QUALITY IS KEY

The performance of any building envelope is highly dependent on a number of factors; not least of all the accuracy of the steel frame. Historically, there has not been enough collaboration between sub-contractors resulting in the steel frame being erected out of tolerance; refer to *P346 Best Practice for the Specification and Installation of Metal Cladding and Secondary Steelwork* (Steel Construction Institute, January 2007). Purlins and rails often sag and twist even without or before the increased weight of additional insulation or panels. This may be intensified as a result of poor workmanship relating to the steelwork upon which the roofing and cladding is to be mounted.

Image 1: Undulating/out of position purlin

To ensure roof and wall cladding systems perform well for the intended life of the building, they must be designed to be functional in terms of keeping the weather out, the heat in (low air permeability) and be durable for the design life of the building. This should be done by selecting products and components that are compatible with one another; for instance using stainless steel fasteners with aluminium, rather than carbon steel.

Over the years, many roofing and cladding contractors have accepted badly installed or incomplete steelwork due to programme constraints or other criteria out of their control. In most, if not all, cases this exposes problems such as unlined, unlevelled and incomplete structural connections resulting in out of tolerance steelwork.
This will inevitably impact on achieving a satisfactory standard of workmanship for the roofing and cladding, whether single ply, composite, twin-skin or standing seam.

The images shown here represent some of the current issues facing roofing contractors. In image 1 (see page 1) undulating/out of position purlins occur when the steel frame is erected at varying heights from rafter to rafter. In this case, rafters are facetted to suit a self-curved twin skin roof cladding system and varying heights of cleats are welded to the facetted rafters to achieve the required curvature. Clearly, a difference in height of the rafters / cleat positions does not achieve the correct purlin lines throughout the roof construction.

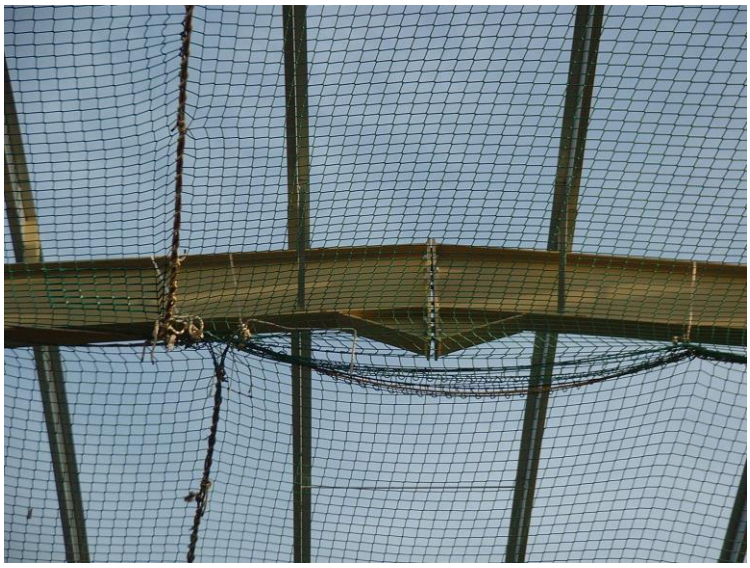

Image 2: Incomplete structural connections

Image 2 (see page 2) shows incomplete structural connectors where the hip purlins are not connected at hip rafter cleats; this not only affects structural capabilities but in addition, there are no structural ‘cleaders’, which are required to ensure non-fragility of the roofing assembly and an air tight junction being achieved.

The Energy Performance of Buildings Directive and proposed amendments to national building regulations inevitably bring new design challenges and the issues outlined above can only be exacerbated by new systems with the additional insulation becoming bulkier and heavier and as a result more difficult to install correctly.

Although increasing the thermal performance of roof and wall cladding systems should in theory increase the efficiency of a building, this is not always the case. Regardless of the strength of a system if it is not installed or used correctly then the desired improvements will simply not be achieved; as the performance of roof and wall cladding systems rests highly on the standard of site practice.

Image 3: Example of good installation and workmanship. Image courtesy of CA Group

While systems can be designed to accommodate a degree of steelwork tolerances, if the standard of workmanship of the steelwork is poor the cladding system will not perform. It is essential that all sections of the roof and wall systems are installed in conjunction with the manufacturer's recommendations. To guard against poorly installed cladding, MCRMA recommends that all installations are undertaken by trained operatives who understand the importance of getting it right first time.

Consideration must be given to all aspects of the cladding installation including;

- Adequately sealed air barrier to limit air leakage.
- Correctly installed roof system, including sealants, fixings and minimum edge distances to ensure non-fragility on roof assemblies.
- Correctly installed fixings into purlins/rail and not fresh air. Fixings should neither be under or over-driven to ensure weathertight washers.
- Continuous insulation: if man-made mineral fibre is used then ensure there are no gaps between rolls and no gaps beneath spacers. With insulated panels or insulation boards, it is necessary to guarantee tight abutments with no gaps and site applied foam as necessary.
- To limit cold bridging, insulate and seal properly.
- Clean down and remove any swarf or detritus that can cause premature degradation.
- Fixings need to be adequately lapped, fixed and sealed flashings.
- When working on a roof, do not walk along flashings, as this will cause damage and will compromise seals.

The encouragement of manufacturers to achieve high standards of workmanship can vary widely. Some choose a route through product training and registered installers for products that require tight tolerances and accurate installation. Others simplify the system; provide on-site servicing or on-the-job tuition, and tools that make life easier for the fixer. What is clear is that high standards in the manufacture of metal roof and wall cladding materials, and correct design and specification are of the utmost importance.

Image 4: Primary and secondary steelwork properly installed

This article was written by Lee Davies, Group Technical Manager, CA Group Limited on behalf of MCRMA. This article first appeared in RCi May 2013

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