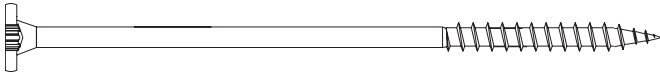


Pitched warm roofs utilising over-rafter rigid foam insulation. Connecting counter-battens to rafters using HeadLok®.

An increasingly common form of warm roof construction is utilising over-rafter rigid insulation. This method greatly improves the thermal insulation of the roof by avoiding cold bridges within the insulation layer. However, the presence of the insulation layer between the counter-battens and rafters greatly complicates the connection between them, requiring fasteners of lengths and strength capacities that preclude the use of most nails and wood screws. HeadLok has been tested in this application and found to satisfy the strength and engineering requirements needed for this application.

Warm roof installations utilising HeadLok®



HEADLOK DIMENSIONAL DATA

TABLE 1

Available Lengths	125mm, 150mm, 175mm, 200mm, 225mm		
Thread Length	51mm		
Head Diameter	15.9mm	Outer (Major) Thread Diameter	6.7mm
Plain Shank Diameter	4.8mm	Inner (Minor) Thread Diameter	4.4mm

FASTENER SIZE SELECTION

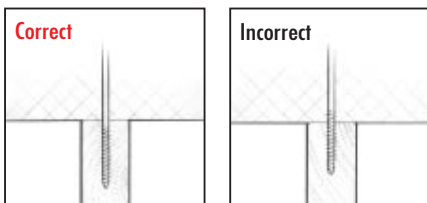
TABLE 2

Thickness of over-rafter rigid insulation (mm)	50	70	100	120	150
Length of HeadLok fastener (mm)	125	150	175	200	225

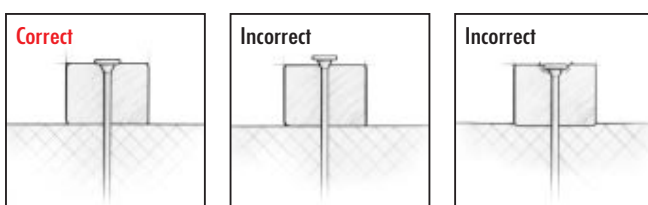
NOTES

- Length of HeadLok fastener = Thickness of counter-batten + Thickness of rigid insulation + 51
- Minimum thickness of counter-batten is 25mm
- The threaded length of the HeadLok fastener must be fully inserted into the rafter

THREAD ENGAGEMENT



FASTENER HEAD DEPTH



INSTALLATION PROCEDURE

- Select the appropriate fastener length from the FASTENER SIZE SELECTION table based on the insulation thickness. Threads should fully engage the rafter (See **THREAD ENGAGEMENT** section.)
- Centre the counter-batten over the underlying rafter by measuring and marking the rafter location onto the insulation surface first.
- Using a drill set to low speed install the HeadLok screw through the centre of the counter-batten and perpendicular to the roof slope.
- Install fasteners according to the REQUIRED SPACINGS table shown on the next page.
- In cases where the limitations following this table are not met, or a design professional chooses to calculate the spacing, use the PERMISSIBLE STRENGTH DATA included in this guide to make these calculations.
- Do not install fasteners closer than 18mm from counter-batten edge or 75mm from counter-batten end.
- Drive the fastener so that the top of the head is lightly embedded into the top surface of the counter-batten. To ensure proper performance, do not underdrive or overdrive the fastener. (See **FASTENER HEAD DEPTH** section.)
- If a split occurs in the batten during installation, or the head fails to sink flush due to spinning free, install a supplemental fastener a minimum of 100mm from original location.

Warm roof installations utilising HeadLok®

REQUIRED SPACINGS FOR HEADLOK FASTENERS ALONG RAFTERS IN PITCHED WARM ROOFS WITH OVER-RAFTER RIGID INSULATION

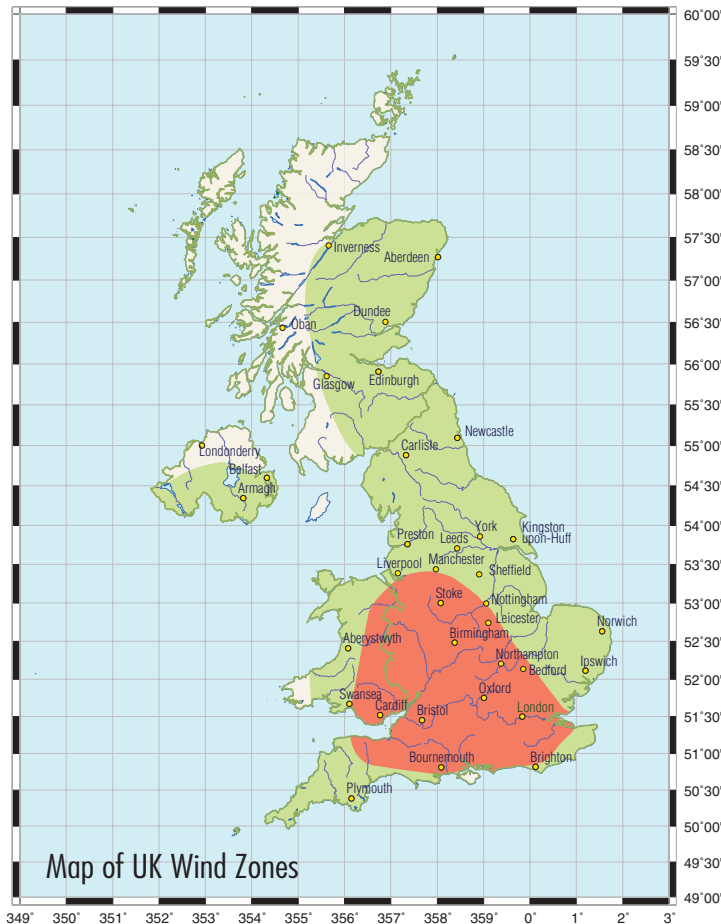
The required spacing of HeadLok fasteners along the rafters of duo-pitch roofs are shown in the Table 3 for three dead weight ranges of tiled or slated roof claddings:

TABLE 3

SPACING (MM) OF HEADLOK FASTENERS ALONG RAFTER FOR:			
Rafters at centres (mm) of:	Roof cladding of dead weight, vertical on slope, in the range of 0.2-0.4 kN/m ²	Roof cladding of dead weight, vertical on slope, in the range of 0.4-0.6 kN/m ²	Roof cladding of dead weight, vertical on slope, in the range of 0.6-0.9 kN/m ²
600	600	500	400
480	600	600	500
400	600	600	600

The basis and limitations for using the spacing recommendations of Table 3 are:

- Each spacing is dictated either by the need to provide adequate resistance against the component of dead and imposed roof loading acting down and parallel to the roof slope or by the need to provide resistance against wind uplift.
- The spacings only apply for duo-pitch roofs with pitches (α) between 30° and 50°. The dead weights of tile or slate roof claddings are as shown, vertical on slope. The imposed roof load (kN/m²) acting on the roof, vertical on plan, is taken as $0.75[(60-\alpha)/\alpha]$.
- For sites with an altitude $\leq 300\text{m}$, the roof is located in the region of the United Kingdom in red on the map shown here. Alternatively for sites with an altitude $\leq 100\text{m}$, the roof is located in the region of the United Kingdom shown in green on the map. The roof may be located in a sea, country or town category of terrain as defined by clause 1.7.2 of BS6399-2 provided that its topography is not considered to be significant according to clause 2.2.2.2 of BS6399-2.
- The height of the ridge of the duo-pitch roof is less than 15m above ground level.
- There is a ceiling fixed to the underside of the rafters which resists the internal wind pressures.
- Gable overhangs do not exceed 300mm.



Warm roof installations utilising HeadLok®

PERMISSIBLE STRENGTH DATA FOR HEADLOK FASTENERS CONNECTING COUNTER-BATTENS TO RAFTERS THROUGH RIGID INSULATION BOARD

Permissible lateral and withdrawal loads are given below for HeadLok fasteners in the specific application of connecting counter-battens to rafters through rigid insulation board under the following conditions:

1. The 51mm threaded part of the screw must be fully inserted into the rafter, whose strength class should be C16 or better.
2. The screw head should be lightly embedded into the top surface of the counter-batten, whose nominal thickness should not be less than 25mm.
3. The spacing of the screws along the rafter should not exceed 600mm.
4. Rigid insulation thicknesses in the range 50-150mm.

Permissible lateral (parallel to roof slope) load =

0.20 kN (all load durations)

Short-term permissible withdrawal load = 0.89 kN

CHECK ON RESISTANCE AGAINST WIND UPLIFT

For duo-pitch roofs whose ridge height exceeds 15m or otherwise not meeting the conditions pertaining to the wind zones of the map shown on page 3, a check on resistance against wind uplift should be made using the equation below. As stipulated in BS5268-3, this equation incorporates a factor of safety of 1.4 against wind uplift.

Maximum allowable wind uplift u.d. load normal to slope =

$$\frac{\text{HeadLok s-t. perm. withdrawal load}}{1.4 (\text{Rafter centres}) (\text{HeadLok spacing})} + \frac{\text{Min. dead u.d. load normal on slope}}{1.4}$$

FOR FURTHER TECHNICAL DATA PLEASE CONTACT:

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FOR ORDERING INFORMATION PLEASE CONTACT:

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Freephone: 0800 652 2203
Email: enquiries@oscsales.com



NOTES

1. In view of the presence of the rigid insulation, the permissible lateral load-carrying capacity of the HeadLok connection between the counter-batten and the rafter cannot be evaluated using annex G of BS5268-2 as it is not a direct timber-timber connection. Instead, the permissible lateral load-carrying capacity of this connection is derived, using safety factors appropriate to BS5268-2, from a bespoke testing programme undertaken in April 2008 at Brighton University and described in TimberSolve report no. OLY.01-01 entitled 'HeadLok screws manufactured by Fastenmaster. Derivation of permissible loads for the application of connecting counter-battens to rafters in roofs.'
2. The permissible withdrawal load of HeadLok fasteners is determined from tests undertaken in accordance with EN14592 at CERAM.