
# GENERAL SITE WORK AND INSTALLATION GUIDE

# INDEX

## INTRODUCTION

Within the confines of this publication, it is not practicable to deal with every aspect of roof construction and site handling. The information which follows is intended as a general guide. The use of experienced contractors is strongly recommended as their personnel will be familiar with the relevant Codes of Practice.

## RESOURCES

In addition to appropriate product training, site personnel should be equipped with whatever specialised tools are required for the products involved. For example, the correct type of torch must be available on site for heat welding torchable products or a thermostatically regulated bitumen boiler for the WILOTEKT compound.

Ensure also that all employees are adequately supplied with personal protection equipment, gloves, goggles, hard hats etc and that they are fully aware of the safety requirements for the site.

All parties should be familiar with any regulations covering the use of tools and equipment and in particular any requirements dictated by the contract.

## TRANSPORT, HANDLING AND STORAGE

As soon as roofing materials are delivered they should be checked to ensure that they conform to the specification or order and that they are sufficient for the work.

### Transport

Rolls of reinforced bitumen membranes (RBMs) and rooflight domes are usually delivered shrink wrapped onto non-returnable pallets. Insulation is delivered in shrink wrapped packs. Articulated lorries are usually used for delivery and it is the purchaser's responsibility to inform Axter Ltd if such vehicles are unsuitable. It is the responsibility of the recipient to arrange the provision of suitable equipment and manpower for off-loading. Fork lift trucks are recommended for off-loading.

### Handling

AXTER's products, although usually thicker than those of other manufacturers, are still reasonably light and can be handled with ease and with a minimum of operatives. Individual rolls and packs of insulation can easily be handled by one man. If a crane is used for unloading, at least two slings should be used. For both crane or fork lift handling, always ensure that rolls are securely banded or wrapped to the pallet. When handling individual products, care must be taken to avoid damage to ends of rolls, to corners of insulation boards and to rooflights.

### Storage

RBM roofing cannot be formed satisfactorily with damp, wet or dusty materials. It is essential that all equipment and materials are kept clean, dry and protected. RBM rolls should be stored vertically, away from excessive heat and should only be unwrapped at the point of use. Pallets of roofing products must not be stacked one on top of the other.

## PREPARATION

Before commencement, the contractor should check that ALL products required for works are available and on site along with copies of the specification and any relevant drawings.  Ensure that a layout drawing is available for tapered insulation schemes.  Even if the contractor is not responsible for the deck it is in his interest to check that it has been installed correctly, with adequate falls, and that it is in a satisfactory condition to receive built-up roofing. All necessary builder's work should also have been completed.

In the case of hot bitumen applied systems the contractor should ensure that a suitable bitumen boiler and thermometer are available close to the area being worked. For heat welding specifications operatives must be supplied with suitable torches and bottled gas facilities must be provided with hose failure shut off devices. Fire extinguishers should always be readily at hand.

### Scaffolding

Before works commence all necessary scaffolding, safety rails or any other equipment necessary to protect both workmen and the public should be in position along with adequate hoisting equipment and access ladders.

## INSTALLATION

Installation should always be carried out in accordance with good practice and with particular reference to current standards and guides including:-

- BS 8000-4 : 1989 *Workmanship on building sites. Code of practice for waterproofing*
- BS 6229 : 2003 *Flat roof with continuously supported coverings – Code of practice*
- BS 8217 : 2005 *Reinforced bitumen membranes for roofing – Code of practice*
- BS 8747 : 2007 *Reinforced bitumen membranes (RBMs) for roofing – Guide to selection and specification*
- NHBC Standards - *Part 7.1 flat roofs and balconies*

Built-up roofing cannot be laid satisfactorily in rain, snow, high winds and extremes of temperature nor can it be applied with wet or frosted materials, In the case of Axter's elastomeric and Alpa®-mix bitumen products, installation should only proceed between ambient temperatures of -5°C and 45°C. For oxidised bitumen products these temperatures are from 5°C to 45°C. If it is intended that work should proceed in adverse conditions, consideration should be given to the provision of a temporary roof.

### Deck preparation

Any deck or substrate to receive built-up roofing must be dry, smooth, free of dust, grease, sharp projections, holes and fissures. If priming of the deck has been specified it must be applied evenly with a brush, roller or mop and the volatile oils be allowed to dry before proceeding with the roofing. Failure to do so means that the bitumen is likely to be weakened thereby reducing the bond strength.

Deck design must be such that it will resist all live and dead loads placed on it. Designs should be in accordance with BS EN 1990 : 2002 Eurocode 0 – *Basis of Structural Design* and BS EN 1991 – Eurocode 1:*Actions on structures*. For green roofs dead loads must account for the saturated weight of the green roof, as well as any hard surfacing.

### Vapour control layers

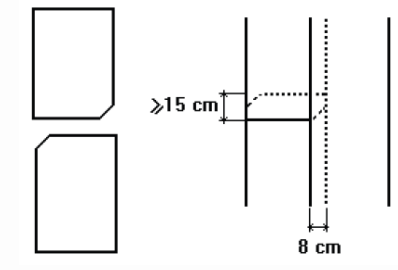
When control layers have been specified the contractor must ensure their integrity before the laying of the insulation. At roof edges and at all details care must be taken to ensure that the insulation is completely enclosed. Side laps should be at least 75mm and end laps 100mm wide.

### Thermal insulation

Thermal insulation boards should be laid closely butted to one another and in a staggered pattern to minimise joint movement. On metal decks care must be taken to ensure that board edges are well supported. A laying pattern at 45° to the troughing is ideal and avoids the danger of unsupported board joints and improves the load distribution to the deck. In most cases installation with the long side of the insulation at right angles to the trough is acceptable. Care must be taken to ensure that insulation boards are well fastened to the substrate.

Where tapered thermal insulation schemes are to be installed then ensure that the installation is in accordance with the drawing and start at the high point so that at the end of the day or if there is a sudden rainstorm, rainwater flows away from the completed area and not back underneath the insulation.

Thermal insulation can be laid in hot or cold bitumen, specialist PU adhesives or be mechanically fastened. In the case of high expected wind loadings it may be necessary to fasten boards in both an adhesive and with mechanical fastenings.




### Accessories

Roofing accessories (rainwater outlets, vents etc) should be fixed in accordance with the manufacturer's instructions. In the case of rainwater outlets care must be taken both in the design and the execution of the works to ensure that adequate provision has been made to remove surface water before the waterproofing membranes have been installed.

### Underlayers

Attachment of the underlayer may be by partial full or mechanical bonding or loose laying as required in the Specification for the works. In all cases care must be taken to ensure that the overlaps are well sealed with corners mitred.

*Partial Bonding*

Partial bonding is achieved by the use of either a perforated base layer (i.e. THERMECRAN) or by spot or frame bonding. In the case of a perforated base layer this is rolled out directly on the substrate with edges of adjacent rolls either overlapped

slightly or closely butted. The underlayer is then rolled out in hot bitumen using approximately 1.5 kg/m$^2$ or torched in the case of THERMECRAN so that the bitumen passes through the perforations and bonds the system to the deck.

For spot or frame bonding the underlayer is spot torched as shown on the plastic film, or with areas approx 300 mm diameter or in a series of bands. With bitumen applied roofing the RBM should be rolled directly into spots of bitumen, min 300mm diameter, or in a series of bands or "S" shapes so that at least 0.5 kg/m$^2$ of either hot or cold applied bitumen is used.

To avoid the effects of wind uplift, partial bonding must not take place close to the edges of the roof or around any upstand. In these areas the system must be fully bonded instead.

***Full Bonding***

Full bonding is achieved by torching or by pouring hot bitumen onto the substrate and then unrolling the felt onto it. Laps should be at least 60mm wide at the edges and 100mm at the ends of all rolls with a visible bead of bitumen. Any excess bitumen at the edges of the RBM should be smoothed out with a broad bladed scraper, spread onto the adhesive and lightly pressed in.

***Self adhesive***

Self adhesive membranes are supplied with a silicone release paper protecting the adhesive surface. This must be removed at the time of laying and the RBM carefully rolled onto the substrate. Adhesion of self adhesive membranes is not immediate and may take a few days to achieve full strength. Adhesion is accelerated by the torching of subsequent layers. Laps should be sealed by torching with mitred joints.

***Hot melt, structural waterproofing***

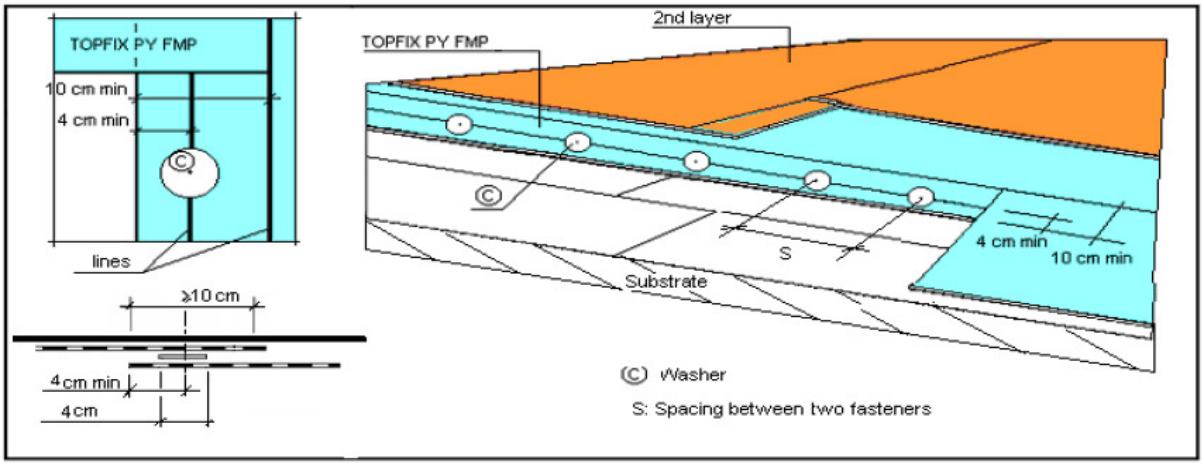
See WILOTEKT-PLUS installation Appendix A.

***Mechanical Fastening***

Mechanical fastening by nailing is usually specified for securing base layers to timber boarded substrates but other specialist fastening systems are also available for fixing to metal decks, woodwool slabs etc. For timber boarded decks the base layer is loosely rolled out onto the substrate and then using large headed galvanised clout nails this layer should be nailed at 150mm maximum centres to the substrate.

Mechanical fastening of Axter's single (FORCE 4000 FMG) or two layer (TOPFIX / TOPMETAL) mechanically fastened systems takes place along the selvedge with suitable stress plates and screws. Fixing densities depend upon local wind conditions and wind uplift calculation must always be prepared before installation starts. In any case a minimum of 4 fixings per lm should be specified.

The figures shown above for the numbers of fasteners are a guide only and actual numbers must be calculated to ensure that they meet the design needs of the roof.




Further information on installing Axter's mechanically fastened membranes can be found in the relevant European Technical Approval (ETA). Please contact Axter for details or download a copy from the Axter website.

*Loose Laying*

In loose laid systems the first, or base, layer is rolled out onto the substrate without any additional bond and with minimum 60mm wide side and 100mm wide end laps well sealed. Subsequent layers are then usually fully bonded. This technique can only be used where sufficient protection is being applied to resist the effect of wind uplift and is

especially suitable for protected membrane roofs. Loose laying totally isolates the waterproofing layers from any movement that may take place in the substrate.

## Intermediate and top layers under site applied protection

Intermediate layers and cap sheets for use under site applied protection (chippings, paving slabs etc) that may be required by the Specification are usually laid by fully bonding to the underlayer. Lap joints as described above must be offset to those in the underlayer to avoid the build up of excessive joint thicknesses.

## Self finished cap sheets

Self finished cap sheets are usually laid by full bond techniques as described above. It is desirable to commence laying the capping sheets at the water outlet points so that laps are not in the direction of the flow of water. Sometimes it is difficult to achieve such laying practice and a well sealed lap will not be at risk. Where gutters are waterproofed with self finished cap sheets it is essential that they are fully lined before the main surface cap sheet is laid so that overlaps in the gutter are in the direction of flow.

A bead of bitumen should be apparent along each lap. This bead may be removed whilst still warm by carefully pre-wetting or coating with a thin band of wallpaper paste the adjacent mineral surface but care must be taken to ensure that no moisture is trapped under the laps. In all cases a trial area should first be attempted to ensure that the method adopted does not remove the granular finish. A similar technique can be employed for metal faced products such as ARMALU or PAXALPHA PB 4000 Copper. Where the bitumen bead is left in position, matching granules may be scattered over it before the bitumen sets hard.

## Laying on slopes and vertical surfaces

For roofs over 5° pitch the surface finish must comprise a granular or metal self finished RBM and adhesion must be by full bond. On slopes of greater than 5° all head laps must be nailed to a suitable substrate at maximum 75mm centres in two rows 50mm apart to prevent slippage. At ridges the capping sheets must be taken over the ridge before nailing to provide additional security against slippage, the nails being subsequently protected by a ridge flashing piece.

The RBM should be laid down the line of the slope and nailed at the head of the sheet.

On some roofs intermediate battens may have to be installed to allow for additional fixing in accordance with the following table:-

| Pitch | Length of pitched run<br>m | Length for RBM<br>m | Batten centres<br>m |
|---|---|---|---|
| 5° to 25° | Up to 8m | 8.0 (no head laps) | Ridge and eaves only |
| 5° to 25° | Over 8 m | 4.0 | 4.0 (plus ridge and eaves) |
| 25° to 60° | Any | 4.0 | 2.0 (plus ridge and eaves) |
| 60° to vertical | Any | 2.5 | 1.25 (plus ridge and eaves) |

## Surface protection

In general where the specification calls for site applied surface protection this should be carried out as soon as the built-up roofing is complete. Surface protection may consist of stone aggregate in a dressing compound, loosely applied stone aggregate, pre-cast concrete slabs on supports, proprietary walkway tiles or felts, paints and insulation either under heavy protection or with a proprietary topping.

Before applying any of these in the manner described in the Specification or to the manufacturer's instructions the roof surface should be dry and free from dirt and grease. Because paints do not possess the same coefficient of expansion nor exhibit the same elastomeric properties as SBS modified bitumen membranes, solar reflective paints should only be applied to granular finished capping sheets. The granules on Axter's products, however, give adequate solar reflective properties and further treatment is not usually required.

Axter's CAMINAXTER walkway membrane can be applied to any sanded or granular finished capping sheet to give protection to the waterproofing from foot traffic. It is not recommended for use on public access roofs, except for fire escapes. CAMINAXTER should be butt jointed or laid stepping stone style where appropriate.

## Detail work

Details at upstands, penetrations, ridges, eaves, verges and outlets should be formed in accordance with drawings available from Axter. Contractors must check that each layer of RBM is overlapped correctly to ensure the integrity of the system. Axter will be happy to give advice on any particular construction and to provide drawings on request.

In general Axter recommends the use of sumps to rainwater outlets.

## Cleaning

All built-up roofing and self finished capping sheets in particular must be kept clean from builder's debris at all times. It is particularly important that nails and other sharp pointed objects are not left lying on the surface. Granular surfaces are particularly prone to damage in the first few days after laying whilst the granules embed themselves properly into the bitumen. Consequently any surface water that hampers construction should be carefully removed with mops and sawdust. Brushing should be avoided at all times.

The granular surface helps protect the waterproofing bitumen from the effects of solar radiation and other atmospheric conditions. Localised granular loss can be repaired by removing any loose granules from the surface and then spreading a thin layer of AXTER's adhesive onto the bitumen. Larger areas can be repaired by spraying the adhesive with either a knapsack or a hand sprayer. (To reduce the viscosity it is possible to mix the adhesive with up to 30% water before spraying.) Loose granules are then spread onto the adhesive and lightly pressed in.

## Operational maintenance

Built-up roofing is generally maintenance free but periodic inspection is advised in accordance with Axter's Maintenance Schedule. Any repairs should be carried out in similar materials to the original Specification as soon as practicable. In the event of mechanical damage to the roofing this should be repaired as soon as possible by torching down a patch manufactured from a suitable Axter RBM, in a matching colour.

Axter Ltd can advise on any particular maintenance programme and is willing to arrange for regular maintenance inspections on request.

## Health and safety

It is important that installers comply with ALL Health and Safety legislation. There are numerous statutory instruments amongst which are:

The Construction (Design and Management) Regulations

The Construction (Health, Safety & Welfare) Regulations

The Health and Safety at Work Act.

The International Agency for Research on Cancer (IARC) has concluded that, as the polycyclic aromatic compounds (PCAs) contained in bitumen products are of a high molecular weight, there is no evidence that they are carcinogenic to man. (Concawe Reports No.85/87 and 7/82.) It is suggested, however, in the light of further evidence, that if total fume exposure for an eight hour time period is kept below 5mg/$m^3$ then inhalation of PCAs will be extremely low.

It is also believed at the present time that:

1 Bitumen is of a low order of acute toxicity.

2 There are no long term effects to man resulting from normal use.

Some products, for details see relevant Product Descriptions or COSHH sheets, are coated with silica sand and the Health and Safety Commission have established that the Maximum Exposure Limit (MEL) for an OES 8hr TWA is 0.3mg/$m^3$ for total inhalable dust and 0.1mg/$m^3$ for respirable dust.

In the case of glass-fibre reinforced membranes the glass-fibre is impregnated and coated with bitumen and therefore poses little risk of exposure. If damage occurs freeing the glass-fibre, then the level of exposure should be controlled to 5mg/$m^3$ total inhalable dust.

# ORDERING

Quotations for the UK home market may be obtained direct from[1]

**AXTER LIMITED**
**West Road, Ransomes Europark, Ipswich IP3 9SX**
**Tel 01473 724056, fax 01473 723263, email orders@axterltd.co.uk**

Quotations for FOB or GIF export can be obtained from Axter's Ipswich office.

Axter's products for the UK home market are supplied direct from the manufacturing sites. Deliveries, minimum quantities and further technical information on all Axter's products can be obtained from the Ipswich address.

Orders for delivery within the UK are normally supplied shrink wrapped onto non-returnable pallets, It is essential that both labour and suitable equipment are provided for offloading. In the event that goods have to be returned for any other reason than quality this will be at the customer's cost and only full, unopened pallets of felt or packs of insulation will be accepted.

All orders are delivered to site, customers' yards or to the nearest point accessible by road within mainland UK. Delivery instructions should be supplied with each order. Delivery can be arranged lo coincide with phased site programmes or as part of an agreed installation sequence.

[1]Delivery charges are levied for small orders.

## ENQUIRIES

Enquiries for assistance with the design of any waterproofing system or with the selection of membranes, insulation or rooflights and methods of installation are encouraged and should be made to Axter Ltd at the Ipswich address.

Axter's Technical Design team are freely available to advise on any of the above aspects and can prepare full specifications if required.  Advice is also available on the thermal and condensation design of roofs and computer predictions can be provided for any flat roof construction.

From many years' experience, Axter Ltd will be pleased to provide examples of the use of their products in different applications, environments and countries.

# APPENDIX A

## WILOTEKT-PLUS *Installation instructions*

### PREPARATION

- Ensure deck is smooth (free of all but minor surface defects), dry, and free of dust, laitance and nibs. If deemed necessary by Axter technical personnel, the deck should be cleaned by power wash and allowed to dry thoroughly.
- Check that rainwater outlets are sumped into the slab by at least 30mm, if this is not possible the outlets must be set flush with the top surface of the deck ensuring no water check is present.
- Prime deck and all upstands with WILOTEKT-PLUS SURFACE CONDITIONING PRIMER by brush or roller and allow to dry - 70 to 100 $m^2$ per drum.
- Seal any open joints, holes, cracks etc with the self adhesive strip STICKBAND 100 or 150, installing it centrally over the opening.
- Around in-situ rainwater outlets, pipe protrusions, etc torch down a 1m x 1m soaker made from the WILOTEKT-PLUS PROTECTION MEMBRANE.
- Install WILOTEKT-PLUS preformed internal and external corners as appropriate, secured in place with WILOTEKT-PLUS compound.

### *WILOTEKT-PLUS Application sequence*

1. Roll out reinforcement mesh, closely butt or overlap adjacent lengths.
2. Heat WILOTEKT-PLUS COMPOUND in a thermostatically regulated bitumen boiler. Maximum temperature 180℃.
3. Position WILOTEKT-PLUS PROTECTION MEMBRANE, by rolling out and back, allowing for 10cm side and 15cm head laps. Stagger lengths to avoid four thicknesses at head laps and mitre corners where laps cross.
4. Pour heated WILOTEKT-PLUS COMPOUND through the mesh, 3 $kg/m^2$, at the same time rolling out the WILOTEKT-PLUS PROTECTION MEMBRANE, making sure there are no unbonded areas and that the mesh is buried in the COMPOUND. Allow WILOTEKT-PLUS COMPOUND to flow naturally; there should be no need to spread COMPOUND with a scraper.
5. Where soakers have been installed, set the WILOTEKT-PLUS COMPOUND back and torch the protection membrane directly to the soaker without the compound. Dress the WILOTEKT-PLUS PROTECTION MEMBRANE into all rainwater outlets.
6. Torch apply the WILOTEKT-PLUS PROTECTION MEMBRANE up all upstands to a minimum height of 150 mm.
7. Check that all joints are secure with a minimum bitumen bead of approx 2mm.

#### *Details*

Apply details, install the WILOTEKT-PLUS DETAILING MEMBRANE (mineral finish) by torching method to the required height and return at least 150 mm down on to the flat.
NB: Where the detail membrane is not exposed; detailing can be carried out with the WILOTEKT-PLUS PROTECTION MEMBRANE (sand finish).

#### *Post application detailing*

If holes are cut through previously installed WILOTEKT-PLUS waterproofing ensure that the cut edge of the system is sealed so that no compound can ooze out.

## Pitch pockets

Pitch pockets are used to waterproof around complex details such as multiple pipe entries, steelwork, stanchion bases, etc.

1. Install the full WILOTEKT-PLUS system on the roof surface up to the detail.
2. Pre-fabricate a once bent galvanised steel metal former of a sufficient size to suit the dimensions of the detail, ensuring a minimum compound depth of 50mm above all fixings is achievable.
3. Ensure the pitch pocket retainer is clean, dry and free from contaminants such as grease.

**Pitch Pockets, cont'd**

4. Ensure the pitch pocket retainer is a sealed unit to prevent hot compound escaping when poured.

5. Place the retainer around the detail, with the foot facing away from the detail, then seal the joint between the retainer and the WILOTEKT-PLUS protection membrane by torching strips of the WILOTEKT-PLUS detail membrane in place. This process will secure the retainer and prevent any compound escaping when poured.

6. Once satisfied that the retainer is secure and no compound can escape during installation, pour molten WILOTEKT-PLUS compound into place. The WILOTEKT-PLUS compound should be poured in a single operation. If compound installation has to stop prior to the retainer being full, the surface of the installed compound must be heated prior to installation of the remaining material.

7. Ensure that the WILOTEKT-PLUS compound finishes at least 50 mm above bolt heads, fixings or similar protuberances.

8. If the top of the pitch pocket is exposed to the elements then it must be protected with the WILOTEKT-PLUS mineral detail membrane. If not exposed then it can be finished with the WILOTEKT-PLUS protection membrane and then covered with the thermal insulation, breather membrane and specified inverted roof finishes.

**Protection**

WILOTEKT-PLUS waterproofing system must be covered with thermal insulation, breather membrane and/or protection as soon as practicable after installation, taking care not to damage the roof waterproofing. Keep roof outlets clear for inspection.

***Thermal insulation***

Install, by loose laying, XPS or EPS HYDROSHIELD thermal insulation boards. It is essential that all joints between the boards are tight and no gaps exist where they meet edge details and other services which perforate the roof deck.

Overlay the XPS with WILOTEKT Breather Membrane and EPS HYDROSHIELD with the HYDROSHIELD breather membrane, overlap adjacent rolls by 300 mm and seal the WILOTEKT-PLUS Breather Membrane edges with HYRA-STICK adhesive and seal the HYDROSHIELD breather membrane with HYDROSHIELD adhesive tape.

***Finishes***

Ballast

Cover breather membrane with minimum 50 mm of rounded washed river gravel nominal size 20 to 40 mm.

Paving slabs

Can be installed on bedding material, a non woven synthetic geo-textile or on proprietary supports. Position Axter fixed or adjustable paving slab supports onto the breather membrane. A rotation screw allows the adjustable supports to be adjusted to height. At roof edges remove relevant wings and position support as close to edge as possible. Slab overhang <12 cm for 450 x 50 cm or < 10 cm for 40 x 40 cm slabs. Leave a 6 to 10 mm gap at all abutments.

Green roofs

Apply reservoir boards or drainage layers directly onto the breather membrane as directed.

Reinforced concrete

Apply concrete as required over a 1000 gauge polyethylene slip layer.

Brick or block pavers

Apply over a sharp sand base laid over Axter filter layer.

Macadam /mastic asphalt

Contact Axter for specialist advice.

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