INSTALLATION OF PURLINS AND SIDE RAILS

The ability of a steel framed building to perform adequately depends on good interaction between the secondary steelwork and the cladding and crucial to this interaction is the correct installation of the purlins and side rails. The Metal Cladding and Roofing Manufacturers Association has produced a new guidance document which offers good practice advice on the installation of the secondary steelwork and associated components.

It is important that the installation criteria are set at the design stage to ensure that all elements of the construction perform as expected and also that the interface, interaction and fit between components and systems meet with expectations.

Purlins and side rails are normally installed at the same time, or immediately after, the erection of the hot-rolled steel frame. Crucial to the performance of the cladding system is the accurate installation of the purlins and side rails to the required tolerances. The overriding issue regarding erection tolerances for secondary steelwork is the ability of the cladding contractor to fix the cladding to the purlins and side rails, without compromising the airtightness, weather tightness or structural integrity of the building envelope.

However, deviations in the position and orientation of the cleats connecting the purlins and side rails to the primary steelwork can occur and this can be remedied by adopting the following limits (see figure 1 overleaf).

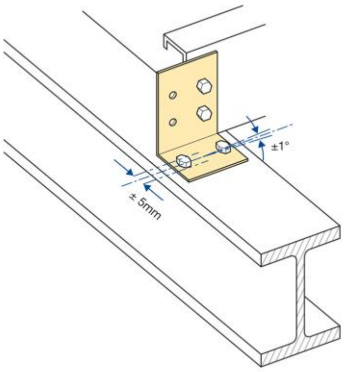

Figure 1 Cleat tolerances

It is worth noting that the positional tolerance of ± 5 mm relative to the setting out point could result in a tolerance of ± 10 mm on the spacing of the purlins or rails at the rafter position. This is important in terms of cladding panel lengths, especially for insulated panels. The rotational tolerance of ± 1^0 is equivalent to a slope of 1 in 60 and greater end rotation can have a significant effect on purlins mid-span rotation and position.

Where built-up cladding systems are used, the provision of a lap between the liner sheets allows moderate deviations to be accommodated. However, the lack of such a lap in insulated panels, together with strict end bearing requirements and manufacturing tolerances on the panel length, means that greater care is needed to facilitate fixing of the panels to the purlins or side rails in this case.

The critical tolerance from a cladding contractor's point of view is the downslope position of the top flange of the purlin at the time that the cladding is fixed. The recommended maximum deviation of the purlin is ± x (see figure 2). This tolerance is applied to the position of the purlin relative to a fixed datum point in order to prevent the build-up of cumulative tolerances over the length of the roof slope.

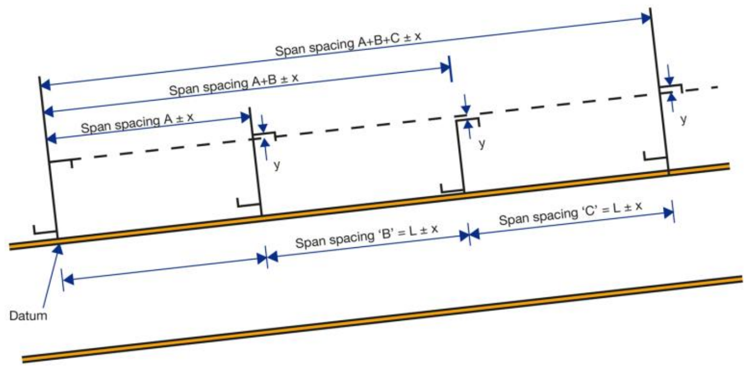

Figure 2 Limits on span position

The same value *x* is also applied as a tolerance on the spacing between the purlins. The suggested value of *x* for insulated panels is 10mm and for built-up systems, 20mm. These suggested limits may also be applied to the vertical position and spacing of side rails supporting wall cladding.

The 10 mm value for insulated panels is based on a purlin flange width of 65 mm. Specifiers may select a purlin section with a wider flange or consider the addition of a light gauge steel angle or plate to provide a wider bearing surface for the roofing/cladding.

Rooflights require special consideration, as the fasteners connecting them to the purlins need to be positioned within a narrow zone around the perimeter of the rooflight. The width available for the fasteners, and hence the tolerance on the purlins, depends on the type of rooflight.

Where built-up cladding systems are specified, the positional requirements for the purlin should also be applied to the top of the spacer system in order that the outer cladding sheets may be installed correctly. The alignment of the top of the spacer system is governed by the position of the purlin and the rotation of the top flange of the purlin relative to the plane of the roof.

In the case of insulated panels, which generally possess a relatively high bending stiffness, excessive purlin twist could prevent the panels from seating properly on the top flange of the purlin.

Most standing seam roof systems are sensitive to purlin rotation and the manufacturer's recommended rotation tolerance can be as low as $\pm 1^0$ in some cases. The simplest way of ensuring that side rails are spaced correctly is to install perpendicular supporting members. However, on their own, these supports are only capable of holding the rails in position relative to one another and will not prevent the entire rail system from sagging.

To overcome this problem, manufacturers recommend fixing the rails from the bottom up, with temporary supports placed beneath the bottom rail if required (see figure 3).

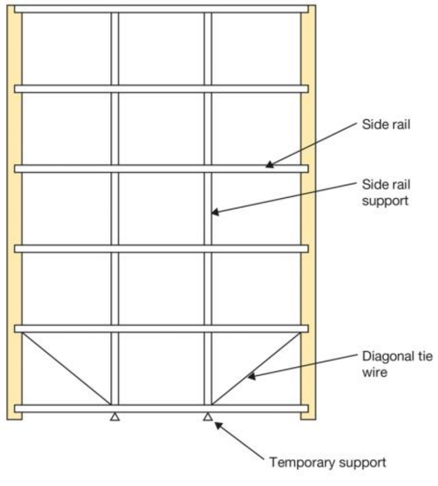

Figure 3 Side rail support during installation

The MCRMA guidance document is an update of section four of the Steel Construction Institute publication P346, *Best Practice for the Specification and Installation of Metal Cladding and Secondary Steelwork*. The document, titled *GD24: Installation of purlins and side rails*, can be downloaded from the MCRMA web site at www.mcrma.co.uk

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