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**Agrément
Certificate
No 96/3279**
Second issue*

Designated by Government
to issue
European Technical
Approvals

FULLFLOW SELF PRIMING SYPHONIC ROOF DRAINAGE SYSTEM

Système d'évacuation des eaux pluviales par effet siphonique
System für Dachentwässerung nach dem Vollstromprinzip

Product



Chek Lap Kok Airport, Hong Kong



Booker, Livingstone



Dyson, Malmesbury



Piccadilly Station, Manchester

Typical projects using the Fullflow drainage system

- THIS CERTIFICATE RELATES TO THE FULLFLOW SELF PRIMING SYPHONIC ROOF DRAINAGE SYSTEM, COMPRISING PRIMAFLOW SELF PRIMING SYPHONIC ROOF OUTLETS AND OTHER COMPONENTS AND PRIMACALC SOFTWARE FOR DESIGN, AND FOR USE WITH CONVENTIONAL PIPING SYSTEMS.


- The system is for conveying surface water from the roof to the underground drainage system of industrial, commercial and public buildings.

- The system is for use in installations designed in accordance with BS EN 12056-2 : 2000, and/or BS EN 12056-3 : 2000 for the conveyance of surface water as is permitted to be discharged into public sewers by The Water Industry

continued

Regulations

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

 The Secretary of State has agreed with the British Board of Agrément the aspects of performance to be used by the BBA in assessing the compliance of drainage systems with the Building Regulations. In the opinion of the BBA, the Fullflow Self Priming Syphonic Roof Drainage System, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements.

Requirement: C4

Resistance to weather and ground moisture

Comment:

The joints between the roof outlet and the roof will adequately resist the passage of moisture to the inside of the building. See sections 11.1 and 11.2 of this Certificate.
Rainwater drainage

Requirement: H3

Comment:

The roof outlets will contribute to carrying the flow of rainwater from the roof to an outfall, thus minimising the risk of blockage or leakage.

Requirement: Regulation 7

Materials and workmanship

Comment:

The system is acceptable. See sections 18.1 to 18.3 of this Certificate.

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continued

Act 1991, Chapter 56, and surface water as is permitted and defined by the Sewerage (Scotland) Act 1968 and the Water and Sewerage Services (Northern Ireland) Order 1973.

- At the design rainfall intensity, installations designed using Primacalc software and installed with Primaflow self priming roof outlets in accordance with this Certificate, will ensure that the outlets eliminate the intake of air into the system. This sets up full bore flow and maximises the capacity of the pipework.
- It is essential that the system is installed precisely in accordance with the computed design.
- Collecting pipes are installed horizontally under the roof, reducing the number of downpipes and the associated underground work and drainage.
- Components are used individually or in conjunction with conventional pipes and fittings which comply with the performance specification obtainable on request from the Fullflow technical department.
- Fullflow and Primaflow are registered trade marks.

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



In the opinion of the BBA, the Fullflow Self Priming Syphonic Roof Drainage System, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations and related Technical Standards.

Regulation:	10	Fitness of materials
Standards:	B2.1 and B2.2	Selection and use of materials and components
Comment:		The system is acceptable. See sections 18.1 to 18.3 of this Certificate.
Regulation:	17	Preparation of sites and resistance to moisture
Standard:	G3.1	Resistance to precipitation
Comment:		The system meets the relevant requirement of this Standard. See sections 11.1 and 11.2 of this Certificate.
Regulation:	24	Drainage and sanitary facilities
Standard:	M2.1	Drainage system
Comment:		The system will meet the requirement of this Technical Standard.

3 The Building Regulations (Northern Ireland) 1994 (as amended)



In the opinion of the BBA, the Fullflow Self Priming Syphonic Roof Drainage System, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Building Regulations as listed below.

Regulation:	B2	Fitness of materials and workmanship
Comment:		The system is acceptable. See sections 18.1 to 18.3 of this Certificate.
Regulation:	N7	Rain-water drainage
Comment:		The system meets the relevant requirements of this Regulation.
Regulation:	C5	Resistance to ground moisture and weather
Comment:		The system meets the relevant requirements of this Regulation. See sections 11.1 and 11.2 of this Certificate.

4 Construction (Design and Management) Regulations 1994

Information in this Certificate may assist the client, planning supervisor, designer and contractors to address their obligations under these Regulations.

See sections: *5 Description, 9 Strength and 15 Behaviour in relation to fire.*

Technical Specification

5 Description

5.1 The Fullflow Self Priming Syphonic Roof Drainage System consists of Primaflow self priming syphonic roof outlets, technical specifications and Primacalc computer software to design the pipework for each installation.

5.2 The Primaflow outlet bowls are available with plain spigots 56 mm or 75 mm external diameter and are available in a range of materials: stainless steel, copper, galvanized mild steel, PVC coated aluminium, and with the option of small or large flange (see Table 1). A typical outlet is shown in Figure 1. Outlets can be fixed either mechanically or with a combination of mechanical and adhesive methods and are supplied with a self-adhesive sealing strip⁽¹⁾ with the appropriate fasteners⁽²⁾.

(1) to BS 6213 : 1982(1992).

(2) TEK screws to BS 4174 : 1972.

Table 1 Flange diameter (mm)

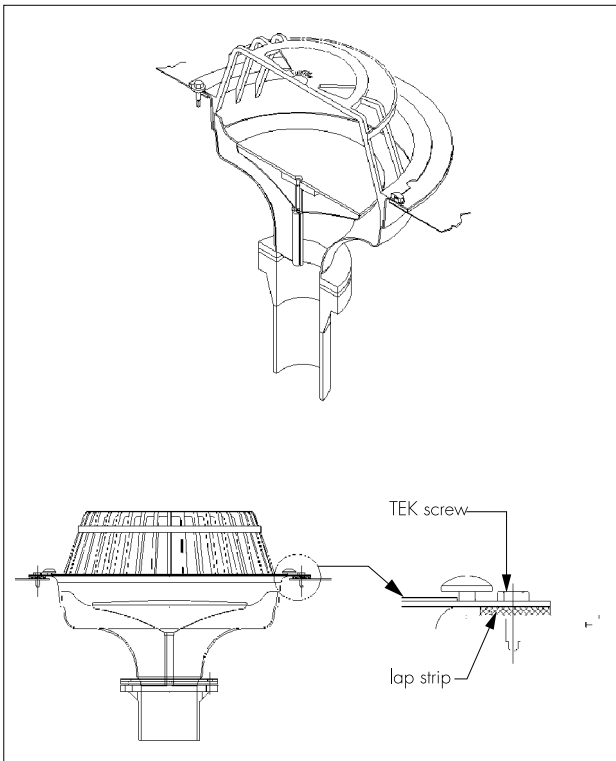
	Outlet spigot size (mm)	
	56	75
Small	235	340
Large	370	470

5.3 The outlets are for use with the pipes and fittings covered by the performance specification given in section 7 of this Certificate. Pipework should be independently certificated for compliance with the declared specification.

5.4 Suitable pipes and fittings are available in the following materials:

- cast iron
- stainless steel
- galvanized steel
- aluminium
- copper
- HPPE (high performance polyethylene)
- HDPE
- ABS
- PP.

Figure 1 Roof outlet



5.5 Factory production control is exercised during manufacture including checks for conformity to the specification of the raw materials, dimensions, and visual appearance. Weld integrity of the studs and visual checks on the outlet are carried out on each unit.

6 Delivery and site handling

Each outlet carries a product code, the manufacturer's logo and the BBA identification mark. The BBA identification mark including the number of this Certificate is incorporated in the company's technical literature. The products are delivered to site either on pallets or in single boxes, depending on the quantity.

Design Data

7 General

7.1 When designed, installed and used in accordance with the provisions of this Certificate, the Fullflow Self Priming Syphonic Roof Drainage System will convey rainwater from the roof to a below-ground drainage system.

7.2 Further advice on designing full bore flow roof drainage systems is available from the Fullflow technical department.

7.3 Gutters should be designed in accordance with BS EN 12056-3 : 2000.

7.4 The Fullflow Self Priming Syphonic Roof Drainage System complies with the recommendations of section 9.6 of H R Wallingford Report SR463,

dated September 1996, *Performance of Syphonic Drainage Systems for Roof Gutters*.

7.5 Pipes and fittings must meet the Fullflow Limited performance specification. The key characteristics include:

- Pipework must withstand both positive and negative pressure equivalent to an 8 m head of water, ie 0.8 to -0.8 bar gauge pressure
- Joints must be either capable of resisting longitudinal forces without sliding apart or restrained to prevent relative movement
- Sharp radius bends in excess of 45° deviation from straight flow should not be used
- Eccentric reducers are recommended for use in horizontal flows with the crown of the pipe level.

7.6 The underground drainage system must be capable of accepting without surcharge the rate of flow of water discharged by the syphonic system in addition to other discharges which may be received.

8 System design and dimensioning

8.1 Each system must be designed by a person trained to use the Primacalc computer program, and familiar with hydraulic and roof drainage design procedures.

8.2 The system is designed to flow at maximum capacity when rainfall is at the design intensity. A system using the pipe dimensions obtained from the design will ensure sufficient capacity to transport the water from the roof to the discharge point.

8.3 The flow rate through an outlet is primarily limited by the acceptable depth of water that is allowed to build up on a flat roof or gutter. Flow rates for given water depths at or around outlets may be estimated from Figure 2.

8.4 Information required to enable a design to be carried out includes:

- (a) design rainfall intensity (normally selected or calculated from BS EN 12056-3 : 2000). As an alternative, the client may specify the location of the building, the category of risk and the estimated life of the building, and Fullflow Limited will establish the appropriate rainfall intensity.
- (b) geometric layout of the roof and outlet positions, the height of the building and its location, preferred piping routes and plan location
- (c) position of underground connection (the underground drainage must be adequately vented to prevent the underground drain acting syphonically).

8.5 Use of the computer program ensures that an economic and effective design is achieved. Critical conditions to be achieved in any design include:

(a) minimum water velocity must be 1.0 ms^{-1} at the design flow intensity to achieve a self-cleansing velocity

(b) computed flow⁽¹⁾ from an individual outlet must not exceed the nominal rated flow for each outlet size. In the computer program there is a device for preventing accidental incorporation of values in excess of these figures. However, the designer may override the device if the associated depth of water in the gutter or on the roof (see Figure 2) is considered acceptable.

(c) in systems with more than one roof outlet, the balance in the system should not exceed 1.0 m.

(1) The computation of the ultimate capacity under full-bore flow has been verified by testing.

8.6 The designer may vary the pipework sizing, layout, or flow to each outlet to achieve an acceptable installation.

9 Strength

9.1 The outlets have adequate strength to resist loads associated with installation and subsequent use. When tested under an accidental pedestrian load⁽¹⁾, the leafguard distorted considerably but remained intact.

(1) Application of a load of 1.25 kN through a 100 mm diameter rubber-faced loading plate.

9.2 The outlet and, in particular, the leafguard should be protected from loads during the construction process.

10 Roof/gutter design

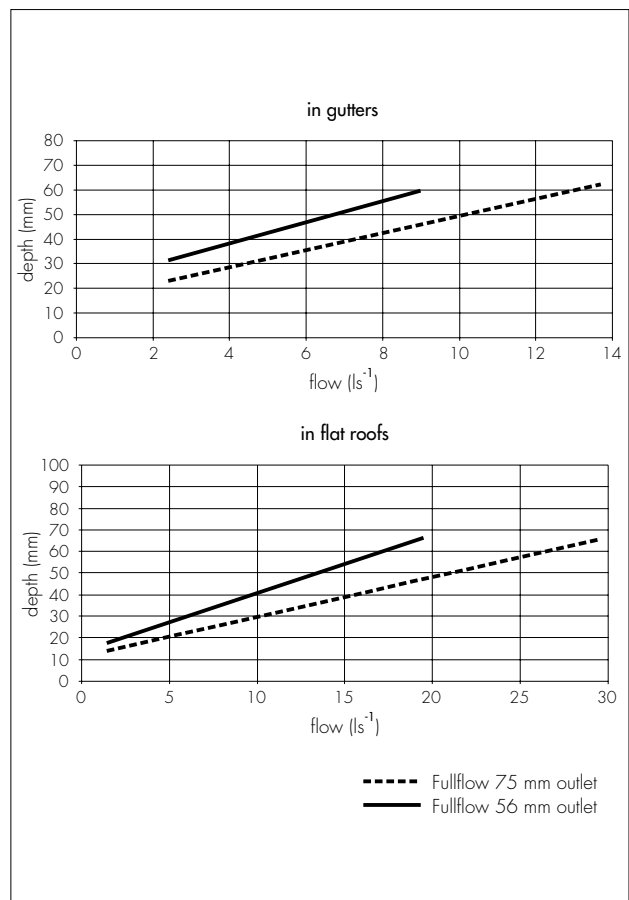
10.1 The roof must be designed to allow rainwater to flow freely to the outlets.

10.2 The water depth around the outlet when the system is operating at its maximum flow rate (full bore flow) may be estimated from the graphs in Figure 2.

10.3 The design of the syphonic system must ensure that the operating head does not result in a build up of water that exceeds the roof design loading or penetrates the roof covering.

10.4 It is recommended that in accordance with BS EN 12056-3 : 2000 the roof and/or gutter design incorporate a built-in overflow facility. The roof must be designed to hold water up to this level should the design rainfall be exceeded or unexpected blockages occur.

Figure 2 Performance of outlets



11 Performance of joints

11.1 The performance of the joint to the pipework system is dependent on the pipework system adopted. Conventional jointing techniques using independently approved products should provide satisfactory performance (see section 5.3).

11.2 The performance of the joint between the outlet and the roof material is dependent on the installation. However, conventional jointing techniques for roofs constructed of similar materials applied correctly should give satisfactory performance.

12 Flow characteristics

When a system is operating at its design intensity, the high velocity of the water will ensure the system is self-cleansing. Self-cleansing can also occur at rainfalls as low as 50% of the design intensity. At rainfalls less than this the system will operate as a vented gravity system.

13 Resistance to chemicals

The performance of the outlets will be unaffected by the types and quantities of chemicals associated with rainwater.

14 Resistance to blockage

The high velocities at which the water flows through the pipework, together with the design of the outlets, reduce the risk of blockages [see also sections 8.4(a), 12 and 17].

15 Behaviour in relation to fire

The bodies of the outlets will not affect the overall fire resistance of the roof in which they are installed.


16 Thermal insulation

Depending on the relative humidity and the temperature, it may be desirable in some situations to provide insulation for the outlet and pipework to prevent condensation.

17 Maintenance

Periodic routine inspection in line with good practice should be carried out to ensure that the outlets are free from gravel, leaves and other debris which could impair the performance of the system. Maintenance is the responsibility of the owner.

18 Durability

 18.1 The materials used for the manufacture of the outlets are durable and when installed correctly will have an effective life equivalent to, or in excess of, the roof/gutter in which they are installed.

18.2 To prevent galvanic corrosion it is essential that compatible fixings, as recommended by the manufacturer, are used for each specified material. Stainless steel, PVC-coated aluminium and copper outlets will, in normal environments, have a life

expectancy of 40 years. In coastal areas or industrial/polluted regions this will reduce to 25 years.

18.3 Galvanized steel outlets are not recommended for permanent structures. From data in BS 5493 : 1977 it is suggested that this material has a life expectancy of 17 years in a non-polluted inland environment. This period reduces rapidly the more aggressive the environment.

Installation

19 General

19.1 The design of the layout of the roof outlets should be in accordance with the recommendations given in BS EN 12056-3 : 2000.

19.2 The outlets should be placed at the roof low points to allow efficient flow of water to the outlets.

19.3 The system must be installed exactly in accordance with the design. Small differences to pipework length/diameter can significantly affect the performance of the system.

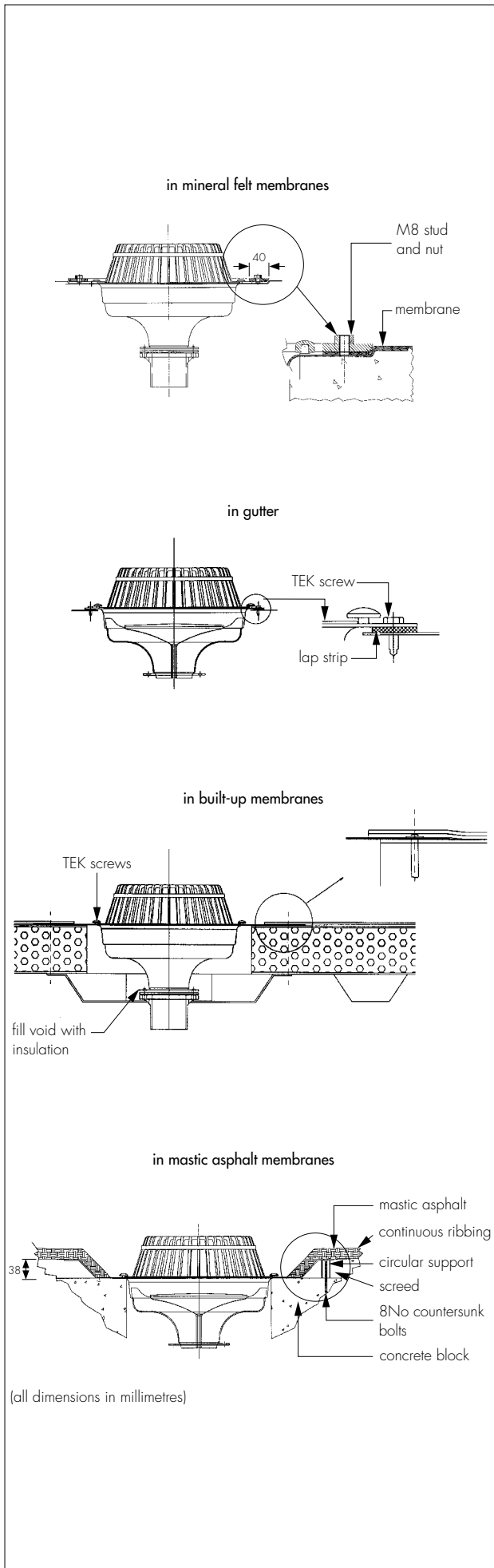
20 Procedure

20.1 An appropriately sized hole must be formed or cut in the roof structure or gutter to accommodate the outlet. The outlet must be secured to the roof structure (see Figure 3).

20.2 The BBA has not assessed individual installation details since they will depend on the roof construction.

20.3 Typical installation details not assessed by the BBA but suggested by Fullflow Group Limited are available from the Fullflow technical department (see also Figure 3).

Figure 3 Roof outlets



Technical Investigations

The following is a summary of the technical investigations carried out on the Fullflow Self Priming Syphonic Roof Drainage System.

21 Tests

Tests were carried out to determine:

- dimensional accuracy
- maximum flow capacities for a defined system
- watertightness
- resistance to loading.

22 Other investigations

22.1 An evaluation of existing data was made to assess:

- resistance to chemicals
- suitability of materials
- durability
- ease of jointing to pipework
- practicability of installation.

22.2 An investigation was carried out to verify the scientific basis and the correlation with full-scale testing of the computer software used to design the installations.

22.3 The manufacturing processes were examined, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

Additional Information

The management systems of Fullflow Group Limited have been assessed and registered as meeting the requirements of BS EN ISO 9001 : 1994 by SGS Yarsley (Certificate No Q62661).

Bibliography

BS 4174 : 1972 *Specification for self-tapping screws and metallic drive screws*

BS 5493 : 1977 *Code of practice for protective coating of iron and steel structures against corrosion*

BS 6213 : 1982(1992) *Guide to selection of constructional sealants*

BS EN 12056 *Gravity Drainage Systems inside Buildings*

BS EN 12056-2 : 2000 *Sanitary pipework, layout and calculation*

BS EN 12056-3 : 2000 *Roof drainage, layout and calculation*

BS EN ISO 9001 : 1994 *Quality systems. Model for quality assurance in design, development, production, installation and servicing*

Conditions of Certification

23 Conditions

23.1 This Certificate:

- (a) relates only to the product that is described, installed, used and maintained as set out in this Certificate;
- (b) is granted only to the company, firm or person identified on the front cover — no other company, firm or person may hold or claim any entitlement to this Certificate;
- (c) has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective;
- (d) is copyright of the BBA.

23.2 References in this Certificate to any Act of Parliament, Regulation made thereunder, Directive or Regulation of the European Union, Statutory Instrument, Code of Practice, British Standard, manufacturers' instructions or similar publication, shall be construed as references to such publication in the form in which it was current at the date of this Certificate.

23.3 This Certificate will remain valid for an unlimited period provided that the product and the manufacture and/or fabricating process(es) thereof:

- (a) are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA;

(b) continue to be checked by the BBA or its agents; and

(c) are reviewed by the BBA as and when it considers appropriate.

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

- (a) the presence or absence of any patent or similar rights subsisting in the product or any other product;
- (b) the right of the Certificate holder to market, supply, install or maintain the product; and
- (c) the nature of individual installations of the product, including methods and workmanship.

23.5 Any recommendations relating to the use or installation 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, common law or other duty which may 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, 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 installation and use of this product.



In the opinion of the British Board of Agrément, the Fullflow Self Priming Syphonic Roof Drainage System is fit for its intended use provided it is installed, used and maintained as set out in this Certificate. Certificate No 96/3279 is accordingly awarded to Fullflow Group Limited.

On behalf of the British Board of Agrément

A handwritten signature in black ink, appearing to read 'P. C. Newson', is written over a light grey background.

Date of Second issue: 29th November 2000

Chief Executive

**Original Certificate issued 17th October 1996. This revised version issued to include change of address of Certificate holder, reference to the revised national Building Regulations, the addition of CDM Regulations, additional Design Data information and revised Conditions of Certification.*

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