

FUNCTIONAL REQUIREMENTS

7.12 ROOF COVERINGS – METAL DECK ROOFING

Workmanship

- i. All workmanship must be within the tolerances defined in Chapter 1 of this Manual.
- ii. All work is to be carried out by a technically competent person in a workmanlike manner.
- iii. Certification is required for any work completed by an approved installer.

Materials

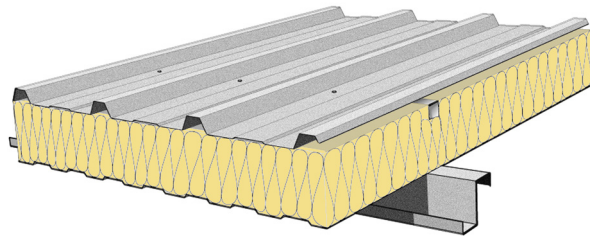
- i. All materials should be stored correctly in a manner that will not cause damage or deterioration of the product.
- ii. All materials, products and building systems shall be appropriate and suitable for their intended purpose.
- iii. The structure shall, unless specifically agreed otherwise with the Warranty provider, have a life of not less than 60 years. Individual components and assemblies, not integral to the structure, may have a lesser durability, but not in any circumstances less than 15 years.

Design

- i. The design and specifications shall provide a clear indication of the design intent and demonstrate a satisfactory level of performance.
- ii. Roof coverings must prevent any external moisture passing into the internal environment of the dwelling.
- iii. Structural elements outside the parameters of regional Approved Documents must be supported by structural calculations provided by a suitably qualified expert.
- iv. The materials, design and construction must meet the relevant Building Regulations, British Standards, Eurocodes and other statutory requirements.

7.12.1 Introduction

Metal roofing is usually built to a decent standard, but occasionally there are problems, especially where site workmanship has not been up to standard.



Double skin system

Figure 1: Typical metal double skin insulated roof

7.12.2 Double skin insulated roofs

7.12.2.1 What is a double skin insulated roof?

A double skin insulated roof is made-up on-site from separate components generally comprising: liner sheet, vapour control layer (VCL), spacer system, insulation, breather membrane and finished externally with top weathering sheets.

Top weathering sheets are generally secret fixed onto clips or standing seam sheets onto halts, these being machine seamed once fixed. Pierce fixed sheets are still widely used, which are fixed directly to the spacer system with external visible fixings.

Liner sheets can be solid or perforated to give an acoustic, sound-deadening roof. They are fixed directly to purlins, and can act as a VCL if a separate vapour barrier is not specified. If the liner is not used as a VCL, a reinforced vapour control sheet should be incorporated within the roof.

Insulation must be installed between the VCL and the top weathering sheet; some systems may require ventilation above the insulation and others may not; it varies from manufacturer to manufacturer. Where there is no requirement to ventilate, the insulation should be compressed slightly to ensure that there are no air voids where condensation may occur.

7.12.2.2 Workmanship

Top weathering sheets

Ensure that the top weathering sheets are installed in accordance with the manufacturer's instructions.

These must be long enough to discharge into the gutter correctly and allow for an eaves angle if required by the system.

Check that end and side lap tape sizes conform to the manufacturer's requirements.

For pierce fixed trapezoidal sheets, check for tell tales to end laps and side laps for the correct number of rows of tape.

Liner sheets

Where the liner sheet is solid and used as a vapour check, note the following:

- Frequency of main fixings to purlins and frequency of side lap stitchers.
- End laps to be sealed with mastic tape; check the size and that this is continuous. Side laps have a wider 50mm Polyband tape placed from the inside so this is visible from above.
- Check for cuts or splits in this metal liner.
- Ensure that to eaves and ridge the correct filler blocks have been used, bedded in mastic; if necessary, a closure flashing must be used from the crown of the sheet to the wall junction to maintain a vapour check. Check the use of sealant tapes and fire-retardant foam.

Separate Vapour Control Layer

This should be a reinforced sheet, and is used to ensure a more positive air seal around the perimeter of the building. The vapour check should be sealed in the field area with the correct tape, with the number of rows dependant on the application. Check the integrity of these tapes and that they are continuous and correctly joined. Where the vapour check abuts the walls to the verge or eaves, it must be properly sealed in accordance with the Architect's detail. Around penetrations, the vapour check must be cut and sealed to any pipes or upstands.

The spacer system is fixed through the vapour check and liner into the purlins. The spacer system

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will have a soft sealing pad to ensure the vapour check is maintained around the fixing.

Check for punctures of the vapour check by foot traffic or damage, and patch as required.

Insulation

Check the packaging to ensure that the correct thickness is being used if one layer is used, or a combination of thicknesses to give the correct specified thickness. For two thicknesses or more, check that all joints are staggered and check the Lambda value against the specification.

Ensure that no packaging or debris is left in the roof void prior to or during the installation of the insulation. The insulation should fill the void or be compressed into the void; there should be no slumping or gaps and it should be packed into voids at the junctions of the ridge and verge.

With standing seam roofs, a rigid mineral slab insulation should be placed at eaves, ridge and around all penetrations and walkways to support the vulnerable areas of the roof, which will give a solid support to the roof sheet pans. This is easy to see during construction and easily felt on completion. The supported pan of the sheet feels solid to walk on.

Support system

Check the frequency of brackets against the specification and the number of fixings per bracket, and that they are the correct type of fixing.

With standing seam roofs, the halter may be fixed with a stainless steel fixing; check the type and frequency of fixing. Check the orientation of the halter in relation to the lay of the sheet, i.e. will they pick up the seam, as there is a right and wrong way round for halters.

Manufacturers provide halter templates to set out halters, and there must be one on-site to obtain the correct gauging of the halters.

Roof penetrations

These must be sealed to maintain the VCL. Where the liner is used as a VCL, the metal-to-metal junction must be sealed with fire-retardant foam. With a separate VCL, this must be sealed to the upstand or pipes with the appropriate tape. Externally with aluminium roof sheets, the junctions with penetrations should be site welded or weathered using glass reinforced plastic (GRP) in-situ weathering.

Roof lights

Standing seam roof sheets are usually on separate insulated upstands. With pierce fixed trapezoidal roof sheets, roof lights are in line, either factory or site assembled. Ensure that the correct size of tape is used, check the number of rows of tape that are required and that side lap tapes are not twisted by fasteners.

General

Check surface finishes for abrasions, dents and cuts, and that the roof has not been used as a

cutting surface for flashings or other metal. Hot swarf from angle grinders burns into the plastisol coating of steel sheets, marks aluminium and rapidly turns to rust. Flashings should have sufficient overlap or butt straps, 150mm wide, and be sealed and supported. Check the frequency of fixings and that they are of the correct type.

7.12.3 Composite panel metal roofing

7.12.3.1 What is a composite panel roof?

A simple sheet roof system with ensured insulation thickness that is delivered with the top weathering sheet, insulation and white liner all in one sheet. With the increase in insulation, thickness panels are being made shorter in length so they can be handled into position. This means that there are more end laps to be checked.

The standard manufacturer's details are to be adhered to, but the following need to be checked.

7.12.3.2 Workmanship and installation

Fixings

There may be a requirement for stainless steel fixings to be used. Check by inspecting boxes and use a magnet; drill points will be magnetic only.

Check fixings are suitable for the purlin type – steel, light gauge cold rolled, heavy gauge or timber – as all fixings are different.

Check the bearing area of the purlin; if the building is not square, the sheets will run out and the

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end lap detail will not be supported. This can be overcome by using a galvanised support that is fixed to the purlin and which supports the end lap. Check that the right number of fixings has been used for the panel and the frequency of side lap stitchers; ensure that they are side lap stitchers and not main fixings.

Sealant tapes

Check the number of rows required by the manufacturer of the panel for end laps. Tell tales should be visible at side laps of each sheet. Tell tales are the ends of the mastic tape run that can be seen or must be felt for at the side of each sheet. The same applies to side laps; there should be a tell-tale at the end of the sheet. Use the end of a hacksaw blade to locate the rows of mastic tape.

On roof lights, mastic tape is visible; check its location, that its size complies with the manufacturer's requirements and that there are the correct number of rows. Tape should not be twisted by the fixings.

Air tightness

There must be a supply of gun foam, fire rated, at roof level for filling in voids before flashings are fixed. If there is not one on site, air tightness and maintaining the insulation cannot be fully achieved.

The use of foam needs to be inspected during the course of construction, and internal tapes to eaves and ridge purlins need to be inspected for

size and position. At the ridge, the gap between panels needs to be filled with foam to maintain the insulation and prevent condensation forming. There also needs to be a suitably sealed inner ridge.

Verge details are difficult and it may be necessary for an internal verge to be cut and sealed around purlins. Check sealant tapes and the use of gun foam to maintain insulation. The manufacturer's details may not be achievable, but an alternative must be devised to maintain air tightness. A degree of confidence in this requirement should be shown on-site as an indication of the importance of air tightness and how this can be achieved.

Gutter junctions

If parapet or valley gutters are being used, check the air seal at the junction of the two. Gutter joints are not always level, and any gaps have to be filled. This will not only prevent wind-driven rain from entering the building, but will also maintain an air seal.

Check that roof sheets are oversailing into the gutter correctly.

Roof penetrations

Penetrations such as flues, vents, upstand-type roof lights and sun tubes need to be sealed internally, the insulation being maintained with site-applied foam. Externally, upstands must be weathered correctly and, with steel composite sheets, this is best achieved using GRP in-situ weathering.

General

Check surface finish for cuts and abrasions.

Check that the roof has not been used as a cutting surface for flashings or other metal. Hot swarf from angle grinders burns into the plastisol coating and rapidly turns to rust.

Flashings should have a sufficient overlap and be sealed and supported. Check the frequency of fixings and that they are of the right type.

Check for closure from gutters and sheet oversails. There should be suitable shrouds to prevent birds or vermin from getting into the building, which can be often overlooked.

Appendix A - Inspection checklists for metal roof coverings

Checklist 1 for double skin Insulated roof systems in steel or aluminium

Component/Inspection	Rectification needed		Comments
	Yes	No	
Check bearing width of purlin			
Check minimum overlap of linear decking sheets: 1. Light gauge steel 2. Hot rolled steel 3. Timber - check for minimum penetration			
Check that side laps are stitched at the correct centres			
Vapour control checks using the liner: 1. Check tape to side laps, minimum width 50mm air and moisture barrier tape 2. Check tape to end laps 3. Check inner fillers to ridge, eaves and verge 4. Check for sealing around the perimeter with fire resisting foam			
Vapour control checks using a separate Vapour Control Layer: 1. Check the minimum overlap is correct 2. Check for the correct sealant tape 3. Check for the correct number of rows of sealant tape 4. Check junctions between Vapour Control Layer and building elements, e.g., upstands, eaves, verge, etc. 5. Check for puncture and repair where necessary			
Spacer systems: 1. Check for correct height of bracket or halter 2. Correct number of fixings per bracket or halter 3. Check for stainless steel if specified 4. Check for gauging of halters for standing seam and secret fix roof sheets			Use a magnet
Insulation: 1. Check that the correct thickness is being used 2. Check that insulation is the correct type and has the same properties as specified 3. Check for compression 4. Check that insulation joints are staggered 5. Ensure that insulation designed to support load has been correctly installed to eaves, ridge, penetrations and walkways 6. Ensure all packaging and debris is removed prior to fitting of the roof sheets			
Breather membranes: 1. Ensure the membrane is laid in the correct direction and in accordance with manufacturer's instructions			

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Component/Inspection	Rectification needed		Comments
	Yes	No	
<p>Roof sheets- standing seam and secret fixed:</p> <ol style="list-style-type: none"> 1. Check that sheets are long enough so that water effectively drains into the gutter 2. Check the direction of lay of sheets in relation to the direction of prevailing wind 3. Check eaves detail, in accordance with manufacturer's details including eaves drips and fixing 4. Check ridge detail including turn up fillers and ridge dams, in accordance with manufacturers details 5. Check verge detail and adequacy of support for cut sheets 6. Check flashing supports, sheet / verge flashing seals and frequency of fixings 			
<p>Roof sheets - pierced fixed:</p> <ol style="list-style-type: none"> 1. Check overlap dimension 2. Check end lap tape and correct number of rows of tape 3. Check for side lap tape 4. Check quantity of fixings per sheet per purlin 5. Check washer size of main fixings and side lap stitchers 6. Check frequency of side lap stitchers 7. Inspect for correct tightening of main fixings and side lap stitchers 			
<p>Penetrations for vents, sun pipes, etc.</p> <p>A - Aluminium sheets:</p> <ol style="list-style-type: none"> 1. Check sheets are site welded and area post coated where colour sheets are used. 2. Check that Vapour Control Layer and breather membrane is maintained around the welded area 3. Check upstands to be at least 150mm <p>B - Steel sheets:</p> <p>Ideally use GRP in-situ weathering flashings; however, if folded flashings are used, check:</p> <ol style="list-style-type: none"> 1. Overlap 2. Sealing and fixing of overlaps 3. If a flat sheet back to the ridge is used, check for insulation under the sheet 4. Check frequency of fixings 5. Check sealing of overlapping sheets 			
<p>Flashings:</p> <ol style="list-style-type: none"> 1. Check end overlap 2. Check frequency of fixings 3. Check correct type of fixing is used 			
<p>Generally:</p> <ol style="list-style-type: none"> 1. Check roof surface for cuts and abrasions 2. Check for hot swarf damage 			

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Checklist 2 for composite panel roofing works

Component/Inspection	Rectification needed		Comments
	Yes	No	
Panel laps to be tight when viewed from inside the building.			
Constant straight line on side laps to be achieved.			
Fasteners correct for the purlin: 1. Light gauge steel 2. Heavy gauge steel 3. Timber			
Fastener material: 1. Coated carbon steel 2. Stainless steel			Check with a magnet
Fastener frequency main roof: 1. Main fixings 2. Side lap stichers			
Fastener frequency roof lights: 1. Main fixings 2. Side lap stichers			
Bearing area of purlin at end lap is a supporting bearing plate required.			Is the building square?
End laps: 1. Correct number of rows of joining tape 2. Correct size of end lap tape 3. Correct position of end lap tape in relation to fixing			
Roof light tape positions: 1. Correct number of rows of joining tape 2. Correct size of end lap tape 3. Correct position of end lap tape in relation to fixing			
Is the roof adequately air tight (visual inspection and air tightness test where necessary)			
Provision of fire retardant gun foam: 1. Eaves level 2. Verges 3. Gutters 4. Internal verge positions 5. Foam insulation at ridge			

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Component/Inspection	Rectification needed		Comments
	Yes	No	
Gutter junctions: <ol style="list-style-type: none"> 1. Adequacy of seals at gutter junctions 2. Correct provision of weir overflows to gutter runs 3. Correct junction detail between gutters and verge flashings 4. Gaps sealed to prevent vermin infestation 5. Correct discharge of water from roof sheets into gutter 			
Roof penetrations: <ol style="list-style-type: none"> 1. Check seals around cut foam insulation internally 2. Check internal flashing closures 3. Check weather penetrations externally 			
Flashings: <ol style="list-style-type: none"> 1. Check end overlaps 2. Check frequency of fixings 			
General: <ol style="list-style-type: none"> 1. Check roof covering for cuts and abrasions 2. Check for hot swarf damage 			