



# FTMA TECH TALK

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## SCREW CAPACITIES - MYTHS & MYSTERIES

The timber industry has historically experienced a shift in the way we connect timber. We started off by creating marvels using Mortise-Tenon or Dovetail Joints. Today, this sounds like fantasy. The skill to imagine such joinery and to engineer it is lost.

We have drifted to joining timber using screws. Simple as it may sound, it is not. First, we need to understand timber as a material (to determine safe critical distances for screws to avoid splitting of timber under stress), and then we need to understand screws themselves. As humble as they may look, screws are engineered products.

### Understanding Screws

Screws have three major components:

1. The driving tip.
2. The threaded shank (fully or partially)
3. The driving head.



These components play a major role in the application and end capacity of the screw. While the driving tip is designed to cut through a specific material or set of materials, the screw's capacity mostly comes from screw thread gripping in timber and screw head bearing on timber face. In terms of engineering, we call it 'Thread Withdrawal' and 'Head Pull Through'. The tip mostly is ineffective in providing any capacity to the screw.

AS 1649 is the governing testing standard to determine the capacity of screws. Whilst AS 1649 elaborate well on calculating Thread Withdrawal for screws (to align with capacities as published in AS 1720.1 Tables 4.6), it subtly directs to the relevance of Head Pull Through in a singular statement.



- (e) For some fasteners in withdrawal, pull-through of the fastener's head through the timber may limit the withdrawal or axial capacity of the fastener. Where preliminary investigation indicates this may be a consideration, appropriately designed tests shall be conducted to determine the head pull-through resistance of the fastener.

AS 1649.2001 Cl 2.1.4 (e)

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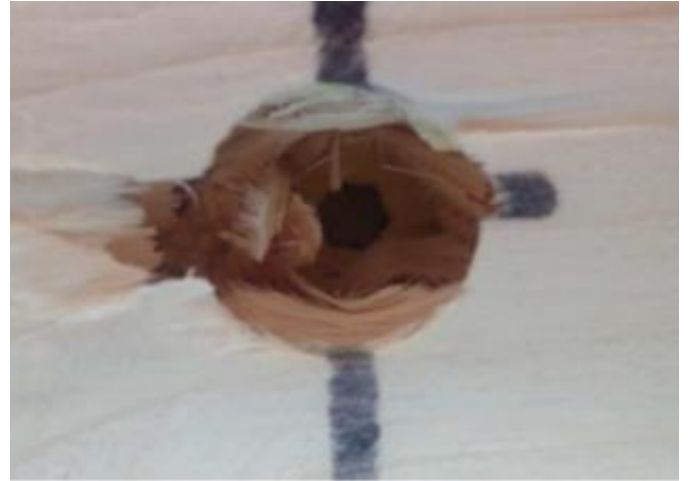
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AS 1649 stops short of recommending any further towards Head Pull Through, which, is a significant behaviour for high capacity/performance screws.

The Head Pull Through capacity of the screw is heavily species-dependent. With the influx of immense volumes of timber from Europe and elsewhere, this phenomenon seems to govern most of the testing. Imported timbers do not have the same fibre structure as Australian-grown timbers and hence are significantly different in their behaviour. Irrespective, relying purely on Thread Withdrawal capacity of screws to design timber connections is a mistake. The capacity of the connection, especially for high capacity/performance screws, is a combination of Thread Withdrawal and Head Pull Through, as can be seen from the images below:



With this understanding, it is prudent to read published Thread Withdrawal capacities of screws (aligning with AS 1720.1) alongside HEAD PULL THROUGH capacities. In case this information is not available, it is prudent to ask if the published capacities of screws are in consideration of Head Pull Through capacity of respective screws. Reach out to your timber design specialist if you require more information.



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