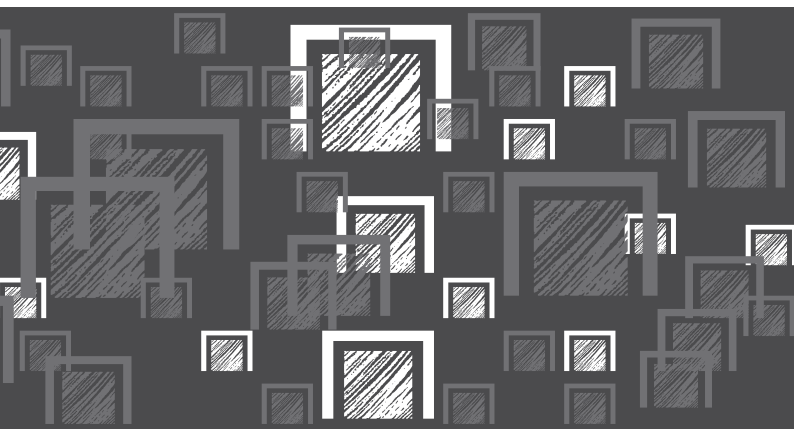
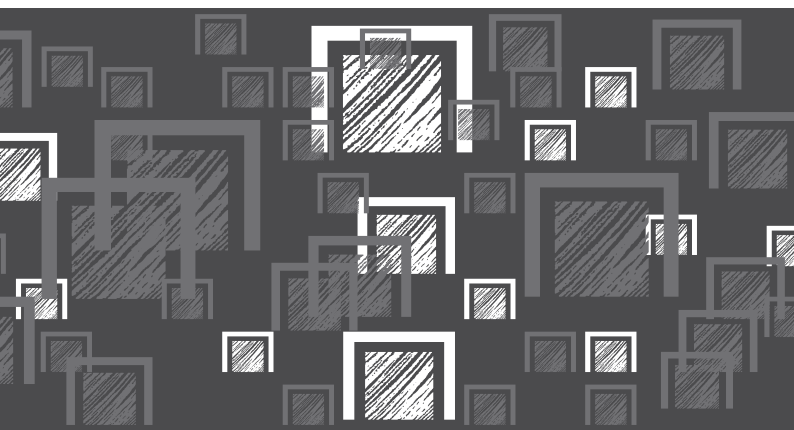




 **ECOLINE**
INSTALLATION MANUAL





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2	PVC Material
3	ECOLINE Membranes
4	Structural Roof Deck
5	Vapour Control Layer (Vcl)
6	Tools and Equipment
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1.0 INTRODUCTION



Axter is part of the Bouygues Group of Companies and is one of the world's leading designers and manufacturers of roofing and waterproofing membranes. With over 100 years of experience, Axter specialises in the production of high quality, robust, fully integrated membranes for extensive use in both new build and renovation projects.

Axter's comprehensive product portfolio includes over 700 different systems which have been engineered to provide unparalleled performance and design flexibility. Through our global network of dedicated representatives and our relentless commitment to research and development, Axter ensures its systems are successfully supplied and installed in more than 60 countries worldwide.

It is Axter's proud tradition in the design and manufacture of high performance waterproofing systems that has facilitated the development of the ECOLINE PVC-p (polyvinyl chloride) next generation synthetic membrane system range.

2.0 PVC MATERIAL AND ECOLINE



PVC (polyvinyl chloride) is one of the most versatile plastic materials available, is used extensively throughout the world and accounts for over 25% of global plastic production. PVC formulated material is used in various industries such as pharmaceutical, construction, automotive and textile, although the construction industry is the largest consumer of PVC products. This is due to the multitude of suitable applications within this sector such as roofing membranes, flooring, pipes, ducts and windows to name but a few.

PVC is utilised in so many ways due to its unique characteristics of strength and flexibility. Strength and flexibility ratios can be engineered to suit the particular application of the material thus ensuring roof membranes are flexible not rigid and remain supple even in extreme cold.

Contrary to most plastics PVC is not 100% produced from fossil fuels as its constituent parts are chlorine, carbon and hydrogen in variable concentration. The principal constituent, chlorine, accounts for approximately 60% of the material and is derived from common salt that is a sustainable raw material with unlimited world supply. Approximately 40% of the raw material is derived from other resources and advanced manufacturing techniques have ensured ECOLINE membranes contain recycled non-virgin polymers in high concentration.

3.0 ECOLINE MEMBRANES

There are three primary types of ECOLINE membranes.

3.1 ECOLINE FM

Polyester reinforced PVC-p membrane for mechanically fixed applications.
ECOLINE FM comprises:

- Flexible UV stable PVC top surface manufactured in standard colours dark grey (RAL 7043) and light grey (RAL 7047). Alternative colours are available subject to volume.
- Woven polyester core.
- PVC underside, with non-virgin polymers in variable concentration, dark grey textured finish.

ECOLINE FM should not be installed without mechanical restraint. ECOLINE FM should not be installed in fully adhered field area situations with ECOLINE ADH (solvent free) adhesive. ECOLINE FM is recommended for standard installation on fully adhered details in conjunction with ECOLINE FM/D (solvent free) contact adhesive.

ECOLINE FM is manufactured in a 1.2mm and 1.5mm* thickness.

* not stocked item

3.2 ECOLINE ADH

Polyester reinforced PVC-p membrane with fleece underside for fully adhered applications.

ECOLINE ADH comprises:

- Flexible UV stable PVC surface manufactured in standard colours dark grey (RAL 7043) and light grey (RAL 7047). Alternative colours are available subject to volume.

3.0 ECOLINE MEMBRANES

- Woven polyester core.
- PVC underside, with non-virgin polymers in variable concentration, dark grey textured finish.
- 200g/m² polyester fleece underside.

ECOLINE ADH must be installed fully adhered with ECOLINE ADH solvent free adhesive.

Only ECOLINE adhesives are compatible with ECOLINE membranes.

ECOLINE ADH is manufactured in a 1.2mm and 1.5mm thickness.

3.3 ECO/D

Un-reinforced PVC-p membrane for site fabricated details.
ECO/D comprises:

- Flexible UV stable PVC membrane manufactured without reinforcement in standard colours dark grey (RAL 7043) and light grey (RAL 7047). Alternative colours are available subject to volume.

ECO/D must not be installed in field areas as the primary waterproofing. ECO/D must only be used for site fabrication of detail work such as pipe collars and internal/external corner reinforcement when E/corners are not available.

ECO/D is manufactured in a 1.5mm thickness only.

3.0 ECOLINE MEMBRANES

3.4 COMPATIBILITY & CHEMICAL RESISTANCE

ECOLINE membranes exhibit variable compatibility and chemical resistance when exposed to substances in controlled laboratory conditions.

The table opposite acts as a guide to ECOLINE material compatibility and general chemical resistance. Statements of compatibility and chemical resistance are dependent upon substance temperature and concentration. Further guidance must be sought from Axter as required.

3.0 ECOLINE MEMBRANES

SUBSTANCE	COMPATIBILITY & CHEMICAL RESISTANCE
Aluminium	Good
Asphalt	Poor
Bitumen	Poor
Common salt	Good
Copper and ferrous materials	Good
Detergents	Good
Diesel oil and fuel oil	Poor
Vegetable and animal fats	Poor
Mineral oils	Poor
Motor oils	Poor
Vegetable and animal oils	Poor
Petrol	Poor
Salt (aluminium, ammonium, calcium, magnesium, potassium, sodium)	Good
Sea water	Good
Silicone oil	Poor
Soaps	Good
Solvent	Poor
Steam	Good
Turpentine oil	Good
Weed killer (aqueous)	Good
Wood preservatives (water based, solvent based)	Poor

* Consult Axter Ltd for full compatibility list

4.0 STRUCTURAL ROOF DECK

Structural roof decks can be classified as:

- Panel or sheet (pre-formed, supplied and fixed)
- Cast in-situ
- Existing (refurbishment)

Single-ply synthetic membranes should only be applied over a continuous substrate which provides full support. Substrate materials used to form the roof deck in flat roofs should be those listed in BS 6229 : 2003 and conform to the relevant requirements in BS EN 13956 : 2012.

NB: it is imperative that the structural deck does not have sharp edges, is free from debris, is installed to the correct drainage falls in accordance with BS 6229: 2003, is clean and dry and suitable to receive the membrane and/or vapour control layer. It is the responsibility of the ECOLINE accredited installer to notify the client if the structure is not satisfactory and to cease installation immediately.

4.1 PROFILED METAL

Profiled metal decking typically consists of (a) galvanised steel, (b) coated steel, or (c) aluminium that is profiled to provide the necessary strength to suit the span and load requirements. These materials are generally used for lightweight roof systems where rapid installation is required.

(a) Galvanised steel

Minimum recommended thickness 0.7mm to BS EN 10346 : 2009. Typical gauge range 0.7-1.2mm.

(b) Coated galvanised steel

Minimum recommended thickness 0.7mm to BS EN 10346 : 2009. Typical gauge range 0.7-1.2mm.

(c) Aluminium

Minimum recommended thickness 0.9mm to BS EN 1396 : 2007. For mechanically fastened roof systems peel rivets or expanding fasteners, which provide a positive clamping action, should be used.

4.0 STRUCTURAL ROOF DECK

4.2 TIMBER

All timber products must be sustainably sourced and carry the internationally recognised Forest Stewardship Council (FSC) certification. Timber decking of all types should be specified to suit the load and span capability of joists and purlins. Timber decking is generally classified into pre-formed sheets and timber boarding. Modern roof construction typically utilises sheets but it is common in refurbishment situations to identify timber boarding.

(a) OSB (oriented strand board)

Roofing grade OSB should be manufactured to BS EN 300 : 2006 grade OSB/3 and be certified by the British Board of Agrément or BRE Certification. The minimum recommended thickness is 18mm.

(b) Plywood

Plywood should be Exterior grade WBP 18mm thick and certified to conform to BS EN 1995-1-1 : 2004 Eurocode 5 Design of timber structures and to BS EN 636 : 2012 Plywood. Specifications minimum Service class 2 – ‘humid conditions’ or where required Service class 3 – ‘Exterior conditions’.

(c) New timber boarding should be a minimum 25mm thick and, ideally, tongued and grooved as this maintains its resistance to deflection after natural shrinkage. Existing timber boarding must be prepared through the correction of any uneven planks with all nail heads flush.

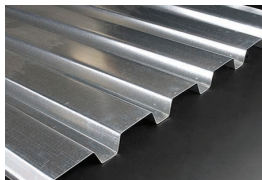
4.0 STRUCTURAL ROOF DECK

4.3 CONCRETE

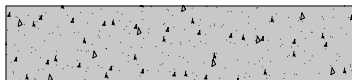
Structural concrete decks can be classified as either reinforced (cast in-situ), precast, pre-stressed or lightweight aerated. Concrete must be dry, free from irregularities and laid to the correct drainage falls in accordance with BS 6229 : 2003.



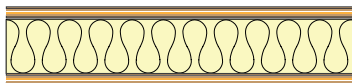
Metal



Plywood



Concrete



SIPS decks



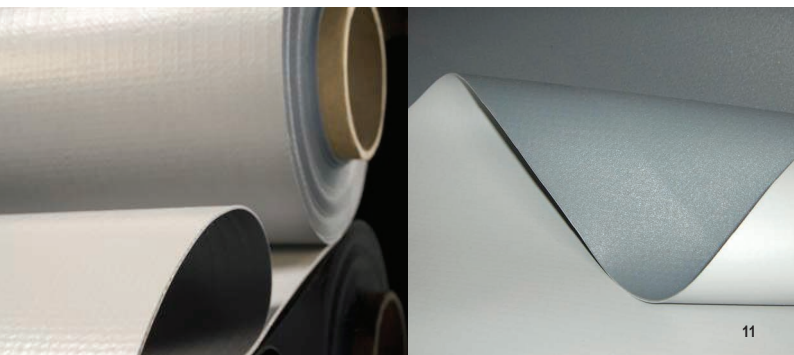
4.0 STRUCTURAL ROOF DECK

4.4 STRUCTURAL INSULATED PANEL SYSTEMS (SIPS)

Structural insulated panel systems (SIPS) comprise an insulated core of polyisocyanurate (PIR) or expanded polystyrene (EPS) sandwiched between plywood (BS EN 636 : 2012 Plywood. Specifications Service class 2 minimum, higher Service class plywood may be required, as defined by the specifier) or Oriented Strand Board (to BS EN 300 : 2006 OSB/3).

ECOLINE FM membrane can be adhered (ADH) or mechanically fastened (FM) to the panel dependent upon approval by the panel and membrane manufacturer. Plywood deck thickness must be checked for suitability to receive mechanical fixings with pull out tests completed.

Panel joints, abutments and penetrations must be sealed with Axter AFT tape. Careful attention must be given to the possibility of interstitial condensation occurring within the structure. Due to the impracticality of installing a vapour control layer to the warm side of the deck, panel manufacturer advice should be sought on how to prevent vapour transmission.



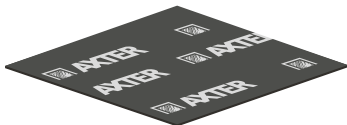
5.0 VAPOUR CONTROL LAYER (VCL)

When a vapour control layer is specified its type and classification will be determined by the building use and construction (Structural deck type). The type of vapour control layer will vary but will be one of the following membranes as specified by Axter Ltd:

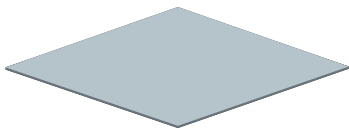
1000 gauge polyethylene membrane (VAP-P) loose laid onto the metal or timber deck and restrained by the mechanical fixings for the insulation and membrane.



Polymer modified (SBS) reinforced bitumen membrane, torch bonded onto concrete (VAP-AL) and self-adhered/heat activated onto metal and timber (VAP-AL SK).



Polymeric foil self-adhesive membrane onto metal or timber (VAP-IND).



6.0 TOOLS AND EQUIPMENT

It is essential that the welding equipment is in good working order and maintained to a high standard. Hot air welding equipment must be kept clean, especially the weld nozzle, and equipment temperature checks are advised.

The ECOLINE accredited installer must comply to all industry recognised methods of good practice and wear all appropriate safety equipment (safety boots, hard hat, gloves, safety glasses, high visibility clothing).

The following equipment inventory is essential:

Hand held welding equipment -
Leister™ Triac – PID or similar



Automatic welding equipment -
Leister™ Varimat or similar



20mm weld nozzle



5mm cord weld nozzle



6.0 TOOLS AND EQUIPMENT

90°angle weld nozzle



60°angle weld nozzle



40mm weld nozzle



40mm E/Profile weld nozzle (as necessary)



30mm (orange) silicone pressure roller



Probing tool



6.0 TOOLS AND EQUIPMENT

Wire brush for cleaning equipment



50mm rubber pressure roller for adhered upstands



8mm brass roller



Heavy duty scissors for membrane cutting



- Industry standard personal protection equipment (PPE). NB: site specific requirements may apply.
- Suitable power cables and electrical generator equipment may be required dependent upon site circumstances.

7.0 GENERAL INSTALLATION

Prior to installing ECOLINE PVC-p single ply synthetic membranes the roof substrate deck must be checked for its suitability. It is essential that the roof deck is clean and dry, free from irregularities such as concrete nibs or screw heads, and all detritus that may damage or compromise the system during or post installation is removed. All ECOLINE membranes should not be installed in wet weather conditions or in temperatures below 5°C (ADH adhered systems).

When installing over an uneven surface as may be the case on refurbishment projects, a suitable Axter protection / separation (ECO 125/200/300) membrane should be installed prior to the ECOLINE system. Axter separation layers must be installed to eliminate direct contact between the ECOLINE PVC-p membrane and oil based products, such as bitumen membranes. ECOLINE membranes should not be installed in direct contact with unfaced polyurethane/polyisocyanurate and polystyrene insulation boards and separation membranes must be installed. Please refer to section 3.4 of this document or consult Axter for further reference.

ECOLINE PVC-p membranes can be installed mechanically fixed (FM) or fully bonded (ADH) as part of a warm roof waterproofing and insulation system.

8.0 HOT AIR WELDING TECHNIQUES

ECOLINE membranes are welded by hot air method, either by automatic welding machines or handheld equipment. Welding is achieved by rolling out the roofing membrane with the required overlap. Both sides of the overlap are heated to melting point and pressed together with a silicone pressure roller.

Hot air welding techniques can be adapted to suit the specific climatic conditions at time of installation to ensure a secure weld is achieved at all times. Test welding is essential and should be employed by the ECOLINE accredited installer to enable the correct settings to be achieved for the welding equipment.

A good weld is obtained when a secure PVC melt seam is achieved along the weld. Care must be taken to control the temperature of the welding equipment to ensure the membrane is not burned/charred if too hot. Similarly if the equipment is too cold a secure weld will not be achieved and a good melt seam will not be visible.

The membrane overlap joints are sealed by hot air welding technique.

The correct execution of membrane welding requires the following equipment:

- Automatic welding machine, Leister™ or equivalent (2m wide membrane).
- Manual hand held welding machine (Leister™ or equivalent) for difficult access areas.
- Silicone pressure roller (30mm) for securing the weld.

In the traditional overlap system the membrane is fixed to the base within its side lap and overlapped by the adjacent sheet. The two sheets are then welded together using either a semi-automated hot air welding or hand held equipment. This guarantees a homogenous seam which is of greater strength than the membrane.

The minimum recommended membrane overlap must be 120mm, ensuring that the specified membrane fixing (MTP/C fixing) is completely covered.

8.0 HOT AIR WELDING TECHNIQUES

It is essential that all membrane joints achieve a minimum effective welding area of 40mm. End laps must be staggered by 250mm and 4 roll ends should never coincide. Where 3 membranes overlap the centre sheet must be chamfered.



(fig 1 membrane layout)

8.0 HOT AIR WELDING TECHNIQUES

Axter insists upon a weld test being completed before commencing work each day in order to determine the optimum weld conditions such as temperature and speed for the specific day. Note environmental conditions and the equipment used can affect these parameters and must be regularly monitored to ensure conformity of weld quality. Weld tests must be completed every 200 linear metres and prior to commencement of morning and afternoon work phases.

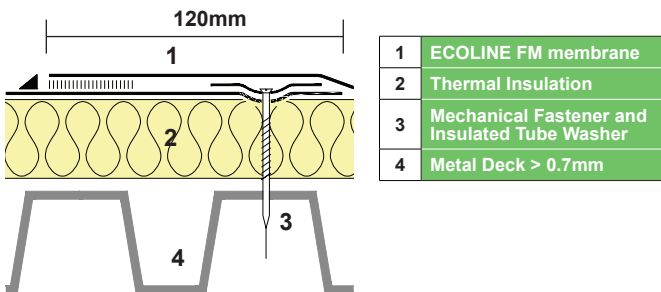
It is essential that the membrane is completely clean and dry before commencing the welding operation. If necessary the membrane should be cleaned with Axter E/Clean cleaning solution prior to attempting the weld.

All weld seams must be tested with a probing tool at least 15 minutes after welding, to ensure weld security has been achieved and to highlight any weld defect.

9.0 ECOLINE FM MECHANICAL INSTALLATION

9.1 MECHANICAL INSTALLATION

ECOLINE FM polyester reinforced membrane is rolled out and secured to the structural deck using Axter mechanical (MTP or C) membrane fixings and washers. This is to ensure that the roofing membrane can withstand the wind uplift and general climatic forces to which it will be exposed throughout its serviceable life. Where the substrate is not a metal deck (concrete, OSB, plywood or timber) the direction of the membrane is not critical. If using a metal structural deck the membrane must be installed perpendicular to the profile. ECOLINE mechanical fixings and washers should be installed through the membrane and insulation into the crowns of the deck (fig 2 mechanical fixings and overlaps).



(fig 2 mechanical fixing and overlaps)

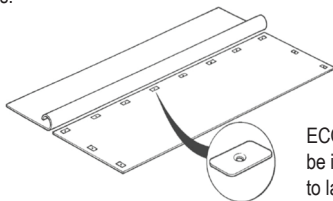
ECOLINE FM is laid out loose, straightened and tightened prior to installing the fixings. Position the membrane so that a minimum 120mm overlap is achieved, this positioning is aided by the black line printed on the membrane indicating lap position. Once positioned install 2-3 fixings at one end and stretch the membrane longitudinally to tighten. Then install an additional 2-3 fixings at the opposite end of the membrane ensuring that the membrane is kept tight and secure. The membrane must be installed smooth without wrinkles, this is achieved by stretching the membrane out to the side whilst installing the required fixings down the lap.

The specified fixings must be installed in accordance with the project specific fixing rate calculation as completed by Axter. Any deviation from the specified fixing type and fixing rate will result in removal of the system guarantee and possible attachment failure.

9.0 ECOLINE FM MECHANICAL INSTALLATION

9.2 MECHANICAL FIXING

The position of ECOLINE MTP/C membrane fixings and M/washers is critical to ensure installation security and performance. Incorrectly installed fixings will result in a lack of performance and potential failure of the system and invalidate Axter wind uplift calculations.

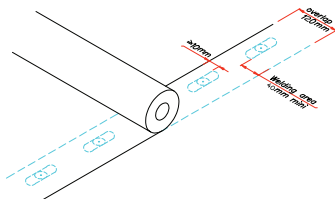


ECOLINE M/washers must be installed parallel to lap edge

(fig 3 mechanical fixing layout)

ECOLINE M/washers should be installed with the length parallel to the lap edge. Incorrectly installed M/washers and MTP/C fixings could compromise system performance and integrity. If a stress plate is incorrectly installed within the weld zone this will increase stress on the weld at this point and may result in weld failure.

The specified (MTP or C) fixings must be installed along the edge of the ECOLINE FM polyester reinforced membrane in accordance with the fixing rate calculation. Fixings should be located 10mm off the printed line on one edge of the membrane, ensuring that the membrane overlap is min. 100mm wide with the fixing completely covered. Please refer to Axter for standard detail drawings.



(fig 4 overlap diagram)

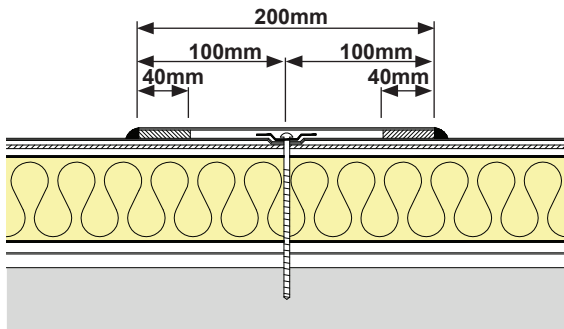
ECOLINE FM should be mechanically restrained at roof perimeters and roof penetrations with ECOLINE pre-drilled restraint bar and PVC cord. The restraint bar should be fixed at the calculated fixing rate (min 200mm centres) with ECOLINE fixings.

9.0 ECOLINE FM MECHANICAL INSTALLATION

9.3 INTERMEDIATE FIXINGS

Where intermediate fixing lines are required, the following fixing and ECO/R cover strap procedure must be followed (fig 5 intermediate fixing):

- Fixings should be installed at the required location through the field membrane in a straight line and at the required fixing centres as determined by the fixing calculation.
- Once in-situ the intermediate fixings must be sealed, through the installation of ECO/R cover strap membrane.
- The ECO/R cover strap must be at least 200mm wide with a minimum 40mm weld line on each side.



(fig 5 intermediate fixing)

9.0 ECOLINE FM MECHANICAL INSTALLATION

9.4 FIXING PRECAUTIONS

- Do not start work without a fixing calculation provided by/approved by Axter Ltd.
- Do not deviate from Axter wind uplift fixing calculation.
- Do not install less than 4 fixings /m².
- When using ECOLINE FM 1.05m wide membrane, do not install fixings at a rate greater than 1m centres along the lap.
- ECOLINE FM 2.10m wide membrane should only be installed in the centre of the roof. Fixing centres must never exceed 550mm. The fixing must never be installed closer than 30mm from the edge of the membrane.
- Membrane must be installed perpendicular to metal deck profile and precast concrete plank structures.
- ECOLINE washers and fixings must be used ensuring the length of the washer is parallel to the membrane edge.
- ECOLINE restraint bar, cord and fixings must be used at roof perimeters, upstands and parapets.

10.0 ECOLINE ADH ADHERED INSTALLATION

ECOLINE ADH

ECOLINE ADH fleece backed membranes and ADH adhesive should only be applied to suitably prepared substrates and compatible insulation boards. ECOLINE ADH membranes and ADH solvent free adhesive should only be applied in dry weather conditions at temperatures of 5°C and above.

Following surface preparation the ECOLINE ADH membrane should be installed as follows. Completely unroll, position and straighten the membrane without tension. The adjoining lap should be positioned using the printed line on the membrane as a guide, ensuring a minimum 100mm overlap is achieved. Cut the membrane, leaving a minimum 100mm head lap at perimeters and upstands. Once correctly positioned, fold the sheet in half along the length, ensuring that it is smooth with no wrinkles. It is essential to ensure the bonding area is clean, dry and free from dust.

Apply the ADH adhesive to the surface of the insulation/substrate. Do not over-apply the adhesive and ensure even coverage. Do not apply adhesive to welding area. On the membrane from the fold use a weighted roller to ensure a smooth, even finish is achieved. Repeat this procedure for the other half of the membrane.

10.1 BONDING PRECAUTIONS

- Always ensure that the adhesive is stored internally in dry conditions at temperatures above 5°C.
- Do not use ADH adhesive in high humidity conditions.
- Insulation boards should be taped using Axter AFT tape when using Hyra-stik insulation adhesive.
- Membrane to be laid into wet adhesive. Adhesive may be misted with a water spray to accelerate curing.

10.0 ECOLINE ADH ADHERED INSTALLATION

10.2 ADH ADHESIVE

ADH adhesive should be applied by brush, roller or squeegee to achieve an even coverage of adhesive, excessive adhesive build up should be avoided and any excess removed immediately. Particular care should be taken on sloping surfaces to ensure that even adhesive distribution is achieved and that sufficient drying time is provided (approximately 15-20 minutes) to achieve appropriate material grab during installation. Total drying time is 1-5 hours depending upon ambient temperature and humidity.

ADH adhesive should be used for adhering ECOLINE ADH fleece backed membranes only and cannot be used for bonding laps, insulation, accessories or any other component.



10.3 JOINTING PROCEDURE

Longitudinal lap joints are formed by overlapping the two adjacent membranes by a minimum of 60mm, and this area is free from geotextile fleece to enable the two sheets to be welded together in the standard manner. The lap area without fleece should remain free from ADH adhesive and any excess should be removed immediately.

It is not possible to weld transverse lap joints and the transverse seams should be butt jointed. The joint must be covered with a 200mm wide minimum strip of ECO/R membrane that is then welded over the joint in the standard manner. A test weld must be carried out on the membrane to determine weld strength and performance.

ECOLINE ADH should be mechanically restrained at roof perimeters and roof penetrations with ECOLINE pre-drilled restraint bar. The restraint bar should be fixed at minimum 200mm centres with ECOLINE fixings.

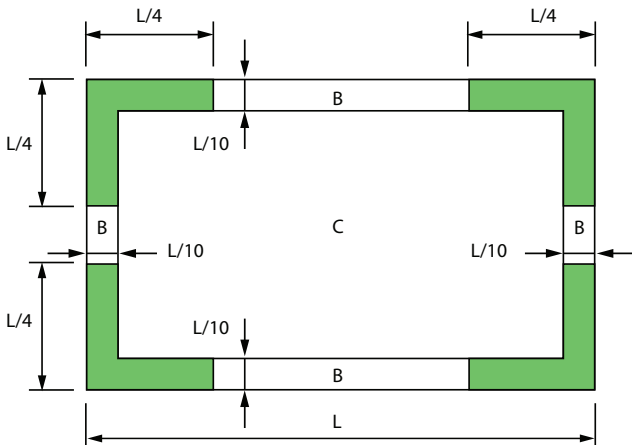
11.0 WIND LOAD CALCULATION

The number of fixings required per m^2 is determined by different variables:

- Characteristics of the wind zone
- Topographic location: exposed area, coastal, urbanetc.
- Building characteristics (height, geometry of the roof ...)

The quantity of fixings must be calculated in accordance with current guidelines (BS EN 1991-1-4 : 2005 + A1 : 2010 Eurocode 1).

National wind load standards must always be complied with when calculating the mechanical installation of ECOLINE membranes. A wind load calculation must be performed on all roofing projects by Axter approved design partners, whether a new build or refurbishment scheme.



11.0 WIND LOAD CALCULATION

11.1 FIXING DENSITY

The fixing density must never be less than 4 fixings / m² irrespective of wind calculation result. The maximum fixing centres must be 330mm with a minimum fixing centre of 170mm. Fixing locations should not coincide with insulation board joints.

It is imperative that local, accurate and recognised wind and topographical data is used to calculate the required fixing density as defined by the regulations and standards in the country of installation.

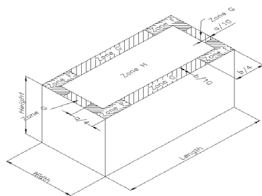
The height of the building is essential, as well as taking into account covered areas. At the roof perimeter and at corners the wind load is greater than in the centre of the roof, so must be taken into account in the calculation. If the height of different elements on the roof (rooflights, parapet walls ...) exceeds 1m, it should be treated as the perimeter for the purpose of the calculation.

Wind load vacuum tests for ECOLINE systems have been completed in accordance with EOTA 006.

Wind uplift resistance: Wadmsr = 564 N per point.

Axter insists upon the use of Axter (MTP or C) fixings and washers with the ECOLINE membrane system range installed in accordance with the project specific wind load calculation.

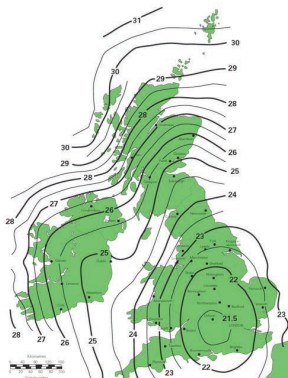
AXTER ECOLINE



b = Length or 2 x Building Height whichever is the smaller
a = Width or 2 x Building Height whichever is the smaller

Building Height	5.2 m	b =	10.4 m
Building Width	17 m	b/10 =	1.04 m
Building Length	14 m	b/4 =	2.6 m
		a =	10.4 m
		a/10 =	1.04 m
		a/4 =	2.6 m

Please note these calculations apply to a membrane width of 1.04m with a 100mm overlap.



12.0 ACCESSORIES

The ECOLINE system offers a complete range of pre-fabricated accessories to ensure secure detailing and system performance.

12.1 E/CLEAN

ECOLINE membranes can be cleaned with E/Clean membrane cleaner to remove any contaminant that may compromise the weld prior to installation.

The use of E/Clean is not mandatory provided ECOLINE membranes are kept clean, dry and free from contamination. In all circumstances destructive weld tests must be completed to ensure weld security and this must be available for inspection by Axter QA managers.



12.2 E/METAL PVC COATED METAL

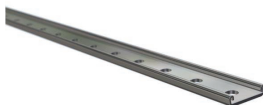
Used in the fixing of ECOLINE waterproofing membranes as illustrated in the Design Guide, section 15.0 of this document. Manufactured with galvanized steel sheet metal coated in ECOLINE PVC, then fixed to the structure, the ECOLINE PVC membrane is welded to the E/Metal profiles without the need for further mechanical restraint. E/Metal is available in 2m x 1m sheets to be bent to suit installation requirements by the trained ECOLINE contractor. Please refer to ECOLINE Standard Details.



12.0 ACCESSORIES

12.3 RESTRAINT BAR AND PVC CORD

Used in the fixing of ECOLINE waterproofing membranes as illustrated in the Design Guide, section 15.0 of this document. The restraint bar is manufactured in 20mm galvanized metal, pre-drilled and available in 1.95m lengths. The PVC cord should be used to weld the back of the restraint bar to the ECOLINE FM membrane during installation.



Note PVC cord is not required when using ECOLINE ADH adhered systems.

12.4 E/CORNER INTERNAL AND EXTERNAL CORNERS

Prefabricated ECOLINE PVC corners for internal and external locations, welded to the membrane by hot air technique.



12.0 ACCESSORIES

12.5 RAINWATER OUTLETS

A complete range of vertical and parapet outlet units and leafguards are available. ECOLINE outlets come with an ECOLINE membrane flange to ensure system compatibility and a secure, leak-free installation.



12.6 FM/D CONTACT ADHESIVE

FM/D Contact adhesive for the bonding of ECOLINE FM membranes only. FM/D Contact Adhesive must not be used for any other bonding purpose.



12.0 ACCESSORIES

12.7 ADH ADHESIVE

ADH adhesive for the bonding of ECOLINE ADH fleece backed membranes only. ADH adhesive must not be used for any other bonding purpose.



12.8 E/PROFILE

PVC decorative profile that replicates the appearance of a standing seam roof.



12.9 ECOLINE LIQUID PVC

Liquid PVC for sealing joints as secondary protection (optional).



13.0 INSULATION MATERIALS

The most commonly used insulation materials within single ply warm roof construction are:

13.1 Polyurethane (PUR) or Polyisocyanurate (PIR) foam

A cellular material that achieves a thermal performance through the thermal resistance of blowing agent locked within the cell structure and cell wall.

Rigid urethane foam roof insulation should comply with BS 4841 : 2006 Part 4. Note elements of this standard have been replaced by EN 13165 Thermal insulation products for buildings. Factory made rigid polyurethane foam (PUR) products. Rigid board thermal insulation must be capable of accommodating imposed loads during construction and service. PUR and PIR insulation is suitable for areas of light traffic and boards with higher compressive strengths should be used where higher traffic levels are predicted. Axter HYTHERM (FM/ADH) insulation is approved for use in this application.

13.2 Expanded Polystyrene (EPS)

A cellular material of polymeric origin manufactured by fusing together expanded beads of polystyrene in a high pressure steam environment.

EPS insulation boards should conform to BS EN 13163 : 2008 Thermal insulation products for buildings. Factory made products of expanded polystyrene (EPS). Expanded polystyrene is not compatible with ECOLINE FM PVC membranes and the ECO 125/200/300 polyester separation membrane must be installed above the insulation and before the ECOLINE FM membrane in warm roof applications.

13.0 INSULATION MATERIALS

EPS thermal insulation is available in various compressive strengths dependent upon its intended application and building use and must be capable of accommodating imposed loads during construction and service. EPS insulation is suitable for areas of light and heavy traffic provided the appropriate material grade is selected. Axter HYTHERM (EPS) insulation is approved for use in this application.

13.4 Mineral Wool (MW)

The common name for glass and rock wool. A fibrous material, rock wool comprises a large number of thin fibres that are pressed together with a binding agent, then cured to form a rigid board, slab or roll material, non-combustible in accordance with BS EN 13501 Part 1 and BS EN ISO 1182. Glass wool is not used within flat roof construction.

Roofing grade materials (rigid boards) are available as mono or dual density products, with dual density material achieving improved compressive resistance. Boards should comply with BS EN ISO 13162 Thermal insulation products for buildings. Factory made mineral wool (MW) products. Axter HYTHERM (MW) insulation is approved for use in this application.

The prolonged point loading of mineral wool may result in the material losing its structural stability. Sheet material such as plywood or metal should be laid above the insulation and below the waterproof membrane in areas of increased traffic and/or load to mitigate this occurrence. The E/Step walkway membrane must be used for roof access routes on all roofs where mineral wool is the specified insulation.

14.0 SEPARATION MEMBRANES

Separation membranes of an appropriate density are used to prevent compatibility issues occurring between ECOLINE FM (PVC-p) membranes and other materials. When in direct contact with a non-compatible material such as bitumen or polystyrene a chemical reaction will occur over time between the two materials that may result in the gradual degradation of the plasticizer content of the membrane. This degradation may cause the ECOLINE FM (PVC-p) membrane to become more rigid over time and lose flexibility. This process is resolved through the introduction of an appropriate (ECO) separation membrane.

When installing ECOLINE FM as part of a warm roof construction above expanded polystyrene (HYTHERM EPS) insulation, the ECO/200 separation membrane should be installed prior to the waterproofing. The ECO/200 should be rolled out loose with a minimum 100mm overlap; the membrane is secured in place through the installation of the main ECOLINE FM mechanically fastened system. When installing ECOLINE ADH fleece backed membrane it is not necessary to install a separation membrane over the HYTHERM EPS insulation.

NB: it may be necessary to install ECO separation membranes in other roof constructions and technical advice should be sought from your Axter prior to installation.

14.0 SEPARATION MEMBRANES

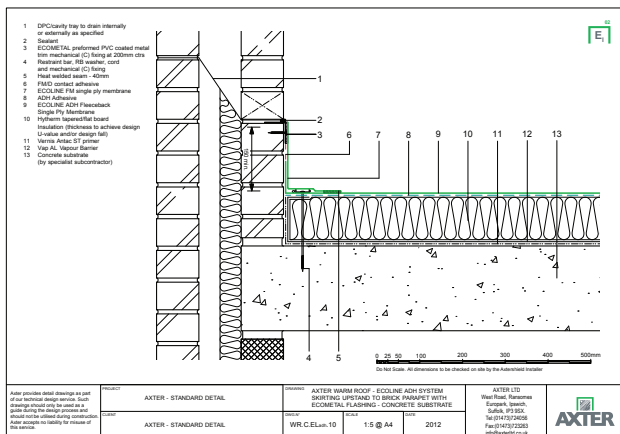
ECO / 125, 200 or 300 separation membrane



15.0 DESIGN GUIDE

Axter provides a comprehensive, bespoke design service on all projects to ensure our systems are correctly incorporated into the building design and construction process. ECOLINE standard details are for reference purposes only and subject to project specific amendment and should be used as a design guide only. Axter detail drawings should not be used for construction purposes.

Example detail drawing. **Please refer to Axter Ltd for full design information.**



16.0 ON SITE QUALITY AUDIT

It is essential to the long term performance of ECOLINE that the system is installed by skilled operatives trained in the ECOLINE philosophy of high standards and industry recognised good practice.

To ensure that Axter's high standards of workmanship and system performance are achieved, ECOLINE system installations will be inspected during the course of construction by Axter QA personnel who will complete site specific ECOLINE quality audit (EQA) reports.

EQA reports will focus upon critical performance areas such as:

- Operative qualification checks
- Installation equipment
- Welding trials
- Weld security checks
- Specification compliance
- Health and safety compliance

It is the primary responsibility of the ECOLINE trained roofing contractor to ensure ECOLINE systems are installed correctly and to the required standards. EQA reports should be maintained in the project file by the installer in order to demonstrate their compliance with and achievement of manufacturer standards. Failure to comply with this process will compromise the issue of guarantees on completion.

ECOLINE / ECOLINE Quality Audit Report
For use by ECOLINE Trained Roofing Contractors
Site: [blank] Inspector: [blank]

Contractor	Inspector
Site Address	Site Reference
Supervisor	Visit Number
Operative Number	ECOF / T1878 / 001-GA
Overall Rating	
of installation quality	
Individual items related to contractor's supervision / Comments	
Individual Rating	
General housekeeping	
Correct equipment, tools, PPE and documentation (paper drawings)	
Material storage on site	
Professionalism of labour	
Compliance with specification	
Quality of main roof area	
Site Page 1 of 2 Date Reported: [blank]	

17.0 ROOF INTEGRITY TESTING

The installer should complete manual testing of seam joints with the use of a probing tool. To avoid any doubt concerning seam integrity, a destructive peel test must be completed by the trained operatives and be available for inspection by Axter QA personnel.

Once roofing works are complete it is essential that roof integrity testing be completed and the results issued to the main contractor or other appropriate authority to demonstrate system security.

Low voltage electrical resistance (pulse) testing is deemed to be a suitable method of testing for roof system integrity and should be completed by trained/qualified operatives.

18.0 ACCREDITED INSTALLER SCHEME

Axter operates a manufacturer approved installer scheme reinforced by compulsory operative training at an Axter approved training centre. It is essential that roofing contractors wishing to install the ECOLINE system complete and pass the ECOLINE training syllabus. ECOLINE trained operatives will be issued with photographic identification and a certificate. ECOLINE trained operatives must complete training refresher courses every three years to maintain their competency in the system.

ECOLINE AXTER LINE INSTALLER



AXTER ECOLINE INSTALLER

This is to certify that the Operative named below has completed an installation training course and is now approved for a period of three years to install the AXTER ECOLINE PVC waterproofing system.

Operative Name: _____

Operative Number: _____

Company Name & Address: _____

Partner Stockist: _____

Start Date: _____ Expiry Date: _____

Authorised By: _____

Name: _____

Title: _____

CERTIFICATE AXTER ECOLINE INSTALLER CERTIFICATE AXTER ECOLINE INSTALLER CERTIFICATE AXTER ECOLINE INSTALLER CERTIFICATE AXTER ECOLINE INSTALLER CERTIFICATE



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18.0 ACCREDITED INSTALLER SCHEME

NB: competence in competitors' systems is not sufficient qualification to automatically become a member of the ECOLINE scheme.

All single ply membrane systems carry material differences in relation to detailing, installation, fixing and welding and Axter insists that all operatives are fully competent in the handling and installation of ECOLINE.

In addition to manufacturer training, ECOLINE systems should be installed by accredited roofing professionals trained to at least NVQ (England, Wales & Northern Ireland) SVQ (Scotland) level 2 (Applied Waterproof Membranes – Single ply Roofing) with all supervisors having achieved Level 3.

Axter recommends that all ECOLINE operatives are Construction Skills Certification Scheme (CSCS) registered and should carry a valid registration card.



19.0 TEMPORARY PROTECTION

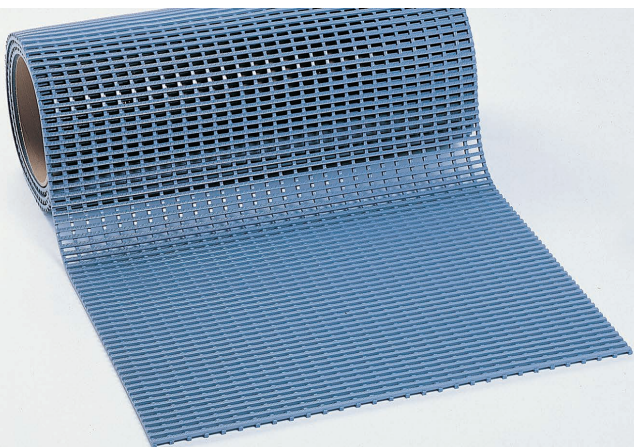
Modern construction techniques permit numerous works trades to be active on a project at any given time. The specialist roofing contractor must be vigilant; works programmes and sequencing can present significant difficulties as it is essential that completed waterproofing works are protected from damage by other trades and out of sequence detailing. Both circumstances can result in water ingress through defect and may invalidate the system guarantee.

The completed roof should NOT be used as a working platform and no building work should take place from a completed roof. Care must be taken to ensure that no solvents, paint, plaster cementitious materials or any other contaminants come into contact with the roof surface.

The completed roof should NOT be used as a storage platform, however if deemed unavoidable, manufacturer approved protection methods must be implemented and Axter must be consulted prior to action.

The roof MUST be protected at all times from damage during the construction and post construction phase and Axter's E/Step walkway/protection membrane should be installed to protect the waterproofing system and provide clear access routes.

E/Step Walkway



20.0 ROOF MAINTENANCE

Completed roofs should be maintained in accordance with appropriate industry guidance and manufacturers' guarantee requirements. Axter recommends that regular inspection of the roof system be completed bi-annually, with the first inspection taking place in early spring and the second in late autumn. Bi-annual roof inspections must comply with the following maintenance criteria:

- Check outlets are free from blockage and minor obstructions that may impede drainage.
- Check for damage to the roof system.
- Check general roof equipment (lightning and mansafe equipment) is secure.
- Ensure the roof is free from debris and materials from other trades have not been left on the roof.
- Ensure roof walkways are installed and utilised.

If ponding water is occurring on the roof this may result in a build-up of silt and algae on the membrane surface. Although this will not compromise the integrity of the roof membrane it is unsightly and can become slippery if suitable walkway membranes have not been installed.

Silt and algae can be cleaned from the membrane surface by brushing with soapy water and the use of fungicides and specialist cleaning solutions are not recommended.

Please refer to the Axter Maintenance Schedule for comprehensive maintenance guidance.

Provided the ECOLINE system has been installed by trained operatives in accordance with the Axter specification and design standards and roof maintenance inspections have been completed, the ECOLINE system should provide a durable roof waterproofing with a service life in excess of 25 years.



Full system information is available at www.axter.co.uk.



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Technical information and specifications within this document are for guidance only and are subject to change without notice. Axter Ltd cannot be held responsible for errors or for information which may be construed as misleading. It is the specifier's responsibility to ensure that the materials are suitable for the requirements of the construction. All specifications should be checked with Axter Ltd prior to their use.