

GD 23 INSPECTION CHECKLIST FOR METAL-BASED ROOFING AND CLADDING SYSTEMS

1.0 INTRODUCTION

This checklist has been compiled to help ensure that the metal-based building envelope complies with the appropriate Building Regulations and industry standards. The inspection checklist covers the metal-based roofing and cladding systems most commonly used on industrial, commercial and warehouse buildings.

The use of the checklist in conjunction with making the appropriate checks and the recording of conformance at each stage of the build process will assist in achieving compliance and a reduction in errors; this will, in turn, lead to the successful completion of a reliable, durable and sustainable building envelope.

This checklist can be used by local authority building inspectors, main contractors, architects, engineers or others involved in the specification, procurement and installation of metal roofing and cladding systems and assemblies.

2.0 SYSTEM DESCRIPTION

2.1 Built-up on site roof and wall cladding

A multi element assembly incorporating self-supporting metal inner and outer profiles (shaped), which are produced at the factory and are held apart by a site installed structural support system. The space between the inner and outer profiles is filled with thermally efficient Class A1 mineral fibre insulation.

The assembly has inherent structural strength; can be subjected to external imposed loads i.e. wind; provides a degree of weather resistance and offers a level of thermal performance. The inner and outer profiles can be supplied with a pre-coated finish to provide durability and aesthetics.

2.2 Sandwich panels

An assembly of various components and materials comprising of metal profiled (shaped) outer and inner skins, which are either adhesively or cohesively bonded, at the factory, to a thermally efficient expanded foam or fibrous core material to provide a wall, skin or assembly.

The composite assembly has inherent structural strength, can be subjected to external imposed loads i.e. wind, provides a degree of weather resistance and offers a level of thermal performance. The inner and outer profiles can be supplied with a pre-coated finish to provide durability and aesthetics.

2.3 Rainscreen façade system

An outer panel of water-shedding metal or metal laminated material and the associated materials are attached and supported by bracketry on the outside of the existing façade as in the case of refurbishment or a new structural wall as in the case of new build.

The through wall construction and assembly, which projects horizontally from the internal environment to the external environment of a building can comprise of various and different layers which are made from diverse materials. The outer layer is designed to shed water, while the inner layers serve multiple functions such as a building's structural wall (existing or new), insulation and extra vapour, breather and weather barriers. The assembly can incorporate a ventilated air cavity that allows any water or moisture that passes into it from either the internal environment of the building or the external environment to drain to the exterior of the building.

The assembly must include site installed fire stops and cavity barriers at pre-determined vertical and horizontal intervals and at the surrounding positions of through wall penetrations to stop the progression of fire. The assembly has inherent structural strength, can be subjected to external imposed loads i.e. wind, provides a degree of weather resistance and offers a level of thermal performance and is non-combustible. The outer panels can be supplied self-coloured or with a pre-coated finish to provide additional durability and aesthetics.

2.4 General

In all cases, the metal-based envelope should perform an aesthetic function and an environmental function to separate the building's internal and external atmospheres. Some elements of the construction might not be interchangeable and therefore the specifier should ensure that individual elements meet with the manufacturer or system supplier recommendations. The performance should be tailored for the application by the specifier or building designer in consultation with the supplier and system manufacturer.

3.0 SPECIFICATION COMPLIANCE

Item	Specification compliance	Proof of compliance	Checked by	Date
Roof/wall system assembly	Specification (final version, client agreed and detailed)	Written confirmation with approval documentation for checking by LABC or other independent organisation		
Fire	Fire rating for system	Certificate of compliance		
Fire	Fire resistance for system (if needed)	Certificate of compliance for the installed system and the period required		
Fire	Factory insulated composite to LPC 1181 (if needed)	Certificate of compliance issued by the manufacturer for the specified and installed system		
Thermal	Design stage compliance with Building Regulations, Part L for England, Wales or Part F for Northern Ireland or Section 6 for Scotland	Printed copy of the Simplified Building Energy Model (SBEM) calculation or calculation using other approved calculation method for the building in question See MCRMA GD 21 for notional building and backstop figures		
CE marking	Construction products shall be CE marked if compliance is required by a harmonized European Standard or Common Understanding and Assessment Procedure (CUAP)	Manufacturer or system supplier Declaration of Performance (DoP) or CE Mark label providing written confirmation. See MCRMA GD06 for details of products within a metal-based roof or wall system that require CE marking		
Safety	Non-fragility statement for roof system assemblies and rooflight assemblies	Manufacturer or system supplier confirmation that the actual assembly has undergone a non-fragility test and has a performance statement for the installed parameters in line with ACR(M)001-2019 [Sixth edition] See also MCRMA GD 13		

4.0 DESIGN COMPLIANCE

Item	Specification compliance	Proof of compliance	Checked by	Date
Construction drawings	Construction drawings shall show in detail the assembly, method of fixing, provision for the inclusion of insulation plus air and vapour sealing around and across the individual details, at junctions and at interfaces	Check site construction drawings and actual staged installation against specifier design details		
Calculations - general	Project specific performance calculations - Comprehensive and complete structural calculations together with supplementary calculation to cover items such as wind load, snow load and fixing arrangement.	All calculations shall be based on the actual material and system specification rather than a generic specification. Written approval from project engineer or independent engineer.		
Calculation	Structural calculations covering primary and secondary structure.	Engineer calculations confirming compliance with Eurocode and National Annex		
Calculation	Wind loading on roof and wall coverings	Engineer calculations confirming compliance with Eurocode and National Annex. Reference BS EN 1991-1-4:2005+A1:2010, NA to BS EN 1991-1-4:2005+A1:2010 and see also MCRMA GD 15		
Calculation	Snow loading on roof	Engineer calculations confirming compliance with Eurocode and National Annex. Reference BS EN 1991-1-3:2003+A1:2015, NA+A2:18 to BS EN 1991-1-3:2003+A1:2015 and see also MCRMA GD 16		
Calculation	Fasteners and fixings	Engineer calculations identifying the forces within each connection and element and drawings showing quantity, specification and layout of fasteners and fixings at each location.		

Item	Specification compliance	Proof of compliance	Checked by	Date
Thermal	U value for both roof and wall constructions	Manufacturer or system supplier literature or written confirmation from specifier.		
Thermal	U, psi and f value for each detail as required	Manufacturer or system supplier literature or written confirmation from specifier.		
Thermal	U, psi, f and frame factor values for rooflight system	Manufacturer or system supplier literature or written confirmation from specifier NOTE Twin skin rooflights are unlikely to comply with current Building Regulations		

5.0 ON-SITE COMPLIANCE

Item	Specification compliance	Proof of compliance	Checked by	Date
Drawings	Availability of paper copies of the most recent and up to date drawings which show the final approved system, details and fixing regime	Check availability of site drawings and actual staged installation against design details		
Specification	Client approved material and system specification	Check materials and systems on site conform to the client approved specification and comply with relevant regulations. Deviations should be noted and written confirmation should be obtained from the specifier or engineer to prove compliance and to confirm that changes do not compromise the specification and performance		
Material	Fastener material	Check fasteners to ensure that they are manufactured from the specified material and the appropriate grade, they are fixed and spaced in accordance with the design specification and calculation, washer sizes are correct for the application and that the fasteners are installed at the correct depth i.e. not under-driven or over-driven onto the surface of the sheet material. See MCRMA GD32 and GD33		
Thermal	Insulation	Check to ensure the Lambda value and the nett thickness of the installed insulation aligns with the values in the approved specification. See MCRMA GD28		
Material	Rooflights	Inspect and check that rooflights have a CE mark label and are manufactured from the appropriate grade and weight of material to comply with the non-fragility performance statement for the assembly. See ACR(M)001-2019 [Sixth edition] NOTE Twin skin rooflights are unlikely to comply with current Building Regulations		

Item	Specification compliance	Proof of compliance	Checked by	Date
Material	Metal based roof sheeting	Inspect and check that roof sheeting complies with the design specification and that the sheets have a CE mark label. See BS EN 14782:2006, BS EN 14509:2013, BS 5427:2016 +A1:2017		
Installation	Non-fragility	Inspect and check to ensure that the installation of the roof assembly profiles, fasteners and sealants conforms to the manufacturer or system supplier installed parameters for non-fragility. See ACR(M)001-2019 [Sixth edition]		
Installation	Condition of primary and secondary structure before and during installation of roofing and cladding materials	Inspect for adequacy and completeness and ensure that all component parts are fixed and secured and purlin spacing and alignment is within tolerance. Reference MCRMA GD 20		
Installation	Loading out of roof before installation of sheeting material	Inspect that the sheeting material is positioned above a rafter position and the imposed load that is applied to the primary and secondary structure is not causing distress to the component parts		
Installation	Landing position of sheets and composite panels on purlins	Inspect and confirm that landing position at end laps aligns with the purlin position and ensure that the up slope and down slope sheet material is fully supported at the landing positions. See MCRMA GD19		
Installation	Fixing and fastening of sheeting material to primary and secondary structure	Inspect and confirm that all fasteners are to the correct specification, are engaged and installed correctly and that individual fasteners are in close and full contact with the substructure. See MCRMA GD33		
Installation	Spacer bars	Inspect and check that the spacer bars and brackets are an appropriate depth to space the sheets apart and avoid excess compression of the insulation (10% compression advised for quilt)		

Item	Specification compliance	Proof of compliance	Checked by	Date
Installation	External side and end lap seals	Inspect and check that the external side and end lap seals are in accordance with the manufacturer's recommendations and that they are positioned correctly, are in the right number and are adequately compressed to form a weather tight seal. See MCRMA GD19 NOTE End and side lap seals form part of the assembly and must be included to ensure non-fragility of the assembly.		
Installation	Profile closure blocks (roof)	Inspect and check that profiled closure blocks, which form an integral part of the weather, air and vapour check, are installed and sealed away from the leading edge at ridge, eaves and each flashing positions.		
Installation	Continuous insulation layer (roof)	Inspect and check to ensure that the building fabric has a continuous insulation layer over the entire area of the envelope and insulation is also installed within areas of flashings and junctions. The insulation should be dry, fully expanded and should not contain any voids.		
Installation	Metal based wall sheeting	Inspect and check that wall sheeting complies with the design specification and that the sheets have a CE mark label. See BS EN 14782:2006, BS EN 14509:2013, BS 5427:2016 +A1:2017		
Installation	Continuous insulation layer (wall)	Inspect and check to ensure that the building fabric has a continuous insulation layer over the entire area of the envelope and also within the flashings and junctions. The insulation should be dry, fully expanded and should not contain any voids. The wall insulation should be held in position to prevent any slumping over time.		

Item	Specification compliance	Proof of compliance	Checked by	Date
Installation	Profile closure blocks (wall)	Inspect and check that profiled closure blocks, which form an integral part of the weather, air and vapour check, are installed and sealed away from the leading edge at each flashing positions.		
Installation	Identification of rooflight area	Inspect and check that rooflight perimeters are highlighted with high visibility fasteners with poppy red heads. See MCRMA GD33		
Installation	Construction details	Inspect and ensure that installed and assembled details comply with final drawings		
Installation	Air and vapour barrier layer	Inspect and check installation for missing seals and damage to the continuity of the air and vapour barrier layer. Reference MCRMA GD 19		
Installation	Factory insulated composite panels	Inspect and check that the supported end lap is sealed to the top face of the support purlin to avoid the ingress of condensation. See MCRMA GD19		
Installation	Factory insulated composite panels	Inspect and check that the supported end lap is butted closely above the top face of the support purlin to avoid cold bridging. See MCRMA GD19		
Installation	Factory insulated composite panels	Inspect and check that side laps joints are fully butted to minimise opportunity for cold bridging and ingress of moisture. See MCRMA GD19		

6.0 COMPLIANCE AT COMPLETION STAGE

6.1 Energy performance

Item	Specification compliance	Proof of compliance	Checked by	Date
Calculation	Post completion proof of building compliance with country specific Building Regulations	Rerun design stage SBEM calculation or calculation using other approved calculation method for the building in question based on installed building parameters to check compliance together with the production of Energy Performance Certificate (EPC)		

6.2 Deviation from design specification

Item	Specification compliance	Proof of compliance	Checked by	Date
Specification	Planned or unplanned deviations from design specification and calculated performance	All planned or unplanned changes to the specification should be noted and identified in writing for confirmation by the specifier or employer. All deviations should be checked for compatibility and compliance with relevant regulations		

6.3 Specification performance gap

Item	Specification compliance	Proof of compliance	Checked by	Date
Specification	Variations in design and post completion performance checks and calculations	Non alignment or variations in thermal and air permeability checks and calculations should be investigated and the client, specifier or project engineer should provide evidence of compliance before final approval is given. Differences may have an impact on building performance and future sustainability		

REFERENCES

ACR(M)001-2019 [Sixth edition] *Test for Non-Fragility of Large Element Roofing Assemblies*

BS EN 1991-1-4:2005+A1:2010 Eurocode 1. *Actions on structures. General actions. Wind actions*

NA to BS EN 1991-1-4:2005+A1:2010 UK National Annex to Eurocode 1. *Actions on structures. General actions. Wind actions*

BS EN 1991-1-3:2003+A1:2015 Eurocode 1. *Actions on structures. General actions. Snow loads*

NA+A2:18 to BS EN 1991-1-3:2003+A1:2015 UK National Annex to Eurocode 1. *Actions on structures. General actions. Snow loads*

BS 5427:2016+A1:2017 *Code of practice for the use of profiled sheet for roof and wall cladding on buildings*

BS EN 14782:2006 *Self-supporting metal sheet for roofing, external cladding and internal lining. Product specification and requirements*

BS EN 14509:2013 *Self-supporting double skin metal faced insulating panels. Factory made products. Specifications*

MCRMA publications

GD 06 *CE marking of construction products*

GD 13 *Non fragility of roofs - a checklist*

GD 15 *Guidance for wind loadings on roof and wall cladding*

GD 16 *Guidance for snow loading on cladding*

GD1 8 *Guidance to the Construction (Design and Management) Regulations 2015*

GD 19 *Effective sealing of end lap details in metal roofing constructions*

GD 20 *Serviceability states and deflection criteria*

GD 21 *Thermal performance of buildings: non-domestic construction*

GD 28 *Guidance for wind loadings on roof and wall cladding*

GD 32 *Self drilling fastener installation tools*

GD 33 *Fasteners for metal roof and wall cladding: design, detailing and installation guide*

MCRMA guidance documents can be downloaded at
<https://mcrma.co.uk/publications-2/publications-guidance-documents/>

Primary standards dealing with the design, specification and use of components, products and systems used in both the structure and the roofing and cladding envelope of industrial, commercial and warehouse buildings are listed at
<https://mcrma.co.uk/industry-standards/>

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