

**Formpave Ltd**

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**Agrément
Certificate
No 97/3373**
Second issue*

Designated by Government
to issue
European Technical
Approvals

FORMPAVE PAVING BLOCKS

Paves du béton
Betonpflasterziegel

Product

• THIS CERTIFICATE RELATES TO FORMPAVE PAVING BLOCKS, CONCRETE PAVERS FOR USE IN STORM WATER CONTROL SYSTEMS.

• The products are used to provide a surfacing for domestic driveways, patios, pedestrian areas, car parks, low-speed roads and lightly trafficked areas liable to surface ponding from rainwater.

• It is essential that the products are installed in accordance with the Design Data and Installation parts of this Certificate.

These Front Sheets must be read in conjunction with the accompanying Detail Sheets, which provide information to specific blocks.

Regulations — Detail Sheet 1**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 paving blocks with the Building Regulations. In the opinion of the BBA, Formpave Paving Blocks, if used in accordance with the provisions of this Certificate, will meet the relevant requirements.

Requirement: H3

Comment:

Rainwater drainage

The products will contribute to the dissipation of rainwater from pavement areas, and minimise the risk of ponding. See sections 7.1 and 7.2 of the appropriate Detail Sheet.

Requirement: Regulation 7

Comment:

Materials and workmanship

The products comprise acceptable materials. See section 9 of the appropriate Detail Sheet.

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



In the opinion of the BBA, Formpave Paving Blocks, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations and related Technical Standards as listed below.

Regulation:	10	Fitness of materials
Standard:	B2.1	Selection and use of materials and components
Comment:	The products are acceptable. See section 9 of the appropriate Detail Sheet.	
Regulation:	24	Drainage and sanitary facilities
Standard:	M2.5	Discharges from a drainage system
Comment:	The products will contribute to meeting the relevant requirements for rainwater drainage in this Standard. See sections 7.1 and 7.2 of the appropriate Detail Sheet.	

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



In the opinion of the BBA, Formpave Paving Blocks, if used in accordance with the provisions of this Certificate, will satisfy the various Building Regulations as listed below.

Regulation:	N7	Rain-water drainage
Comment:	The products will contribute to the dissipation of rainwater from pavement areas, and minimise the risk of ponding. See sections 7.1 and 7.2 of the appropriate Detail Sheet.	
Regulation:	B2	Fitness of materials and workmanship
Comment:	The products comprise acceptable materials. See section 9 of the appropriate Detail Sheet.	

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 section: 1 *Description* (1.6) of the appropriate Detail Sheet.

Additional Information

The management systems of Formpave Ltd have been assessed and registered as meeting the requirements of BS EN ISO 9002 : 1994 by the British Standards Institution Quality Assurance, Registration No FM 12515.

Conditions of Certification

5 Conditions

5.1 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.

5.2 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.

5.3 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.

5.4 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.

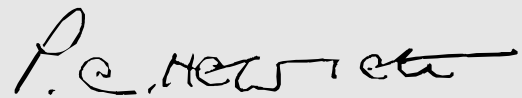
5.5 Any recommendations relating to the use or installation of this product which are contained or referred to in this Certificate are the minimum standards required to be met when the product is used. They do not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, 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, Formpave Paving Blocks are fit for their intended use provided they are installed, used and maintained as set out in this Certificate. Certificate No 97/3373 is accordingly awarded to Formpave Ltd.

On behalf of the British Board of Agrément

Date of Second issue: 3rd June 1999


Director

**Original Certificate issued on 22nd July 1997. This version includes reference to the revised Building Regulations, revised Conditions of Certification, introduction of CDM Regulations, and removal of reference to porous blocks.*



Formpave Ltd

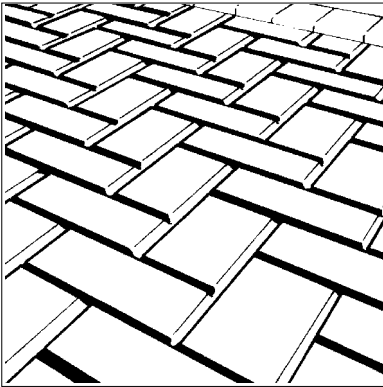
**FORMPAVE POROUS RECTANGULAR
PAVING BLOCKS**

Certificate No 97/3373

DETAIL SHEET 2

Second issue*

Product



• THIS DETAIL SHEET RELATES TO FORMPAVE POROUS RECTANGULAR PAVING BLOCKS, 80 mm THICK POROUS CONCRETE PAVERS FOR SURFACE RAINWATER DRAINAGE.

This Detail Sheet must be read in conjunction with the Front Sheets, which give the product's position regarding the Building Regulations and the Conditions of Certification.

Technical Specification

1 Description

1.1 Formpave Porous Rectangular Paving Blocks are manufactured from C40 concrete using weigh-batched raw materials complying with the requirements of BS 6717 : Part 1 : 1993, and pigments to BS 1014 : 1975(1986), in a traditional vibratory block press.

1.2 The blocks are cured, palleted and strap-banded or, alternatively, shrink-wrapped and labelled.

1.3 Continuous quality control is maintained on the incoming raw materials.

1.4 Manufacturing process conditions are computer controlled and in-process quality control tests are conducted on wet density, product thickness and dimensional tolerance.

1.5 Quality assurance tests are conducted on the finished products for:

appearance
dimensions
density
characteristic strength.

1.6 The dimensions (in mm) of the product are:

length	200
width	100
thickness	80
coverage per pallet (m ²)	9
colours ⁽¹⁾	Charcoal Natural grey Red brindle Red

(1) Special colours are available to order.

1.7 Ancillary items (outside the scope of this Certificate) are available for use in the Formpave Infiltration Storm Water Control System:

13/12 Geotextile — a polypropylene geotextile membrane for use as a filter/separation layer.

SC membrane — an impermeable membrane for use as a waterproof lining.

SC seal — to be used to seal the SC membrane at the pipe penetrations.

AT77 — an all-weather PVC electrical insulation tape.

2 Delivery and site handling

2.1 The blocks are delivered to site on banded pallets, labelled with the block type, size and date of manufacture.

2.2 Blocks should be stored on a firm, level base in their original packaging until they are laid.

2.3 Care should be taken during handling and storage to avoid damaging the block's corners.

Design Data

3 General

3.1 Formpave Porous Rectangular Paving Blocks, when installed with proper edge restraints, are satisfactory for use as a surfacing for domestic driveways, patios, pedestrian areas, car parks, low-speed roads and lightly trafficked areas.

3.2 When laid on a common sub-base consisting of 5 mm clean stone to BS 882 : 1992, bedded on a geotextile membrane with a minimum 350 mm depth of granular material comprising crushed gravel, rock or concrete as specified by Formpave Ltd, the blocks will dissipate surface rainwater in areas liable to ponding.

3.3 When designing an area to be surfaced with the blocks, the manufacturer's laying specification must be followed.

4 Strength and stability

4.1 When tested in accordance with BS 6717 : Part 1 : 1993 the mean compressive strength of Formpave porous blocks was 38 Nmm^{-2} , with no individual block below 30 Nmm^{-2} .

4.2 The blocks have adequate impact resistance and will withstand all normal loads during handling and laying, and under light traffic conditions, when laid in accordance with the manufacturer's instructions.

4.3 The blocks provide a surfacing which will withstand displacement and remain stable when used in the situations described in section 3.1. However, where surface settlement occurs due to failure of the supporting substructure, some localised edge spalling may result.

5 Chemical resistance

The blocks are made from C40 concrete and are resistant to most chemicals likely to be spilt on road surfaces or parking areas, such as oil or petrol. In common with most porous materials, oily spillage will eventually stain the surface.

6 Skid resistance

The wet-skid resistance value measured in accordance with Road Research Laboratory Road Note 27 gave a mean reading of 85. The blocks meet the requirements of prEN 1338 : 1996.

7 Rainwater drainage



7.1 Tests indicate that the blocks will absorb approximately 9 mm of rain, which will be subsequently released by evaporation.

7.2 Tests conducted on a 1 m^2 Formpave pavement indicate that during heavy periods of rain, water will drain through the pavement's surface and into the basecourse material at a rate of 4500 mm h^{-1} , eliminating surface ponding.

8 Maintenance

8.1 Provided there is no deterioration of the base, and the blocks are used in normal pedestrian or light traffic situations, only twice-yearly cleaning using a mechanical suction brush is necessary to clean blocked pores. This should be conducted in spring and following leaf fall in autumn.

8.2 In some lightly used pedestrian areas, eg embankments, weed or moss growth in the joints may take place, but this can be overcome with normal proprietary weedkiller.

8.3 If required, blocks can be replaced using standard installation methods.



Formpave Porous Rectangular Paving Blocks are resistant to weathering, including freeze/thaw, and to the traffic described in this Certificate. They will retain their colour⁽¹⁾ and integrity and will act as a rainwater drainage system for a period of up to 20 years.

(1) Except where this is affected by oil staining.

Installation

10 General

10.1 Formpave Porous Rectangular Paving Blocks must be installed strictly in accordance with the manufacturer's laying instructions, and the Formpave Storm Water Control Brochure.

10.2 All construction works on porous pavements must be carried out after general site works and after topsoiling of adjacent areas have been completed.

10.3 The porous pavement must be protected from silt, sand and other fine particles during construction. Contrary to normal block laying practice, sand must not be brushed into the finished surface since this will reduce the flow capacity (see section 13.4).

11 Subgrade

11.1 Excavation is carried out to the required level to provide a fall of between 1% and 3% to a pipe drain. The subgrade is compacted with a vibrating roller or plate, and all soft spots are removed and filled with a suitable replacement material.

11.2 The bottom and sides of the excavation are lined with SC Membrane, overlapping the joints by 300 mm, and sealed with a waterproof tape. The membrane should extend 100 mm beyond the height of the walls.

11.3 If the subgrade is very coarse a 50 mm sand capping layer should be applied before laying the membrane to minimise the risk of puncture.

11.4 If drainage by infiltration into the subgrade is required, the membrane and sand capping layer may be omitted. However, 13/12 Geotextile should be incorporated between the sub-base store and the subgrade.

12 Sub-base

12.1 A minimum 350 mm depth of stone is spread in layers not more than 200 mm thick, taking care not to puncture the underlying membrane. The base material is compacted with a vibrating plate.

12.2 The geotextile membrane is laid on top of the sub-base, with all joints overlapped by 200 mm and sealed with a waterproof tape.

12.3 Clean single-sized stone (5 mm) to BS 882 : 1992 is spread to a depth of approximately 50 mm and screeded level, ensuring that it is not more than 80 mm below the required finished level.

12.4 The 5 mm stone will compact much less than sand under vibration and a small trial area of approximately 2 m² should be laid to determine the final levels of the blocks.

13 Block laying procedure

13.1 Edge restraint (such as kerb blocks haunched in concrete) must be provided to restrict lateral movement of the paving blocks during service.

13.2 Rectangular paving blocks are laid butt jointed, hand-tight to a 90° herringbone pattern, and laid sequentially across the whole area. At the edges the blocks are laid in stretcher bond formation compressing the geotextile between the blocks and kerbing.

13.3 Where blocks are cut, they should be cut to a tight fit and none should be cut smaller than 30% of the unit block size. Blocks should be cut using a disc cutter and cuts should be vertical to the top surface and not underscored.

13.4 To hold the blocks tightly in place at the edges of the paved area, kiln-dried sand should be applied to fill the joints for an approximate distance of 300 mm from the restraining edges (including tree pit surrounds).

13.5 The blocks are compacted with two passes of a vibrating plate compactor fitted with a rubber foot.

13.6 The projecting geotextile and membrane are trimmed as close to the blocks as practicable, and the surface brushed clean.

The following is a summary of the technical investigations carried out on Formpave Porous Rectangular Paving Blocks.

14 Tests

Tests were carried out to determine:

- dimensional accuracy and squareness
- density
- water absorption
- freeze/thaw resistance
- compressive strength
- resistance to staining and chemicals
- resistance to abrasion
- dynamic friction
- flow rate.

15 Investigations

15.1 The manufacturing process was examined, including the methods of mix design, batching of materials, block casting, curing and storage. Details were obtained of the quality and composition of materials used, and quality control methods were assessed.

15.2 An examination was made of independent test data on the flow rate of water through the system.

15.3 Visits were made to existing sites to assess surface quality, appearance and performance in service.

15.4 Visits were made to sites in progress to assess the practicability of installation.

Bibliography

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

BS 1014 : 1975(1986) *Specification for pigments for Portland cement and Portland cement products*

BS 6717 *Precast concrete paving blocks*
Part 1 : 1993 *Specification for paving blocks*

prEN 1338 : 1996 *Concrete paving blocks — Requirements and test method*

MCHW — *Department of Transport Manual of Contract Documents for Highway Works*
Volume 1 *Specification for Highway Works*

Road Research Laboratory Road Note 27
Instructions for Using the Portable Skid Resistance Tester



On behalf of the British Board of Agrément

Date of Second issue: 3rd June 1999

Director

**Original Detail Sheet issued on 22nd July 1997. This amended version includes change of product name, changes and additional ancillary items, revised strength test data, and amendment of the specification to the sub-base.*



Formpave Ltd

Certificate No 97/3373

DETAIL SHEET 3**FORMPAVE AQUAFLOW PAVING BLOCKS****Product**

• THIS DETAIL SHEET RELATES TO FORMPAVE AQUAFLOW PAVING BLOCKS, 80 mm THICK CONCRETE PAVERS FOR SURFACE RAINWATER DRAINAGE.

This Detail Sheet must be read in conjunction with the Front Sheets, which give the products' position regarding the Building Regulations and the Conditions of Certification.

Technical Specification**1 Description**

1.1 Formpave Aquaflow Paving Blocks are manufactured from C49 concrete using weigh-batched raw materials complying with the requirements of BS 6717 : Part 1 : 1993, and pigments to BS 1014 : 1975(1986), in a traditional vibratory block press. The blocks provide drainage through vertical channels in the end of each block.

1.2 The blocks are cured, palletised, strap-banded, shrink-wrapped and labelled.

1.3 Continuous quality control is maintained on the incoming raw materials.

1.4 Manufacturing process conditions are computer controlled and in-process quality control tests are conducted on wet density, product thickness and dimensional tolerance.

1.5 Quality assurance tests are conducted on the finished products for:

appearance
dimensions
density
characteristic strength.

1.6 The dimensions of the product are:

length (mm)	200
width (mm)	100
thickness (mm)	80
coverage per pallet (m ²)	9
colours ⁽¹⁾	Natural grey, Charcoal, Red brindle, Red

(1) Special colours are available to order

1.7 Ancillary items (outside the scope of this Certificate) are available for use in the Formpave Infiltration Storm Water Control System:

13/12 Geotextile — a polypropylene geotextile membrane for use as a filter/separation layer.

SC membrane — an impermeable membrane for use as a waterproof lining.

SC seal — to be used to seal the SC membrane at the pipe penetrations.

AT77 — an all-weather PVC electrical insulation tape.

2 Delivery and site handling

2.1 The blocks are delivered to site on strap banded pallets (or alternatively on wooden pallets). The packs are shrink-wrapped and labelled with the block type, size, colour and date of manufacture.

2.2 Blocks should be stored on a firm, level base in their original packaging until they are laid.

2.3 Care should be taken during handling and storage to avoid damaging the block's corners.

Design Data**3 General**

3.1 Formpave Aquaflow Paving Blocks, when installed with proper edge restraints, are satisfactory for use as a surfacing for domestic driveways, patios, pedestrian areas, car parks and low-speed roads, and lightly trafficked areas. For areas where the surface is subject to heavy axle weights, eg industrial estates, retail centres, motorway services, airport service areas, garages,

etc, the advice of the manufacturer should be sought regarding the specification of the sub-base.

3.2 When laid on a common sub-base consisting of 5 mm clean stone to BS 882 : 1992, bedded on a geotextile membrane with a minimum 350 mm depth of granular material comprising crushed gravel, rock or concrete as specified by Formpave Ltd, the blocks will dissipate surface rainwater in areas liable to ponding.

3.3 When designing an area to be surfaced with the blocks, the manufacturer's laying specification must be followed.

4 Strength and stability

4.1 When tested in accordance with BS 6717 : Part 1 : 1993 the mean compressive strength of Formpave Aquaflow Paving Blocks was 53 Nmm^{-2} .

4.2 The blocks have adequate impact resistance and will withstand all normal loads during handling and laying, and under light traffic conditions.

4.3 The blocks provide a surfacing which will withstand displacement and remain stable when used in the situations described in section 3.1. However, where surface settlement occurs due to failure of the supporting substructure, some localised edge spalling may result.

5 Chemical resistance

The blocks are made from C49 concrete and are resistant to most chemicals likely to be spilt on road surfaces or parking areas, such as oil or petrol. In common with most porous materials, oily spillage will eventually stain the surface.

6 Skid resistance

The wet-skid resistance value measured in accordance with Road Research Laboratory Road Note 27 gave a mean reading of 67. The blocks meet the requirements of prEN 1338 : 1996.

7 Rainwater drainage



Tests conducted on a 1 m^2 Aquaflow pavement indicate that during heavy periods of rain, water will drain through the vertical channels and into the basecourse material at a rate of 4500 mm h^{-1} , eliminating surface ponding.

8 Maintenance

8.1 Provided there is no deterioration of the base, and the blocks are used for applications described in section 3.1, only twice-yearly cleaning using a mechanical suction brush is necessary. This should be conducted in spring and following clearance of leaf fall in autumn.

8.2 In some lightly used pedestrian areas, eg embankments, weed or moss growth in the joints

may take place, but this can be overcome with normal proprietary weedkiller.

8.3 If required, blocks can be replaced using standard installation methods.

9 Durability



Formpave Aquaflow Paving Blocks are resistant to weathering, including freeze/thaw, and to the traffic described in this Certificate. They will retain their colour⁽¹⁾ and integrity and will act as a rainwater drainage system for a period of up to 20 years.

(1) Except where this is affected by oil staining.

Installation

10 General

10.1 Formpave Aquaflow Paving Blocks must be installed strictly in accordance with the manufacturer's laying instructions, and the Formpave Storm Water Control Brochure.

10.2 All construction works on pavements must be carried out after general site works and after topsoiling of adjacent areas has been completed.

10.3 The pavement must be protected from silt, sand and other fine particles during construction. Contrary to normal block laying practice, sand must not be brushed into the finished surface since this will reduce the flow capacity (see section 13.4).

11 Subgrade

11.1 Excavation is carried out to the required level to provide a fall of between 1% and 3% to a pipe drain. The subgrade is compacted with a vibrating roller or plate, and all soft spots are removed and filled with a suitable replacement material.

11.2 The bottom and sides of the excavation are lined with SC membrane, overlapping the joints by 300 mm, and sealed with a waterproof tape. The membrane should extend 100 mm beyond the height of the walls.

11.3 If the subgrade is very coarse, a 50 mm sand capping layer should be applied before laying the membrane to minimise the risk of puncture.

11.4 If drainage by infiltration into the subgrade is required, the membrane and sand capping layer may be omitted. However, 13/12 Geotextile should be incorporated between the sub-base store and the sub-grade.

12 Sub-base

12.1 A minimum 350 mm depth of stone is spread in layers not more than 200 mm thick, taking care not to puncture the membrane. The base material is compacted with a vibrating plate.

12.2 The geotextile membrane is laid on top of the sub-base, with all joints overlapped by 200 mm and sealed with a waterproof tape.

12.3 Clean single-sized stone (5 mm) to BS 882 : 1992 is spread to a depth of approximately 50 mm and screeded level, ensuring that it is not more than 80 mm below the required finished level.

12.4 The 5 mm stone will compact much less than sand under vibration and a small trial area of approximately 2 m² should be laid to determine the final levels of the blocks.

13 Block laying procedure

13.1 Edge restraint (such as kerb blocks haunched in concrete) must be provided to restrict lateral movement of the paving blocks during service.

13.2 Rectangular paving blocks are laid butt jointed, hand-tight to a 90° herringbone pattern, and laid sequentially across the whole area. At the edges the blocks are laid in stretcher bond formation compressing the geotextile between the blocks and kerbing.

13.3 Where blocks are cut, they should be a tight fit and none should be cut smaller than 30% of the unit block size. Blocks should be cut using a disc cutter and cuts should be vertical to the top surface and not underscored.

13.4 To hold the blocks tightly in place at the edges of the paved area, kiln-dried sand should be applied to fill the joints for an approximate distance of 300 mm from the restraining edges (including tree pit surrounds).

13.5 The blocks are compacted with two passes of a vibrating plate compactor fitted with a rubber foot.

13.6 The projecting geotextile and membrane are trimmed as close to the blocks as is practicable, and the surface brushed clean.

The following is a summary of the technical investigations carried out on Formpave Aquaflow Paving Blocks.

14 Tests

14.1 Tests were carried out to determine:
dimensional accuracy and squareness
density
water absorption
compressive strength
dynamic friction.

14.2 Existing data in relation to a material of similar composition were assessed:
freeze/thaw resistance
resistance to staining and chemicals
resistance to abrasion.

15 Investigations

15.1 The manufacturing process was examined, including the methods of mix design, batching of materials, block casting, curing and storage. Details were obtained of the quality and composition of materials used, and quality control methods were assessed.

15.2 An examination was made of independent test data on the flow rate of water through the system.

Bibliography

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

BS 1014 : 1975(1986) *Specification for pigments for Portland cement and Portland cement products*

BS 6717 *Precast concrete paving blocks*
Part 1 : 1993 *Specification for paving blocks*

prEN 1338 : 1996 *Concrete paving blocks — Requirements and test method*

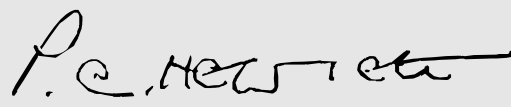
MCHW — *Department of Transport Manual of Contract Documents for Highway Works*
Volume 1 *Specification for Highway Works*

Road Research Laboratory Road Note 27
Instructions for Using the Portable Skid Resistance Tester.



On behalf of the British Board of Agrément

Date of issue: 3rd June 1999


Director



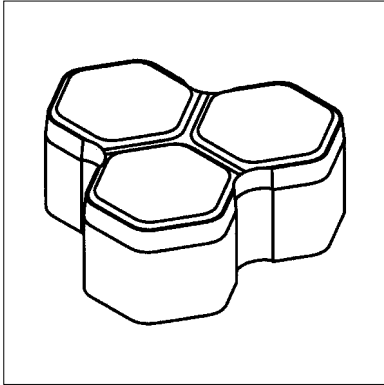
Formpave Ltd

Certificate No 97/3373

DETAIL SHEET 4

AQUAFLOW ML PAVING BLOCKS

Product



• THIS DETAIL SHEET RELATES TO AQUAFLOW ML PAVING BLOCKS, 80 mm THICK CONCRETE PAVERS FOR SURFACE RAINWATER DRAINAGE.

This Detail Sheet must be read in conjunction with the Front Sheets, which give the products' position regarding the Building Regulations and the Conditions of Certification.

Technical Specification

1 Description

1.1 Aquaflow ML Paving Blocks are manufactured from C49 concrete using weigh-batched raw materials complying with the requirements of BS 6717-1 : 1993, and pigments to BS EN 12878 : 1999, in a traditional vibratory block press. The blocks provide drainage through three vertical channels.

1.2 The blocks are cured, palletised, shrink-wrapped and labelled.

1.3 Continuous quality control is maintained on the incoming raw materials.

1.4 Manufacturing process conditions are computer controlled and in-process quality control tests are conducted on wet density, product thickness and dimensional tolerance.

1.5 Quality assurance tests are conducted on the finished products for:

appearance
dimensions
density
characteristic strength.

1.6 Aquaflow ML blocks represent three conjoined hexagonal blocks. They are for use in conjunction with Aquaflow MLE end blocks, Aquaflow MLTB top and bottom blocks and Aquaflow (rectangular) blocks, for edging purposes (see Figure 1).

1.7 Aquaflow ML blocks are designed for machine or hand laying. The interlocking shape of the blocks makes them especially suitable for heavy duty applications.

1.8 The blocks are available in Natural, Charcoal, Red and Red brindle standard colours

with special colours available to order. See Figure 1 for dimensions.

1.9 Ancillary items (outside the scope of this Certificate) are available for use in the Formpave Infiltration Storm Water Control System:

13/12 Geotextile — a polypropylene geotextile membrane for use as a filter/separation layer.

SC membrane — an impermeable membrane for use as a waterproof lining.

SC seal — to be used to seal the SC membrane at the pipe penetrations.

AT77 — an all-weather PVC electrical insulation tape.

2 Delivery and site handling

2.1 The blocks are delivered to site on wooden pallets. The packs are shrink-wrapped and labelled with the block type, size, colour and date of manufacture.

2.2 Blocks should be stored on a firm, level base in their original packaging until they are laid.

2.3 Care should be taken during handling and storage to avoid damaging the block's corners.

Design Data

3 General

3.1 Aquaflow ML Paving Blocks, when installed with proper edge restraints, are satisfactory for use as a surfacing for domestic driveways, patios, pedestrian areas, car parks and low-speed roads, and lightly trafficked areas. For areas where the surface is subject to heavy axle weights, eg industrial estates, retail centres, motorway services, airport service areas, garages, etc, the advice of the manufacturer should be sought regarding the specification of the sub-base.

3.2 When laid on a common sub-base consisting of 5 mm clean stone to BS 882 : 1992, bedded on a geotextile membrane with a minimum 350 mm depth of granular material comprising crushed gravel, rock or concrete as specified by Formpave Ltd, the blocks will dissipate surface rainwater in areas liable to ponding.

3.3 When designing an area to be surfaced with the blocks, the manufacturer's laying specification must be followed.

4 Strength and stability

4.1 When tested in accordance with BS 6717-1 : 1993 the mean compressive strength of Aquaflow ML Paving Blocks was 53 Nmm⁻².

4.2 The blocks have adequate impact resistance and will withstand all normal loads during handling and laying, and under light traffic conditions.

4.3 The blocks provide a surfacing which will withstand displacement and remain stable when used in the situations described in section 3.1. However, where surface settlement occurs due to failure of the supporting substructure, some localised edge spalling may result.

5 Chemical resistance

The blocks are made from C49 concrete and are resistant to most chemicals likely to be spilt on road surfaces or parking areas, such as oil or petrol. In common with most porous materials, oily spillage will eventually stain the surface.

6 Skid resistance

The wet-skid resistance value measured in accordance with Road Research Laboratory Road Note 27 gave a mean reading of 67. The blocks meet the requirements of prEN 1338 : 1996.

7 Rainwater drainage



Tests conducted on a 1 m² Aquaflow pavement indicate that during heavy periods of rain, water will drain through the vertical channels and into the basecourse material at a rate of 4 500 mm h⁻¹, eliminating surface ponding.

8 Maintenance

8.1 Provided there is no deterioration of the base, and the blocks are used for applications described in section 3.1, only twice-yearly cleaning using a mechanical suction brush is necessary. This should be conducted in spring and following clearance of leaf fall in autumn.

8.2 In some lightly-used pedestrian areas, eg embankments, weed or moss growth in the joints may take place, but this can be overcome with normal proprietary weedkiller.

8.3 If required, blocks can be replaced using standard installation methods.



Aquaflow ML Paving Blocks are resistant to weathering, including freeze/thaw, and to the traffic described in this Certificate. They will retain their colour⁽¹⁾ and integrity and will act as a rainwater drainage system for a period of up to 20 years.

(1) Except where this is affected by oil staining.

Installation

10 General

10.1 Aquaflow ML Paving Blocks must be installed strictly in accordance with the manufacturer's laying instructions, and the Formpave Storm Water Control Brochure.

10.2 All construction works on pavements must be carried out after general site works and after topsoiling of adjacent areas has been completed.

10.3 The pavement must be protected from silt, sand and other fine particles during construction. Contrary to normal block laying practice, sand must not be brushed into the finished surface since this will reduce the flow capacity (see section 13.4).

11 Sub-grade

11.1 Excavation is carried out to the required level to provide a fall of between 1% and 3% to a pipe drain. The sub-grade is compacted with a vibrating roller or plate, and all soft spots are removed and filled with a suitable replacement material.

11.2 The bottom and sides of the excavation are lined with SC membrane, overlapping the joints by 300 mm, and sealed with a waterproof tape. The membrane should extend 100 mm beyond the height of the walls.

11.3 If the sub-grade is very coarse, a 50 mm sand capping layer should be applied before laying the membrane to minimise the risk of puncture.

11.4 If drainage by infiltration into the sub-grade is required, the membrane and sand capping layer may be omitted. However, 13/12 Geotextile should be incorporated between the sub-base store and the sub-grade.

12 Sub-base

12.1 A minimum 350 mm depth of stone is spread in layers not more than 200 mm thick, taking care not to puncture the membrane. The base material is compacted with a vibrating plate.

12.2 The geotextile membrane is laid on top of the sub-base, with all joints overlapped by 200 mm and sealed with a waterproof tape.

12.3 Clean, single-sized stone (5 mm) to BS 882 : 1992 is spread to a depth of approximately 50 mm and screeded level, ensuring that it is not more than 80 mm below the required finished level.

12.4 The 5 mm stone will compact much less than sand under vibration and a small trial area of approximately 2 m² should be laid to determine the final levels of the blocks.

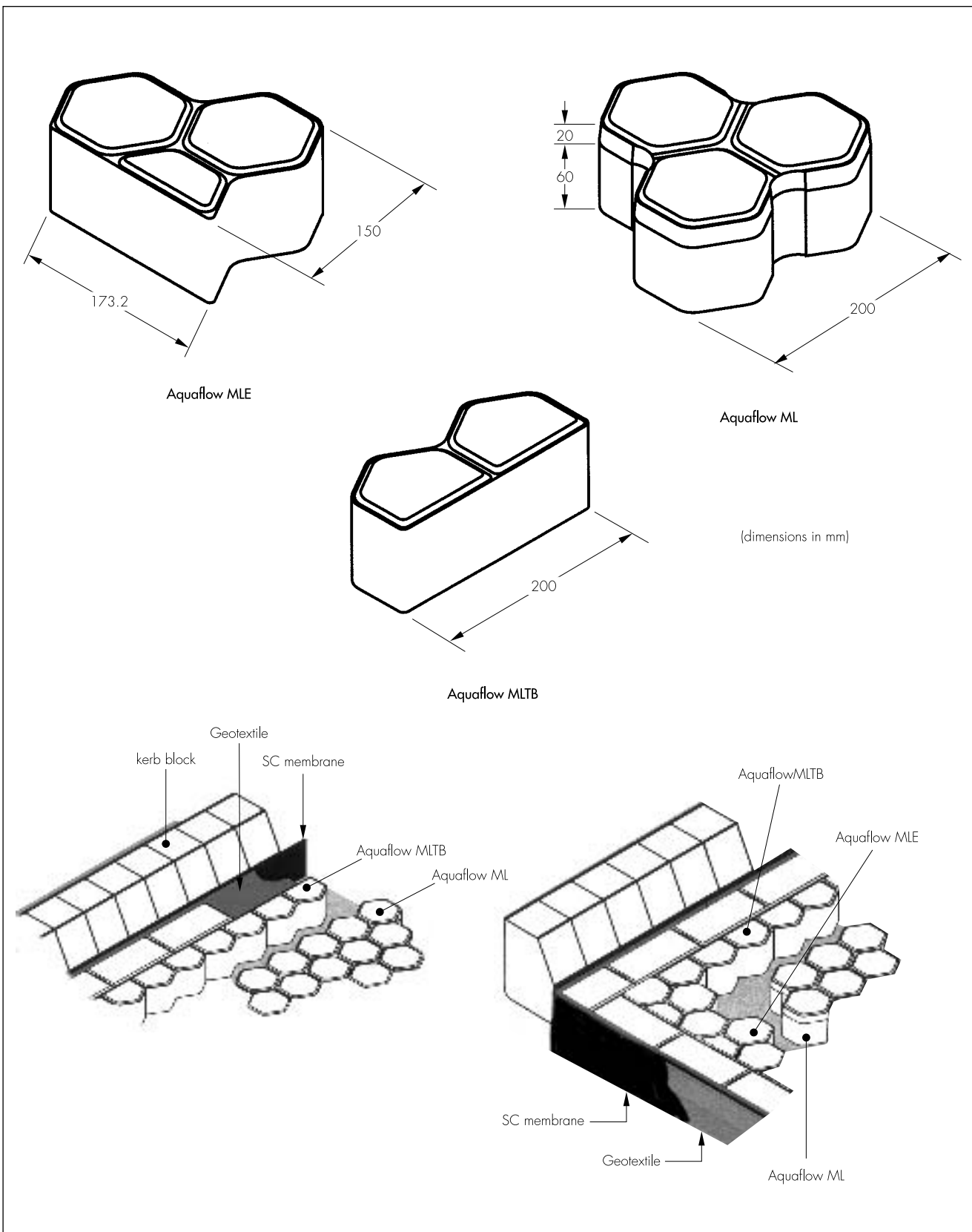
13 Block laying procedure

13.1 Edge restraint (such as kerb blocks haunched in concrete) must be provided to restrict lateral movement of the paving blocks during service.

13.2 Aquaflow ML Paving Blocks are laid butt-jointed, hand-tight, sequentially across the whole area. At the edges Aquaflow MLTB and Aquaflow MLE blocks are used to 'square-off' the paved area (see Figure 1).

13.3 A single or double row of Aquaflow rectangular blocks are laid in a stretcher bond formation against the MLTB and MLE blocks,

Figure 1 Block detail and typical installation



compressing the geotextile between the blocks and kerbing (see Figure 1).

13.4 To hold the blocks tightly in place at the edges of the paved area, kiln-dried sand should be applied to fill the joints for an approximate distance of 300 mm from the restraining edges (including tree pit surrounds).

13.5 The blocks are compacted with two passes of a vibrating plate compactor fitted with a rubber foot.

13.6 The projecting geotextile and membrane are trimmed as close to the blocks as is practicable, and the surface brushed clean.

Technical Investigations

The following is a summary of the technical investigations carried out on Aquaflo Paving ML Blocks.

14 Tests

Existing data in relation to a material of similar composition were assessed:

- density
- water absorption
- compressive strength
- dynamic friction
- freeze/thaw resistance
- resistance to staining and chemicals
- resistance to abrasion.

15 Investigations

15.1 The manufacturing process was examined, including the methods of mix design, batching of materials, block casting, curing and storage. Details were obtained of the quality and composition of materials used, and quality control methods were assessed.

15.2 An examination was made of independent test data on the flow rate of water through the system.

Bibliography

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

BS 6717 *Precast concrete paving blocks*
BS 6717-1 : 1993 *Specification for paving blocks*

BS EN 12878 : 1999 *Pigments for the colouring of building materials based on cement and/or lime. Specifications and methods of test*

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Road Research Laboratory Road Note 27
Instructions for Using the Portable Skid Resistance Tester



On behalf of the British Board of Agrément

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Chief Executive