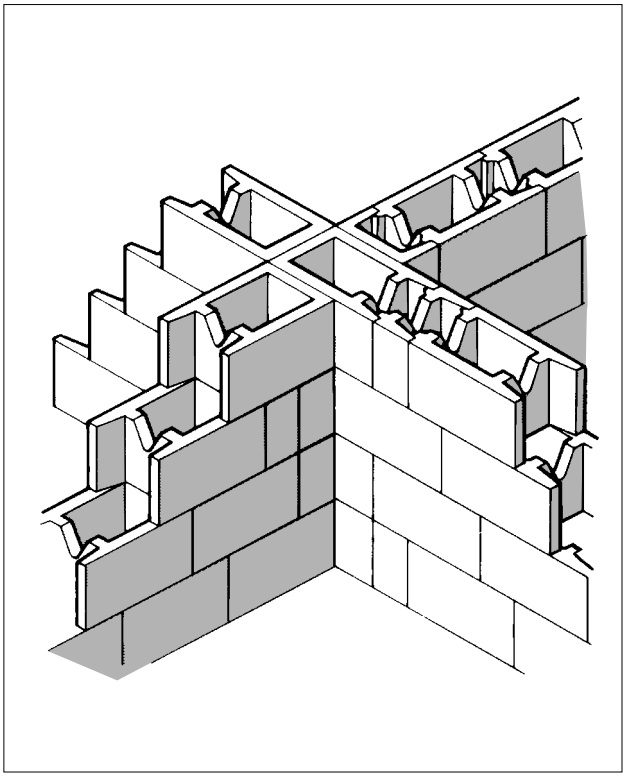


Figure 4 Cross-junction detail



8 Blockwork strength

The characteristic strengths and the appropriate partial safety factors for the blockwork, which can be used for design calculations in accordance with BS 5628 : Part 1 : 1992, are summarised in Table 2.

Table 2 Design strengths

Characteristic strength (Nmm^{-2})		Material partial safety factor
Compressive (f_k)	190 mm block = 14	$\gamma_m = 3.1$
	256 mm block = 18	
Shear (f_v)		
either	$= 0.6_{gA}$*	$\gamma_{mv} = 2.5$†
or	= 0.37	

*A is the design vertical load per unit of wall cross-section due to the vertical loads calculated from the appropriate loading conditions specified in BS 5628 : Part 1 : 1992.

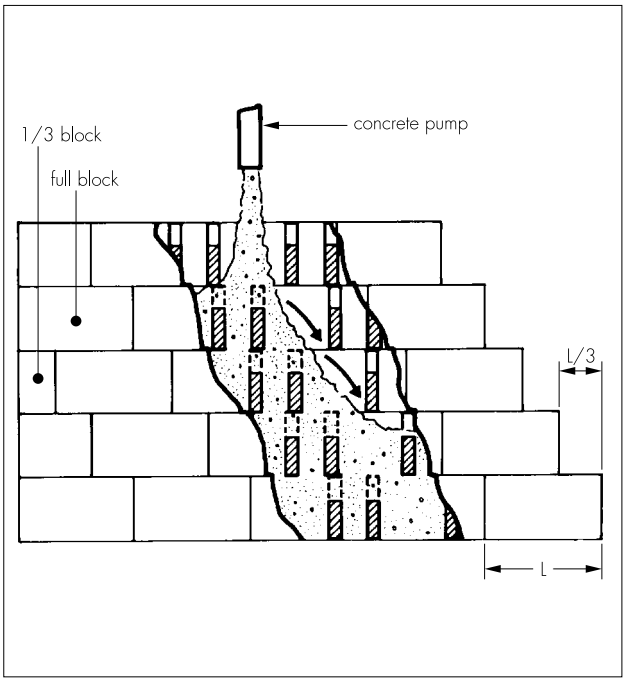
† may not be reduced when considering the probable effects of misuse or accidental damage.

9 Infill concrete

The infill concrete must comply with the following requirements:

(1) The concrete must be able to flow easily through the Stepoc blockwork (see Figure 5) and must therefore be of a consistency suitable for pumping, ie with a slump of a minimum 150 mm sampled in accordance with BS 1881 : Part 101 : 1983 and determined in accordance with BS 1881 : Part 102 : 1983.

Figure 5 Installation of Stepoc blockwork walls



(2) The concrete must have a minimum characteristic strength of 35 Nmm^{-2}. Compliance with the specified characteristic strength should be judged in accordance with Section 16.2 of BS 5328 : Part 2 : 1991.

(3) Admixtures should be added to the fresh concrete mix only in accordance with the recommendations of Section 6.1.5 of BS 8110 : Part 1 : 1997.

(4) The maximum aggregate size shall not exceed 10 mm.

(5) The mix shall contain not less than 300 kg of Portland cement per cubic metre of fresh concrete.

10 Resistance to frost damage

Stepoc foundation blockwork is resistant to the freeze/thaw conditions that are likely to occur below a damp-proof course.

11 Resistance to sulphate attack

Stepoc Foundation Blockwork, when filled with concrete complying with the specification in section 9 of this Certificate, will have adequate resistance to Class 1 sulphate ground conditions as defined by BRE Digest No 363:

less than 0.24% SO_4 in soil by acid extraction
less than 1.2 gl^{-1} of SO_4 in 2:1 water:soil extract, and
less than 0.4 gl^{-1} of SO_4 in groundwater.

12 Behaviour in relation to fire

12.1 When installed in accordance with the requirements of this Certificate the notional period of fire resistance for all thicknesses of Stepoc blockwork,without chasing or holes, has been assessed as 2 hours. This is generally in accordance with the fire resistance of loadbearing masonry comprising solid blocks made from Class 1 aggregate concrete having a minimum thickness of 100 mm (BS 5628 : Part 3 : 1985 : Table 16).

12.2 Stepoc blockwork is non-combustible and will therefore have a Class 0 surface spread of flame rating (see sections 1, 2 and 3 of this Certificate).

13 Movement joints

Movement joints should be designed as for concrete masonry in accordance with BS 5628 : Part 3 : 1985.

Installation

14 General

14.1 Installation must be carried out in accordance with the *Stepoc Block Instruction Manual* (available from Forticrete Ltd), the main requirements of which are reproduced in this section.

14.2 The blocks should be laid on concrete strip or slab foundations designed and constructed in accordance with the recommendations of BS 8004 : 1986 and BS 8110 : Part 1 : 1997.

15 Procedure

15.1 The first course of blocks are:

level and smooth foundation surface

- laid directly onto the foundation using loose sand and small timber wedges where required to ensure alignment and level

uneven foundation surface

- set in a nominal 10 mm thick bed of mortar but no mortar must be allowed between the perpends of the blocks.

15.2 Subsequent courses are laid dry in a one-third running bond (see Figure 5), with the open end of one block engaging the ribbed end of the adjacent block, and to a string line stretched tight between the corner blocks.

15.3 For cavity wall construction using Stepoc blocks, wall ties of the double triangle type to BS 1243 : 1978 can be accommodated by lateral notches in the top of the block shell at intervals not greater than 900 mm horizontally and 450 mm vertically. When the concrete is poured it must be compacted using hand-held rods at the wall-tie locations to prevent the formation of voids.

15.4 Vertical faces should be checked for plumb on completion of alternate courses. Where necessary, corrections to level and plumb may be made by placing small timber wedges or loose sand between courses. Any adjustments made during the laying of the blocks should be carefully

inspected before pouring the infill concrete. Where a number of corrections to level and plumb have been made, the unfilled blockwork should be propped to ensure adequate stability during the concrete pour.

15.5 No more than 10 courses of unfilled blockwork may be laid before a concrete pour is made. Provision should be made to prevent debris from entering the block cavities during construction.

15.6 The blockwork is cut or trimmed to accommodate inserts such as ducting, sleeves, vents and pipes in accordance with the recommendations of BS 5628 : Part 3 : 1985. When specifying or detailing inserts to pass through a Stepoc wall, consideration must be given to the pressures exerted by the infill concrete and the need to ensure that no voids are created due to the concrete flow being obstructed. Consideration must also be given to the effects that trimming, through fittings and inserts will have on the fire resistance of Stepoc blockwork.

15.7 The concrete should preferably be placed by pumping; however, it may be placed by alternative methods provided that:

- fresh concrete can flow in a similar manner to pumped concrete, and
- the method of transportation and placing does not incur an additional risk to the stability of the wall.

Technical Investigations

The following is a summary of the technical investigations carried out on Stepoc Foundation Blockwork.

16 Tests

The following tests were carried out:

(a) To BS 6073: Parts 1 and 2: 1981

dimensional accuracy
dry density of blocks
dry density of block material.

(b) To BS 5628 : Part 1 : 1992, Appendix A3 — characteristic flexural strength of Stepoc wallettes laid dry and filled with concrete.

(c) To MOAT No 12 : 1977 — freeze/thaw resistance of concrete filled blocks.

(d) Compressive tests — on Stepoc walls laid dry and then filled with concrete.

(e) Comparative compressive tests — on individual Stepoc blocks, both filled with concrete and unfilled.

17 Other investigations

17.1 The erection of a trial wall was observed and site visits were made to assess the practicability of installation.

17.2 An evaluation was made of existing data relating to the structural performance of the blockwork filled with concrete.

17.3 The manufacturing process was examined and details were obtained of the quality and composition of the materials used. The manufacturer's quality control procedures were witnessed and records examined to confirm that the characteristic compressive strength of the blocks was determined in accordance with BS 6073 : Part 1 : 1981.

Bibliography

BS 12 : 1996 *Specification for Portland cement*

BS 882 : 1992 *Specification for aggregates from natural sources for concrete*

BS 1243 : 1978 *Specification for metal ties for cavity wall construction*

BS 1881 *Testing concrete*
Part 101 : 1983 *Method of sampling fresh concrete on site*
Part 102 : 1983 *Method for determination of slump*

BS 5328 *Concrete*
Part 2 : 1991 *Methods for specifying concrete mixes*

BS 5628 *Code of practice for use of masonry*
Part 1 : 1992 *Structural use of unreinforced masonry*
Part 3 : 1985 *Materials and components, design and workmanship*

BS 6073 *Precast concrete masonry units*
Part 1 : 1981 *Specification for precast concrete masonry units*
Part 2 : 1981 *Method for specifying precast concrete masonry units*

BS 8004 : 1986 *Code of practice for foundations*

BS 8110 *Structural use of concrete*
Part 1 : 1997 *Code of practice for design and construction*

MOAT No 12 : 1977 *The Assessment of Precast, Insulating Concrete Blocks for General use in Building*

BRE Digest 363 *Sulphate and acid resistance of concrete in the ground*

Conditions of Certification

18 Conditions

18.1 Where reference is made in this Certificate to any Act of Parliament, Regulation made thereunder, Statutory Instrument, Code of Practice, British Standard, manufacturer's instruction or similar publication, it shall be construed as reference to such publication in the form in which it is in force at the date of this Certificate.

18.2 The quality of materials and the method of manufacture have been examined and found satisfactory by the BBA and must be maintained to this standard during the period of validity of this Certificate. This Certificate will remain valid for an unlimited period provided:

(a) the specification of the product is unchanged; and

(b) the manufacturer continues to have the product checked by the BBA.

18.3 This Certificate will apply only to the product that is installed, used and maintained as set out in this Certificate.

18.4 In granting this Certificate, the BBA makes no representation as to:

(a) the presence or absence of patent or similar rights subsisting in the product; and

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

(c) the nature of individual installations of the product, including methods and workmanship.

18.5 It should be noted that any recommendations relating to the safe use of this product which are contained or referred to in this Certificate are the minimum standards required to be met when the product is used. They do not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory or Common Law duties of care, or of any duty of care which exist at the date of this Certificate or in the future; nor is conformity with such recommendations to be taken as satisfying the requirements of the 1974 Act or of any present or future statutory or Common Law duties 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 use of this product.

BBA BRITISH BOARD OF AGRÉMENT
ASSESSMENT OF PRODUCTS FOR CONSTRUCTION

In the opinion of the British Board of Agrément, Stepoc Foundation Blockwork is fit for its intended use provided it is installed, used and maintained as set out in this Certificate. Certificate No 98/3450 is accordingly awarded to Forticrete Ltd.

On behalf of the British Board of Agrément

Date of issue: 5th February 1998

Director

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