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INTRODUCTION

Solar framing can be securely attached to the roof frame using bolts.

This provides an alternative to using standard tek-screws and allows the design of the framing system to be optimised in certain applications.

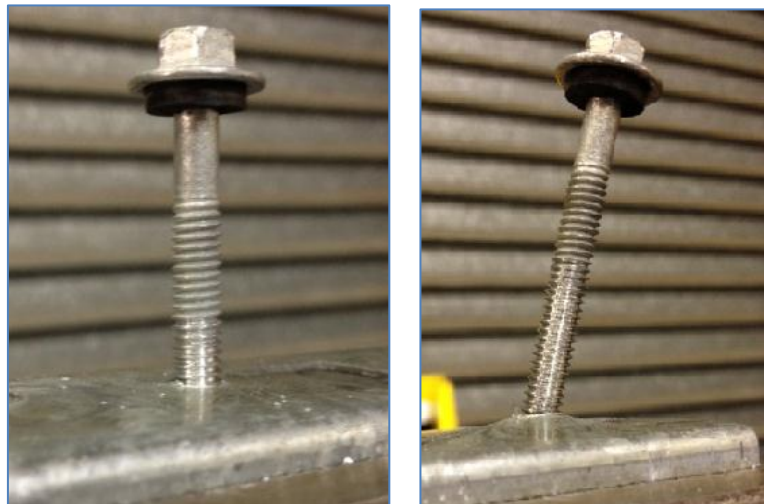
LIMITATIONS TO SCREWS

The fixing capacity of a tek-screw is limited by the thickness of the metal purlin which it screws into. Failure occurs if the metal purlin locally deforms around the screw, allowing the screw to pull out. The problem is exacerbated in cyclonic regions where the “low high low” cyclic wind loads can accelerate failure, and the screw must be de-rated as a result.

The images below illustrate:

Left: A tek-screw in its normal non-stressed state.

Right: A tek-screw that has undergone a load exceeding its rated capacity (look at the ‘bowing’ at the attachment point and the angle of the screw caused by the widening of the hole). This has forced the screw to pull through and now provides no holding capacity.



COMPLIANCE

For simplicity sake, all spacing tables in the SunLock installation manual (referring to the installation on metal purlins) are based on the ‘worst case’ assumption that the purlins are 0.75 mm thick.

Due to this conservative calculation, solar arrays installed in the edge zones in cyclonic regions require tightly spaced and unviable distances between fixing points. In these situations, an alternative solution is required.

SAMPLE CASE STUDY

Consider the following installation in Mackay, QLD:

- Wind region C
- Flush mounted
- Installed on a metal purlin roof with a pitch of 10 degrees
- Installed in the edge zone

Drawing S3 of the SunLock installation manual states that the L-feet are to be spaced at 90 mm intervals. This is unrealistic.

Using M8 bolts instead of the supplied 14 gauge tek-screws increases the fixing capacity of each fastener from 0.63 kN to 3.74 kN, which is a 500% increase. This means that the L-feet spacing can be increased from 90 mm to 550 mm, which is a viable alternative.

CORRECT USE OF BOLTED FASTENERS

If bolts are to be used in place of a tek-screw, the following considerations must be adhered to prior to design and installation:

- Ensure that easy access is available to the roof cavity / underside of the purlins.
- Bolts should be Grade 4.6 or higher (240 MPa yield strength).
- Bolts should have an appropriate level of corrosion resistance (Class 4 galvanised or 304 grade stainless steel or higher).
- Flat washers with a sufficient outer diameter (~12 mm) should be used to prevent the fastener from pulling through the bolt hole. These should be used when fastening to SunLock channel or on the underside surface of a purlin.
- Lock nuts should be used to prevent the fasteners loosening under high frequency wind loads.

Consultation with an engineer is required to establish the rating of the new fastener and the subsequent spacings.



FURTHER INFORMATION

For further information contact Apollo Energy on 1300 855 484 or sunlock@apolloenergy.com.au.