The Building Envelope Authority

Guidance Documents

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CPD APPROVED

GD 28 MINERAL WOOL INSULATION INSTALLATION: BEST PRACTICE GUIDE

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1.0 INTRODUCTION

All buildings whatever their use must provide protection from the external environment and the requirements of the internal environment will depend upon the intended use of the building. Insulating a building is one of the most cost-effective ways of saving energy and reducing heating and cooling bills. Installation practices and procedures at the construction phase must ensure that the insulation of the building fabric, including details and junctions, meets with the design stage calculations, manufacturer's guidance and Building Regulations.

The Metal Cladding and Roofing Manufacturers Association has produced this document to offer good practice guidance in the storage, handling and installation of mineral wool insulation in built-up metal roof and wall cladding systems.

The aim of the guidance is to promote good practice across the industry, leading to improvements in building envelope performance, efficiency and health and safety.

Specific insulation design and installation instructions should be obtained from the relevant insulation and system manufacturers for each project.

2.0 DESIGN

The most common form of insulation in built-up cladding systems is glass or rock mineral wool quilt which is favoured due to its non-combustibility, lightweight, low thermal conductivity and ease of handling, as a cost effective and sustainable solution. There are other built-up systems on the market which use denser slab products to achieve an improved acoustic or fire performance. Both glass and rock mineral wool insulation products achieve a European Reaction to Fire Rating Classification of A1 (equivalent to non-combustible) as defined in BS EN 13501–1 making them ideal for fire wall and standard constructions.
Fire wall systems require testing to BS 476-22 and must carry current certification.

The use of mineral wool insulation with its inherent acoustic absorption properties also means that an excellent sound reduction can be achieved within lightweight metal systems with suitably designed constructions.

The design lambda value (λ) represents the thermal conductivity of a material as installed in a building. This value needs to be selected by the designer, taking into account the specific internal and external design conditions, such as temperature and humidity, which can influence the performance of the material once installed. Typical available lambda values (λ) are 0.040, 0.037, 0.035 and 0.032 W/mK

The accurate calculation of U-values requires detailed knowledge of product characteristics, calculation methodologies and standards, and construction techniques. The accurate calculation of U-values is a fundamental requirement to meet Building Regulations and must be carried out at the design stage. In metal roofing and cladding, U-values are calculated to BS EN ISO 10211 and take into account bridging effects caused by spacer systems.

MCRMA system manufacturers provide U value tables compliant with BS EN ISO 10211 for their systems. These specify the nett insulation thickness and lambda value (λ) for particular systems.

The insulation should be designed to fit the insulation cavity within the build-up, contacting the underside of the external sheet. Specify the insulation to fit a cavity gap size, letting the installer and insulation manufacturer select the appropriate insulation roll thickness to allow for slight (not excessive) compression. It is common practice to specify insulation under slight compression within the cavity (system manufacturers typically recommend a figure of up to 10%) and to ensure contact with the external sheet.

Mineral wool insulation products (glass and rock) are open cell insulation products relying on entrapped air to provide their thermal performance. The vapour resistivity of mineral wool insulation is considered to be negligible and the same as that of air (5–5.9 MNs/gm). Mineral wool insulation products can therefore be used to reduce the risk of condensation as they allow natural drying out of the construction due to their ability to ‘breathe’.

3.0 SITE CONSIDERATIONS

Specific installation instructions should be obtained from the relevant insulation and system manufacturers

3.1 Storage

The insulation products recommended for metal built-up systems are supplied compression-wrapped in polythene on pallets, protected by waterproof shrouding which allows the product to be stored outside for a limited period of time.

Where product is being stored for any length of time, the product must be protected from the elements and should be lifted clear of the ground.

3.2 Recovery to manufactured thickness

For efficient transportation, mineral wool insulation products are generally delivered to site compression wrapped in polythene.

For the installed product to achieve its design parameters and hence its thermal insulation properties, the thickness of the insulation should be specified to ensure that the uncompressed thickness recovers to a thickness that fully fills the construction.

The Standard for mineral wool, BS EN 13162, references BS EN 823 for the determination of thickness and recognises that mineral wool (glass and rock) behaves in such a way that thickness recovery takes place.

Once released from the compression wrapping, mineral wool insulation should be installed in a method ensuring recovery of thickness. Generally, the installer should check that the quilt insulation is filling the roof cavity during sheeting and in contact with the external sheet.

3.3 Unpacking

Remove external shrink-wrapped waterproof hooding and shrouding. Packaging should be collected and disposed of responsibly. Packaging discarded within the construction is not acceptable and will have a detrimental effect on performance. Once unpackaged the insulation rolls should not be left open to the elements.

4.0 ROOF INSTALLATION

Rolls of insulation should be distributed at each run starting at the ridge. Quilt insulation is normally provided at 1200mm widths as standard. The polythene packaging should be cut along its length and removed; it must not be discarded in the roof construction (nor should any other packaging, fixings, fillers or mastics)

Mineral wool insulation is located between the profiled metal outer cladding sheets and inner lining sheets. The lining sheets are fixed on top of the supporting purlins. The inner and outer metal cladding sheets are separated by rail and bracket systems or preformed insulated spacer systems.

To maintain continuity of the insulation where rail and bracket systems are used, the insulation is tucked under the rails, with all quilt edges tightly butted.

Check that the insulation is recovering in thickness and fills the cavity with a degree of compression between the skins to comply with design requirements.

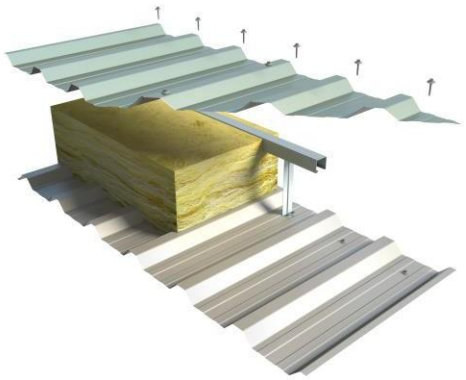

Fig 1 – Typical trapezoidal twin skin roof system

Care and consideration should be taken when laying insulation around roof lights. Ensure that a clean edge runs the length of the rooflight to maintain a continuous run of insulation

The rail and bracket system is used to create the space for the insulation and is then secured by the recommended fixings to the purlin.

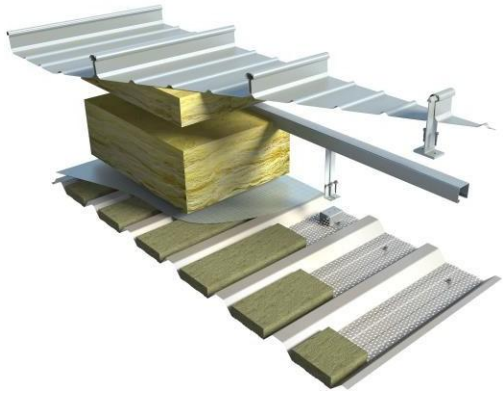

Fig 2 - Typical standing seam roof system with perforated liner for sound absorption

Closely butt all joints to ensure continuity of insulation and reduce the risk of gaps. Where a double layer insulation system is required, stagger joints where possible to minimise thermal bridging gaps.

Where brackets are already in place, the quilt insulation may be compressed and formed around the bracket and under the rails to form a tight fit around protrusions thus minimising the potential for thermal bridges or gaps forming. Alternatively, and depending upon the density of the quilt, the application and the system, the insulation may need to be cut to accept the brackets.

Insulation should not be walked on or compressed excessively as this will damage the fibres, and will result in a loss of thickness and thermal performance. If insulation damage does occur, replacement material must be installed.

Protection

It is good building practice to ensure that construction products are installed under the correct conditions and as such, prolonged exposure to the elements should be avoided and the insulation products should be installed in a dry state.

Only lay out as much insulation as can be covered within the work period and before rain.

Protect insulation at ridges and verges until covered by flashings. Verge insulation can be installed at the time of installing the flashing.

5.0 WALL INSTALLATION

Installation is usually carried out from scissor lifts. The polythene packaging should be cut along its length and removed; it must not be left in the wall construction, nor should any fixings, filler or mastics.

When the system incorporates a horizontal spacer system, products should be clamped across the full width at the head of the wall construction to avoid slump. The support rail and bracket system is used to clamp the insulation and is then secured by recommended fixings to the cladding rail - this helps to minimise the thermal bridging effect through the fixings. Allow the roll to drop down and secure the support rail at regular intervals.

When the system incorporates vertical spacers reference should be made to the system manufacturer for specific advice about installation and methods for clamping and fixing the insulation to avoid slumping.

To maintain continuity of the insulation the insulation is tucked under the rails, and all quilt edges must be tightly butted. Prolonged exposure to the elements should be avoided.

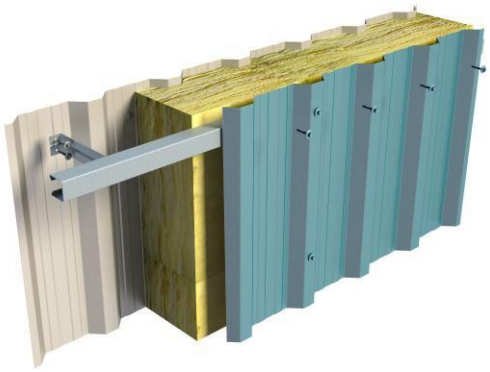

Fig 3 – Typical trapezoidal twin skin wall system

Stick pins and/or alternative methods of fixing can be used at regular intervals for additional support to the insulation. Insulation must be pushed onto the stick pins and secured using non-return washers. The non-return washers should hold but not compress the insulation. The insulation hangers (stick pins) need to be secured the day before they are loaded and can only be applied to dry surfaces. Mechanical fixing at rail positions is recommended. Where foil-faced products are used they should be placed with the foil facing to the inner liner sheet.

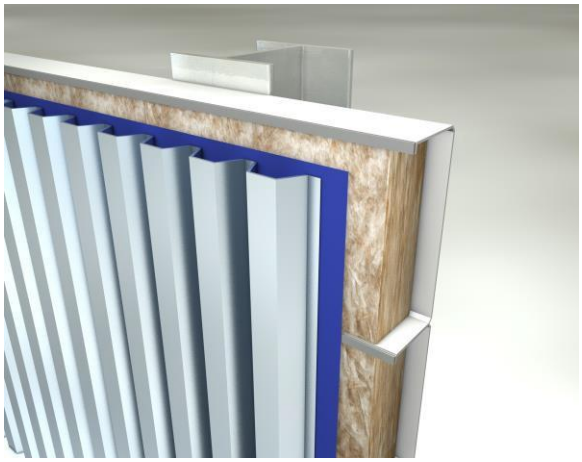

Fig 4 Built-up metal wall liner cassette tray system including an additional or secondary vapour check

Where brackets are already in place, the quilt insulation can be compressed and formed around the bracket and under the rails. There is no need to cut the insulation to suit, as the product will form a tight fit around protrusions thus minimising the potential for the thermal bridges or gaps forming. Tightly butt all joints to ensure continued continuity of insulation and reduce the formation of gaps. Each end of any joints should be pinned to prevent sagging.
Where a double layer insulation system is required, stagger joints where possible to minimise thermal bridging gaps.

6.0 STANDARD OF WORKMANSHIP

No matter which insulation is used, it is vital that the material is installed carefully throughout, ensuring junction and details such as apertures, ridges, eaves and corners are fully filled with no gaps.

Building regulations require that the building fabric should be constructed so that there are no significant thermal bridges or gaps in the insulation layer(s) within the various elements of the fabric, at the joints between elements and at the edges of elements, such as those around window and door openings. Thermal bridging within elements, such as at spacers, is taken into account when calculating U-values. Thermal bridges at junctions and openings must be calculated separately and the heat losses at these points included in the relevant SBEM calculations.

Where a wall system is specified as a fire wall, the whole system will have been tested to the appropriate Standard, have a current fire certificate, and must be installed exactly as the manufacturer’s instructions for the fire wall system.

However, ensuring that no gaps are present and that a high standard of workmanship has been employed is essential to the performance of the system as a whole.

CONCLUSION

Adoption by industry of the guidelines outlined in this document will lead to better and more consistent standards of metal roofing and cladding construction.

MCRMA member companies can advise on the suitability and performance of materials, systems and assemblies to ensure that insulation requirements are calculated properly and specified accordingly. In addition, design information can be obtained from any of the independent roofing and cladding inspectors featured on the MCRMA web site at www.mcrma.co.uk

MCRMA ONLINE CPD PROGRAMME

This guidance document is available as an online CPD and is accredited by the CPD Certification Service. MCRMA's online CPD programme is open to anyone seeking to develop their knowledge and skills within the metal building envelope sector. Each module also offers members of professional institutions an opportunity to earn credit toward their annual CPD requirement.

MCRMA provides informative self-study training, delivering good learning value with an online assessment to check knowledge. The course material is studied offline with an online assessment component to verify knowledge. It is a training with learning and CPD value accredited by the CPD Certification Service. This module has an anticipated CPD value of 60 minutes or equivalent.

To take the CPD associated with this document go to GD28 CPD Test

REFERENCES

BS EN 13501-1:2007+A1:2009
Fire classification of construction products and building elements. Classification using test data from reaction to fire tests

BS EN ISO 10211:2007: Thermal bridges in building construction. Heat flows and surface temperatures. Detailed calculations

BS EN 13162:2012+A1:2015
Thermal insulation products for buildings. Factory made mineral wool (MW) products. Specification

BS EN 823:2013
Thermal insulating products for building applications. Determination of thickness

DISCLAIMER

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