GUIDANCE NOTE No. 14
Best Practice for the Installation of
Water Flow Reducing Layers in Inverted Roofs

1. Introduction

This guidance note has been produced by a Specialist Technical Group (STG) convened by the LRWA Technical Committee. The STG consisted of technical experts from the waterproofing, insulation and blue roofing industry.

2. Background

A water flow reducing layer (WFRL) is a loose laid membrane installed over inverted roof insulation. It is not a waterproof layer, but acts as a barrier to significantly reduce the volume of rainwater reaching the waterproofed roof deck. The follow-on benefit of that is to reduce the rainwater cooling effect in thermal transmittance calculations, allowing target U-values to be met using thinner insulation solutions.

The performance of a WFRL is independently tested, and the result is incorporated into the third-party verification of inverted roof solution providers.

The WFRL also allows the dispersion of any moisture vapour that would otherwise build up within the inverted roof system, and stops fines reaching the waterproofing level.

Concerns over poor WFRL installation on site have led to the creation of this guidance note to help installers achieve the correct performance.

3. Roof System Design and Construction

To ensure correct performance from a water flow reducing layer, the complete inverted roof system must be correctly designed, specified and constructed.

Roof deck
The roof deck - including gutter falls, cross falls and lateral falls - should achieve drainage falls as described in BS 6229:2018.

Where an inverted roof solution is certified by a third party as suitable for use on a ‘zero falls’ roof, the guidance in BS 6229 is clear that a design fall of 1:80 should be used as back falls are not acceptable.

Detailed structural analysis should be used to prove the roof deck as designed will not suffer from negative falls when works are complete. Negative falls are likely to result in ponding water on a roof which potentially may become stagnant.

Back falls/negative falls should be avoided on all roof types. Specific to inverted roof design is the concern that water may flow under the laps of the WFRL. Increased flow of water below the WFRL would potentially increase~~s~~ the short-term real-world thermal transmittance of the roof.

However, it is currently uncertain as to what degree this worsening of performance occurs.

Where areas are found to have a negative fall and/or potential ponding, BS 6229:2018 recommends remedial action such as the laying of a localised screed, or installing an additional rainwater outlet.

Waterproofing
Install the inverted roof waterproofing system in accordance with the manufacturer’s instructions and third-party certification, relevant British Standards codes of practice, and the LRWA Codes of Practice.

Thermal insulation
As per ETAG 031, thermal insulation on an inverted roof should be extruded polystyrene (XPS) or expanded polystyrene (EPS), manufactured to EN 13164 or EN 13163 respectively.

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It is possible to apply the principles of ETAG 031-1 to other insulation materials such as Vacuum Insulated Panels. When proposing an alternative insulation to that prescribed in the ETAG, it is important to ensure that the chosen insulation meets the essential performance requirements outlined in the ETAG for the insulating material, and can be verified by independent 3rd party testing.

Loose lay the rigid insulation boards in accordance with the manufacturer's instructions and third-party certification (e.g. BBA or KIWA certificate).

WFRL
ETAG 031 describes typical properties of a water flow reducing layer. Synthetic non-woven membranes supplied as a WFRL should be water resistant, diffusion open, UV stable and rot resistant.

Water flow reducing layers are tested with a specific thermal insulation, using a test method detailed in ETAG 031. The insulation and WFRL are named together in the third party certificate and should be installed together accordingly.

The contractor should include a check of the installed WFRL as part of their quality control procedures, ensuring that it is installed in accordance with this guidance note. The waterproofing system holder should ensure the system has been installed to meet the terms of their guarantee.

4. How to Install a Water Flow Reducing Layer

As both the insulation and the water flow reducing layer are loose laid, install only as much of the system as can be ballasted at the time. A roof ballast layer must be installed as works progresses, to avoid potentially damaging both the WFRL and the inverted roof insulation boards and protect them both from the effects of wind uplift and foot traffic.

If temporary ballasting must be used, it should prevent any movement of the WFRL, especially at the joints, to ensure the correct laps are maintained during installation.

Lay the WFRL over the roof insulation, at right angles to the designed slope of the roof, starting at the bottom of the slope.

Make sure all side and end overlaps are a minimum of 300mm.

When cutting the WFRL, use a sharp knife or strong scissors.

Turn up the membrane at upstands and penetrations so it finishes above the finished roof surface. At soil vent pipes the WFRL should be star cut and turned up with an additional piece of WFRL wrapping the pipe to ensure continuity of the WFRL. Suitable proprietary products may also be considered.

In addition to correctly designed drainage falls, the roof should be designed with dual-level drainage, at both the WFRL level and the waterproofing level. The WFRL should be turned down at drainage locations to allow water to flow to outlets.

Correct installation of the WFRL must be maintained during any roof maintenance and repair works. If the WFRL is removed for any reason, it should be replaced in accordance with manufacturer’s instructions to ensure the roof continues to achieve its designed thermal transmittance.

5. Guidance Specific to Inverted Green Roofs

Green roof solutions are designed and specified by specialists, and are subject to their own guidance which is itself changing as green roofs become a more common solution. More information is available in the Green Roof Organisation (GRO) Code of Practice.

6. Guidance specific to inverted blue roofs

A blue roof system temporarily holds rainwater on a roof, and attenuates its flow away from the roof, to avoid overwhelming storm drainage. They are an increasingly common feature of Sustainable urban Drainage Systems (SuDS). A blue roof system will act as a normal drainage path off the roof for most of

the year, apart from during the key design storm events. It will then actively slow the rainwater's discharge rate off the roof, as part of the wider site, SuDS strategy. Blue roofs can be specified on ballasted conventional warm roofs, and inverted roof constructions.

To achieve an even distribution of water across the whole roof and aid attenuation calculations, blue roofs function best when they are as close to level as possible and with no back falls.

The recommendation of BS 6229:2018 to design to a fall of 1:80 in order to achieve a zero falls roof should still be followed, but the advice of a blue roof system supplier should be sought from an early stage too.

Manufacturers/suppliers of blue roof solutions require the water flow reducing layer to be installed as per the system (insulation + WFRL) supplier's instructions. If temporary ballasting or attachment must be used, it should prevent any movement of the WFRL, especially at joints and upstands, to ensure the correct laps are maintained during installation.

Blue roof system manufacturers are not seeking to change the method of installation, though they may tape the WFRL membrane at joints or upstands to help secure it in poor weather.

Beyond that, the installation of the blue roof solution is the remit of its manufacturer and/or their registered contractor. Detailing is critical to the success of a blue roof installation, and systems are not intended to be installed or inspected by anyone without the appropriate training.

However, to aid understanding of blue roof systems, the following points may be of interest to anybody involved with the design, specification, installation or maintenance of an inverted roof featuring a blue roof drainage/attenuation solution.

- The WFRL should be lapped and sealed to avoid/minimise rainwater getting below the insulation layer
- The WFRL should be lapped and taped onto the lip of the water attenuation chamber.
- At parapets/upstands, the WFRL should finish a minimum of 50mm above the top of the blue roof attenuation level (the finished edge may be covered by the ballast covering).
- The WFRL should be taken up all protrusions/penetrations and sealed. This includes between the top of the insulation layer and the bottom of the recessed lip of the water attenuation chamber, and behind parapet chambers.
- Inspection and maintenance of the blue roof should be carried out in accordance with the blue roof manufacturer's programme, and the terms of the blue roof warranty

At the time of writing, efforts are ongoing to better understand the performance of blue roofs through several different industry initiatives.