

Guidance on Membrane Gutters

GUIDANCE DOCUMENT GD 17

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INTRODUCTION

Membrane gutters have been used in the roofing and cladding industry for over 30 years for single skin and insulated applications, and are mostly used in commercial, warehousing, manufacturing and retail buildings, although they are sometimes also used for larger blocks of apartments. Within the last 10-15 years the popularity of membrane gutters has overtaken that of traditional bolted gutter systems. This is for a variety of reasons, primarily due to the reduction in risk relating to water ingress at or about the gutter joint location position.

When membrane gutters were first introduced, the membrane was originally manually bonded to the steel substrate, a method which could prove difficult in establishing leak points should a pin-hole occur. Today, most, if not all, membrane gutters are pre-laminated eliminating this issue and the associated problems with small scrapes, scuffs etc.

There are two types of insulated gutters available in today's market which are designed to be fully walkable; factory assembled insulated gutters and composite insulated gutters, detailed below. Both these gutter types, as well as single skin gutters are available in standard lengths of 3m, but are also available up to 8m, which reduces the number of site welded joints. All welded joints should be a minimum thickness of 1.2mm, and should be installed in accordance with the gutter manufacturer's guidance to achieve minimum weld distances.

GD 05 gives more information about types of industrial gutters.

Single Skin Gutters

Manufactured to suit project specific requirements and performance criteria, using a minimum 1.2mm thick 'Class A' PVC membrane pre-laminated onto 1.2mm to 3mm galvanised steel substrate, or aluminium in 2.0mm or 3.0mm.

Single skin gutters should be designed and tested (either physically or by FEA) in accordance with BS 9101:2017.

Factory Assembled Insulated Gutters

Manufactured to suit project specific requirements and performance criteria, using a minimum of 1.2mm thick 'Class A' PVC membrane pre-laminated on to 1.2mm to 2.0mm thick pre-coated galvanised steel substrate, incorporating factory inserted insulation, usually rock fibre or polyisocyanurate (PIR) foam, to suit thermal requirements (See MGMA document GD5), finished internally with a minimum 0.7mm Galvanised Steel or 0.7mm pre-painted liner) (contact MGMA manufacturers for available options). Factory assembled insulated gutter should be designed and tested (either physically or by FEA) in accordance with BS 9101:2017.

Composite Insulated Gutters (Fully bonded insulation)

Composite gutters are gutters which rely on the insulation to provide structural strength. Composite gutters must have a structurally capable core, i.e. PIR or insulation (not mineral fibre). They are manufactured to suit project specific requirements and performance criteria, using a minimum 1.2mm thick 'Class A' PVC membrane pre-laminated onto 1.2mm to 2.0mm thick pre-coated galvanised steel substrate, incorporating a fully bonded PIR insulation core to suit project specific thermal requirements, finished internally with a minimum of 0.5mm pre-painted liner) (contact MGMA manufacturers for available options).

Composite insulated gutter should be designed and tested in accordance with BS 9101:2017, tests must be done physically for this gutter type; FEA cannot be used.

There is no standard specific to the structural integrity of bonded membrane gutters as a complete system; it is indirect or component based.

General

Gutters supported from purlins must overhang the entire purlin upper flange, and it is recommended to have a downturn at the outer edge, the dimensions of which will be project specific to manufacturer's design.

APPLICATIONS AND PERFORMANCE

Uninsulated single skin and insulated gutter systems in both new and refurbishment applications should comply with the following performance criteria and standards.

Warning indicators (tell-tale overflows) should be installed in gutters; more information can be found in GD23.

Performance standards

Membrane Characteristic	Test Method	Machine Laminated	Manually Laminated
Class A	ECCA-T1	1.2mm min.	1.2mm min.
Membrane adhesion	EN13523-6	100% adhesion flat cross hatch + Erickson	100% adhesion flat cross hatch + Erickson
Corrosion resistance – salt spray	ECCA-T8	1000 hours	1000 hours
Corrosion resistance – humidity	BS 3900/F2	1000 hours	1000 hours
Scratch resistance	EN 13523-12	Products must comply with the performance criteria detailed within the Standard	Products must comply with the performance criteria detailed within the Standard
Resistance to salt spray	EN 13523-8	Products must comply with the performance criteria detailed within the Standard	Products must comply with the performance criteria detailed within the Standard
Maximum continuous operating temperature	-	80°C	80°C
Minimum forming temperature	-	16°C	16°C
Formation of joints	-	Hot air welded	Hot air welded
Guarantee	-	Refer to individual manufacturers for guarantee of pre-laminated gutter products	

Specification of steel to be used - S220 (min) + Z275g, AZ150, ZM140 (min)

Membranes used for gutters must comply with the Single Ply Roofing Association guidance for membrane manufacturers, who must:

Hold independent certification of all their membrane products (by a member of the Union Européen d'Agrément -Technical Committee)

Manufacturing processes must be independently monitored for conformity with ISO9001:2008.

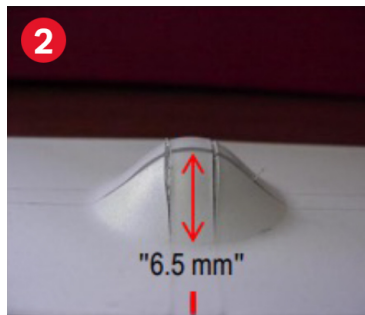
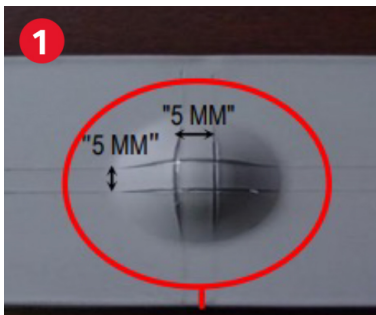
The products must have been declared as conforming with the harmonised product specification for polymeric sheets, EN13956 and affix the CE mark.

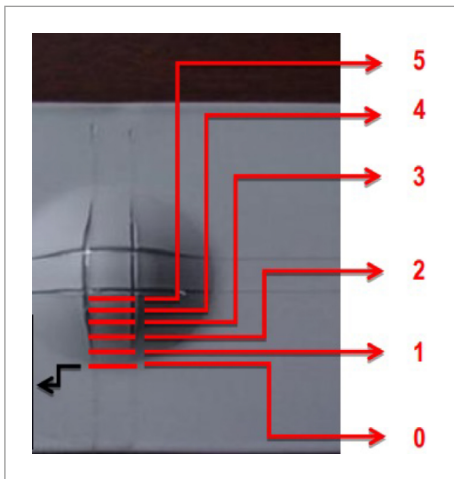
Factory test for bonding of membranes to metal substrates to EN13523-6

Note: The performance criteria listed in the table above are applicable to both the machine and manual lamination processes.

Membrane Bonding Factory Testing of Membrane Adherence (Erichsen Cupping Test)

1. First make two parallel cuts with a 5mm gap both in horizontal and vertical directions.
2. The metal beneath must be visible and a "central square" of 5x5mm must be created. This is also called cross hatch (Photo 1 below).
3. After positioning the "central square" in the middle of the machine, the mold will create a 6.5mm deformation (Photo 2 below).
4. If the adhesion is not adequate, the tested sample will look like a flower (picture 3). On the contrary if it is adequately adhered, the membrane around the bulb with the square cuts will not open up (picture 4). From the top, the membrane must be pulled gently with a knife to measure the detachment.





Adhesion after drawing (drawing depth: 6mm)

REQUIREMENTS FOR MEMBRANE WELDING

Prior to commencement of any membrane welding, whether during manufacture by an MGMA member or on site, the installer must ensure they have the appropriate level of skill and training. The competent welder must also be able to provide evidence / certification of training, when requested. Every competent membrane welder should have a suitable toolkit, which should include but is not limited to:

- Heat gun / hot air tool, complete with:
 - adjustable temperature control
 - 20mm wide slot nozzle & wire brush to clean nozzle
- 40mm wide silicone rubber pressure roller
- Penny roller
- Probe tester
- Knife & scissors
- Combination or long nose pliers (for peel test)

The ambient air temperature and time of year will affect the temperature settings on the heat gun, therefore in advance of welding any gutter joints, the operative must set the temperature output of the heat gun to suit the environmental conditions to ensure the correct weld temperature. Once this has been set, a peel test must be done, which is in line with standard industry practice for membrane roofing.

Peel Tests and Installation

Peel test for setting gun during installation on site

A sample weld should be carried out on which a peel test should be conducted, at the start of every day and/or shift and/or break in shift, to ensure all environmental factors are eliminated and the correct welding temperature set for the heat gun.

The sample weld should be undertaken on the gutter flange which will then be protected by the installed roofing materials. To peel test the sample weld, two cuts need to be made through the joint, typically 25-50mm apart (care should be taken not to damage the substrate), then pulled.

Tests should be recorded (by photograph) with a signature, a date and time stamp and kept as a record of the required compliance within the installer's records and project file.

(NB Setting the weld temperature within the factory environment should follow the manufacturer's own in-house QA procedures.)

Membrane welding straps used for sample weld should be the same batch material as the membrane used for the gutter joints, supplied in cut-to-width coils and cut to length on site. A sample weld should be minimum 200mm long and be welded in accordance with the manufacturer's recommendations, inclusive of the minimum weld distance.

Example of the method of undertaking a peel test (Images and text (amended) used by kind permission of CA Group (© CA Group))

It is recommended that prior to commencing gutter joints, a test strip is welded, followed by a peel test. The peel test should be carried out on a minimum 200mm wide jointing strap welded onto pre-laminated metal. The following is a step-by-step guide of how to complete the peel test.

Step 1: Manufacturer's joint tape is placed 10-15mm from the edge of the gutter purlin flange and a minimum of 125mm from the adjacent joint to be welded.

Mark a line from the centreline of the tape to where the edge of the test membrane should fall; distance should be representative of the manufacturer's joint detail (See Figure 1.1).

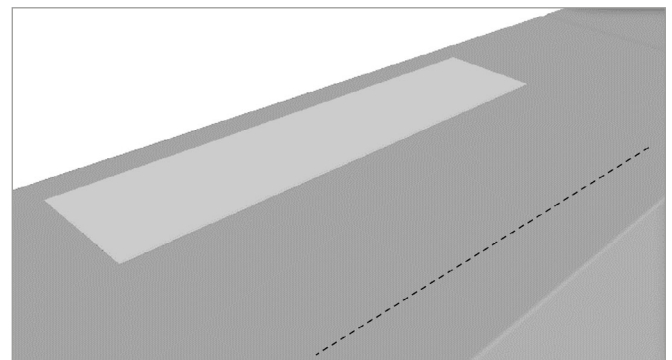


Figure 1.1

Step 2: Position the test membrane strap against the marked line and tack weld either end as shown in Figure 1.2

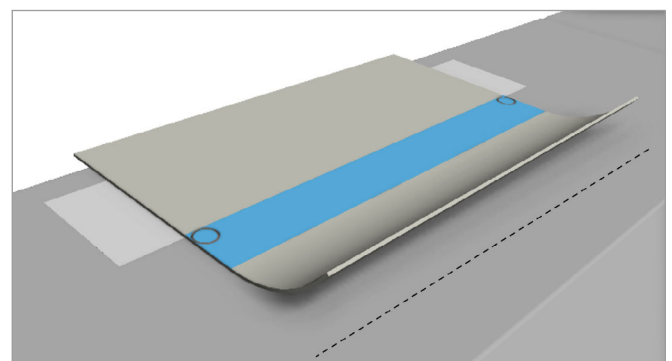


Figure 1.2

Step 3: Once tack is welded, complete the pre-weld section as indicated in blue; pre-weld should be the same width as required by manufacturer's gutter joint detail final welding of the test membrane strap as per manufacturer's recommendations (See Figure 1.3).

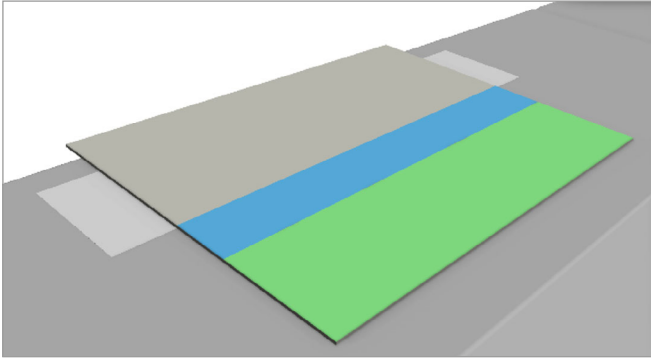


Figure 1.3

Step 4: With a knife, cut a 25-50mm tab in the centre of the test membrane strap, creating a test membrane tab. Care should be taken not to damage the substrate (See Figure 1.4).

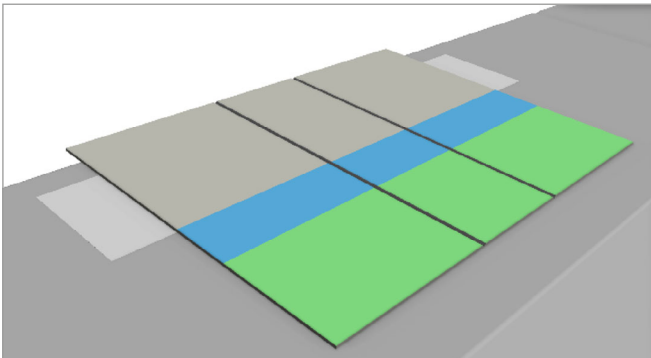


Figure 1.4

Step 5: Using a suitable pair of pliers, lift the test membrane tab and pull until the membrane rips off or delaminates (See Figure 1.5).

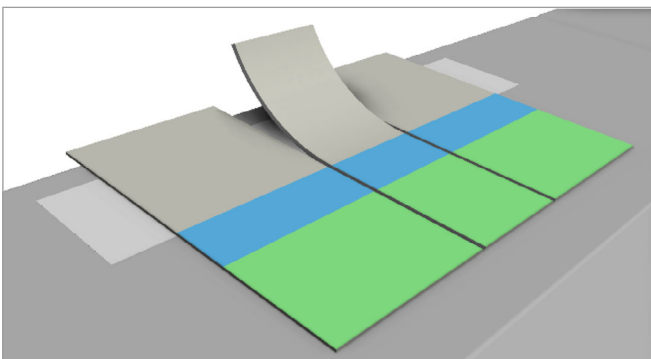


Figure 1.5

Step 6: If the test membrane tab breaks or delaminates without achieving the manufacturer's minimum recommended edge distance, the process must be repeated until a successful weld is achieved (See Figure 1.6).

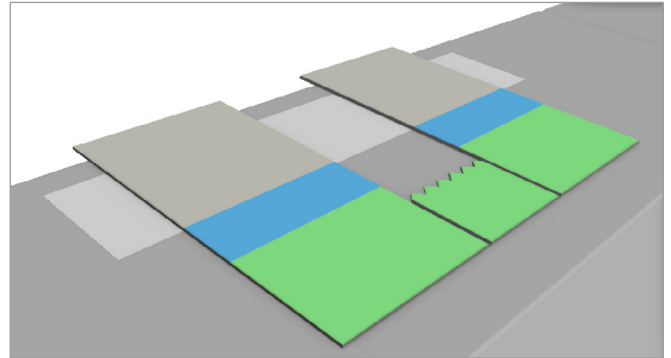


Figure 1.6

Step 7: If welded correctly, the membrane should break achieving the manufacturer's recommended minimum edge distance (see Figure 1.7).

On successful completion of the peel test, the operative should print, sign and date the test section as evidence of the test, photographing for future records.

This is deemed a successful weld and allows the operative to commence welding gutter joints in compliance with manufacturer's published installation instructions and in-service maintenance guidance, following the completion of step 8.

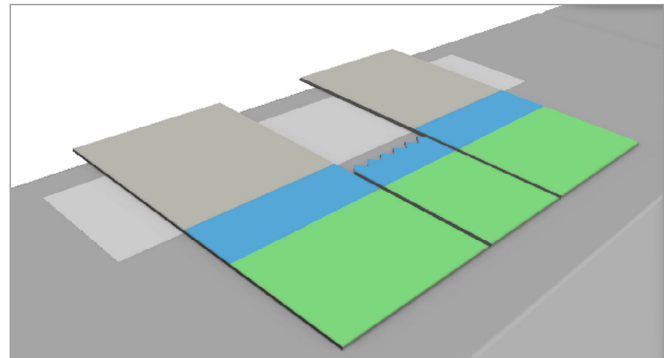


Figure 1.7

Step 8: Prior to installing the roof cladding system, trim back all excess membrane. Inspect membrane for any cuts, and seal if required to manufacturer's recommendations (see Figure 1.8).

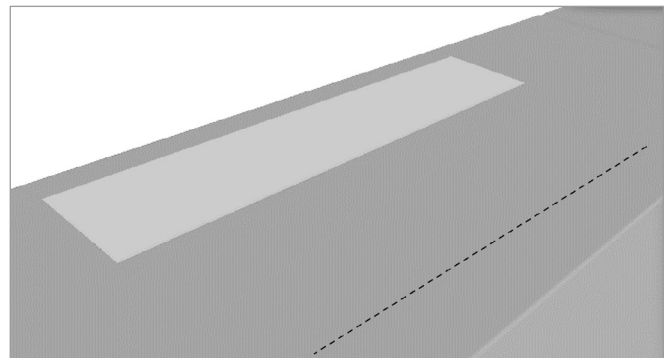


Figure 1.8

Testing of finalised joints by Employer's Representative

Employer's Representative should only carry out a probe test of a finished joint. A peel test should not be carried out as this would be considered detrimental to the gutter installation and be detrimental to the manufacturer's guarantee.

Where the Employer's Representative is required by the employer to carry out a peel test a time and costs should be agreed within the contract to allow this to occur prior to the roofing works commencing at the start of the project, and any test should be carried out on the purlin bearing leg, where it will then be covered by the roofing build up.

The MGMA do not support the use of destructive testing

Notes:

1. Membrane gutter joints to be completed fully prior to installation of the roof cladding system to ensure an effective weather/air seal is achieved with the roof and to prevent excess rainwater and detritus adversely affecting a successful weld.
2. The reference to 'test weld' relates to separate and independent material and welding sample or samples to enable the welder to accurately set the hot air welding gun and their welding technique to the environmental conditions at the time and point of welding. It does NOT mean that the peel test should be done on the actual installed gutter joint or welded product following the act of welding.
3. The 'Probe Tester' reference relates to a pointed tool similar to a bradawl or needle point tool. Following welding of the joint the point of the probe is lightly run down the edges of the overlap strip to check that the edges of the welded strap at the overlap positions are bonded down correctly i.e. without intermittent gaps. If, during the checking process, the edges of the overlap strip are not fully welded, then heat should be reapplied at the relevant positions to ensure a true, continuous and effective bond.

Structural integrity testing of bonded composite gutters

This section deals with the evaluation of the structural performance of bonded membrane gutters, including bond strength, mechanical resistance, and durability under load and environmental conditions.

It is intended for use in composite gutters, or site-laminated bonded systems.

Objectives

- Verify mechanical bond strength between insulation and metal.
- Assess resistance to delamination under environmental and structural loads.
- Ensure the system performs under water loading, thermal cycling, and point loads.

Tensile Adhesion Test (Insulation to Metal Substrate)

Adapted from BS EN 1607

- Sample size: 300 mm × 300 mm gutter cross-section
- Use a tensile testing rig; pull perpendicular at 5 mm/min
- Pass Criteria: ≥ 100 kPa minimum average adhesion strength

Load Bearing Test

Load bearing capacity for the gutter should be undertaken to the requirements of BS9101 and must be a physical test.

Thermal Cycling Test

- Cycle between -20°C to +80°C for 50–100 cycles
- Retest bond strength after cycling
- Pass Criteria: No delamination or blistering

Documentation

All test results should include:

- Material specifications
- Substrate preparation
- Adhesive/membrane types
- Environmental conditions
- Load/displacement graphs

Certification/Marking

Products passing the protocol may be certified under a proposed MGMA Technical Assessment Certificate with defined parameters such as:

- System type
- Design load limits

DESIGN / SYSTEM REQUIREMENTS

- Gutter capacity to be designed to BS EN 12056:3-2000, 'Gravity drainage systems inside buildings – Part 3: Roof drainage, layout and calculation' and where appropriate the guidance in BS 8490:2025 'Siphonic roof drainage systems –Guidance'
- Thermal bridging and condensation control design should be to BS EN ISO 13788.
- Single skin and factory assembled insulated gutters must comply with BS 9101:2017 'Steel and aluminium rainwater system - Specification'.
- Gutter to be designed to withstand all anticipated loads in accordance with appropriate standards in regard to structural loading, wind loading and non-fragility
- Manufacturer factory production control: BS EN ISO 9001 accredited
- Manufacturer environmental management: BS EN ISO 14001 accredited

GUARANTEES

Generally, guarantees from individual manufacturers of gutter systems vary from 10 years to 35 years, depending upon the class of membrane specified, the manufacturing process and materials selected.

To ensure that the lifespan of membranes used in gutters will be adequate these should have been aged tested to the requirements of BS EN 1297.

It is important to note that these guarantees will be affected by the maintenance and inspection regime in place; see MGMA Guidance document GD13 for more information.

Gutters that are not cleaned regularly will degrade quickly due to a build-up of debris such as grit, bird carcasses, plastic bags and a myriad of varying plants and trees etc.

Further advice and guidance is available from any MGMA member company whose details can be found on the MGMA website at www.mgma.co.uk.

REFERENCES

BS 3900-E2:1992 (replaced by BS EN ISO 1518-1:2011) Paints and varnishes. Determination of scratch resistance. Constant-loading method

BS 3900-F2:1973 Methods of test for paint. Durability tests on paint films. Determination of resistance to humidity (cyclic condensation)

BS 8490:2025 Siphonic roof drainage systems - Guidance

BS 9101:2017 Steel and aluminium rainwater system – Specification

BS EN 12056:3-2000, Gravity drainage systems inside buildings – Part 3: Roof drainage, layout and calculation

BS EN 13523-6:2020 Coil coated metals. Test methods. Adhesion Test

BS EN 13523-8:2017 Coil coated metals. Test methods. Resistance to salt spray (fog)

BS EN 13523-12:2017 Coil coated metals. Test methods. Resistance to scratching

ECCA-T1 (1995) Coating thickness

ECCA-T8 (1997) Resistance to salt spray (fog)

Note:

The content of this document supersedes the information given in any previous MGMA Information Sheets

MGMA DISCLAIMER

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