

Steel Tolerances for Industrial Gutter Installation

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INTRODUCTION

For a steel framed building envelope to perform and function correctly, robust interaction between the secondary steelwork and cladding are crucial. Foremost consideration needs to be given to the gutter installation and the supporting steelwork as this element of the build not only needs to successfully carry and dispose of the rainwater from the roof once complete but is also used as a walkway to install and access the roof, both during construction and after completion.

PURLIN RESTRAINT

Industry guidance recommends that purlins which are not fully restrained (by insulated panels or by a non-perforated steel liner) are not subject to any construction loads, other than over the rafters.

In the case of Industrial gutters however, as these are installed prior to the roof cladding, the gutter bearing purlins can't rely on the restraint offered by the roof cladding as noted above.

The gutter bearing purlins must therefore be designed and restrained to take the loadings of both the industrial gutter and the operatives walking in the gutter to lay the roof sheet.

When designing purlin restraint for the gutter bearing purlins, consideration needs to be given to the need for purlins up slope from the gutter bearing purlins having to be left out to enable gutters to be craned up into position. Restraint therefore can't always be taken by bracing to the next purlin up slope.

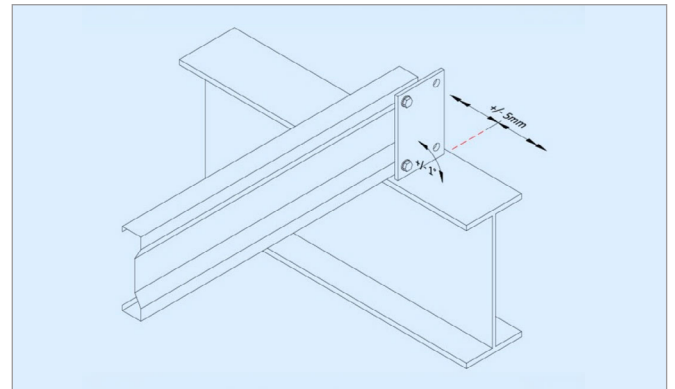


Gutters being craned through the purlins with next purlin up from the gutter being left out for access

CLEAT POSITION & ORIENTATION

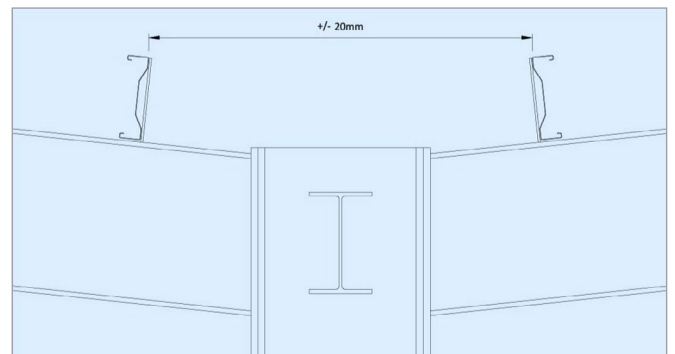
Tolerances on the position and orientation of the purlin cleats (and therefore on the purlins themselves at the point where they intersect the primary steelwork) are included in the 7th edition of the NSSS under the heading "tolerances on attachments" The following limits are given:

- Position of the attachment with respect of the member setting out point +/- 5mm
- Orientation of the attachment +/- 1°



It is worth noting that whilst the +/- 5mm on the cleat position can result in the dimension between gutter bearing purlins (where a valley gutter is to be located) being +/- 10mm differential to the designed dimension, the rotational tolerance of +/- 1° on the cleat (combined with the typical purlin depth from 240mm to 350mm) also needs to be factored in as this can increase the dimension by a further +/- 5mm to each purlin.

Taking into account the cumulative tolerance of both cleat position & cleat orientation the Max tolerance between the top of the purlin shoulders should be +/- 20mm as shown below.



PURLIN TOLERANCE OVER THE SPAN

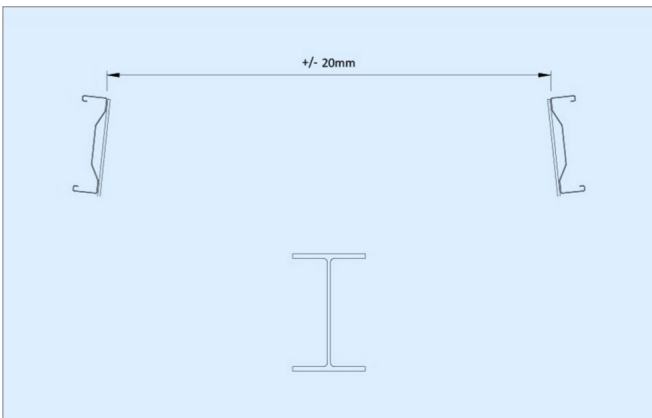
Whilst deflection limits are often given for steelwork, tolerances in terms of purlin position are not normally given along its length, since this can be influenced by the initial straightness of the member (manufacturers rolling tolerances) and deflection under its own self weight. This therefore falls outside of the scope given in National Structural Steelwork Specification (NSSS).

However excessive purlin twist or incorrectly sized sag bars between purlins can pull purlins out of alignment beyond the location of the rafters, resulting in the gutter not fitting correctly within the gutter bearing purlins and compromising the non-fragility status and long term performance of the gutter.



Gutter bearing leg wrapping over purlin at rafter location but not at mid bay as purlin is out of alignment

It is therefore imperative that the same tolerance applied between purlins at the rafter positions is applied and maintained along the length of the purlin.



DEFLECTION ALONG THE PURLIN LENGTH

Whilst deflection limits along the length of the purlin are often derived from the cladding manufacturers requirement for the roof cladding system being installed (typically L/150 for twin skin and L/300 for composite) the gutter bearing purlins need to adhere to stricter deflection tolerances along the purlin length to reduce ponding in the gutters and to ensure the siphonic drainage system functions correctly to avoid the gutters overflowing.

Section 10.6 of BS8490:2025 Siphonic Roof Drainage Systems Guide specifies that "Overall gutter levels should not deviate more than +/- 20mm"

As the gutter is fixed to and as such follows the line of the purlins it is critical that the purlins are installed with a Maximum deflection of +/- 20mm as dictated above.

REFERENCES

SCI – Publication 346: Best Practice for the Specification and Installation of Metal Cladding and Secondary Steelwork

MCRMA – Guidance Document 24: Installation of Purlins and Siderails

BS8490:2025 Siphonic Roof Drainage Systems Guide

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Metal Gutter Manufacturers Association Limited

Suite A
82 James Carter Road
Mildenhall
Suffolk
IP28 7DE
United Kingdom

E-mail: info@mgma.co.uk

Registered in England No: 06476148

Registered office: Suite A, 82 James Carter Road, Mildenhall,
Suffolk, IP28 7DE