MyTiCon Timber Connectors Whitepaper

ASSY® Screws vs Lag Screw

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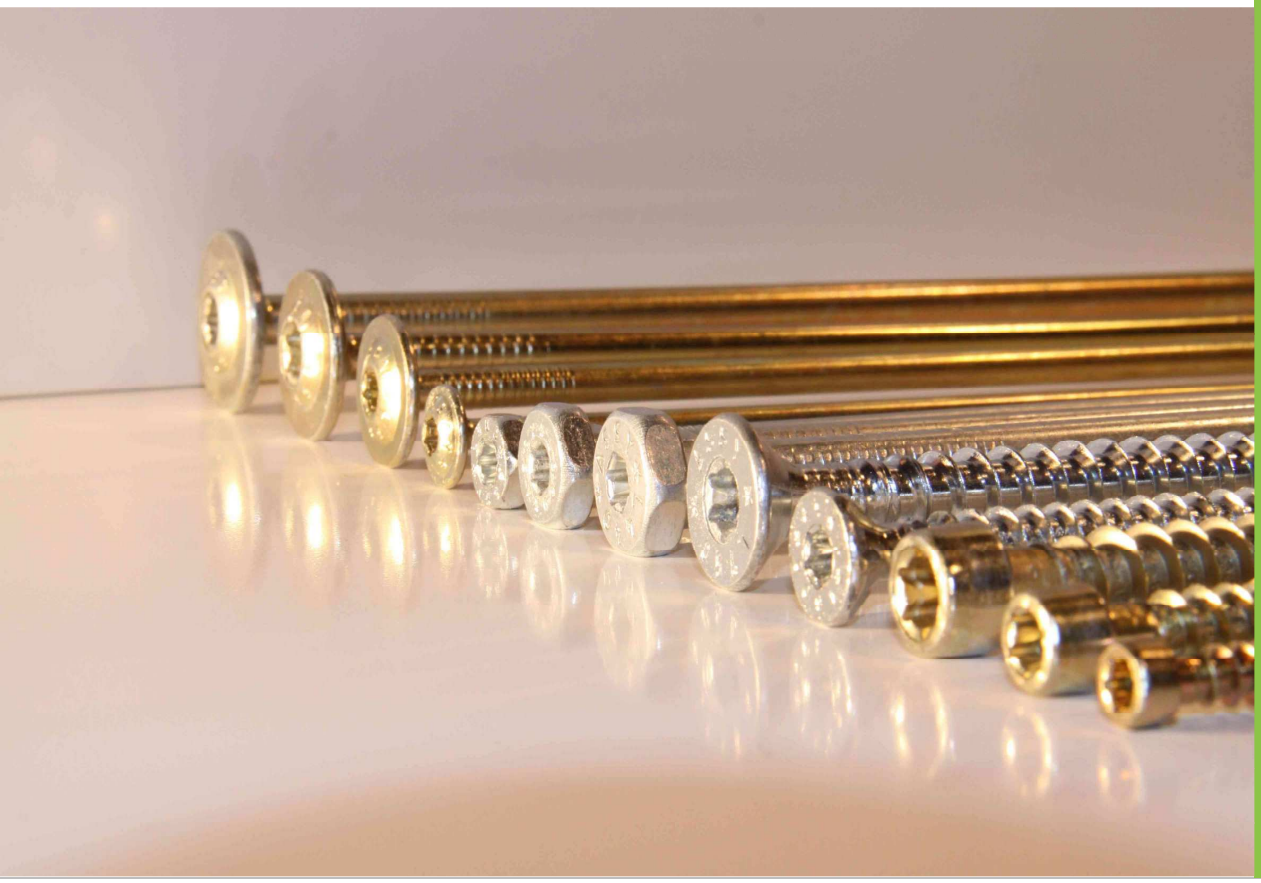
ASSY® Screws vs Lag Screw



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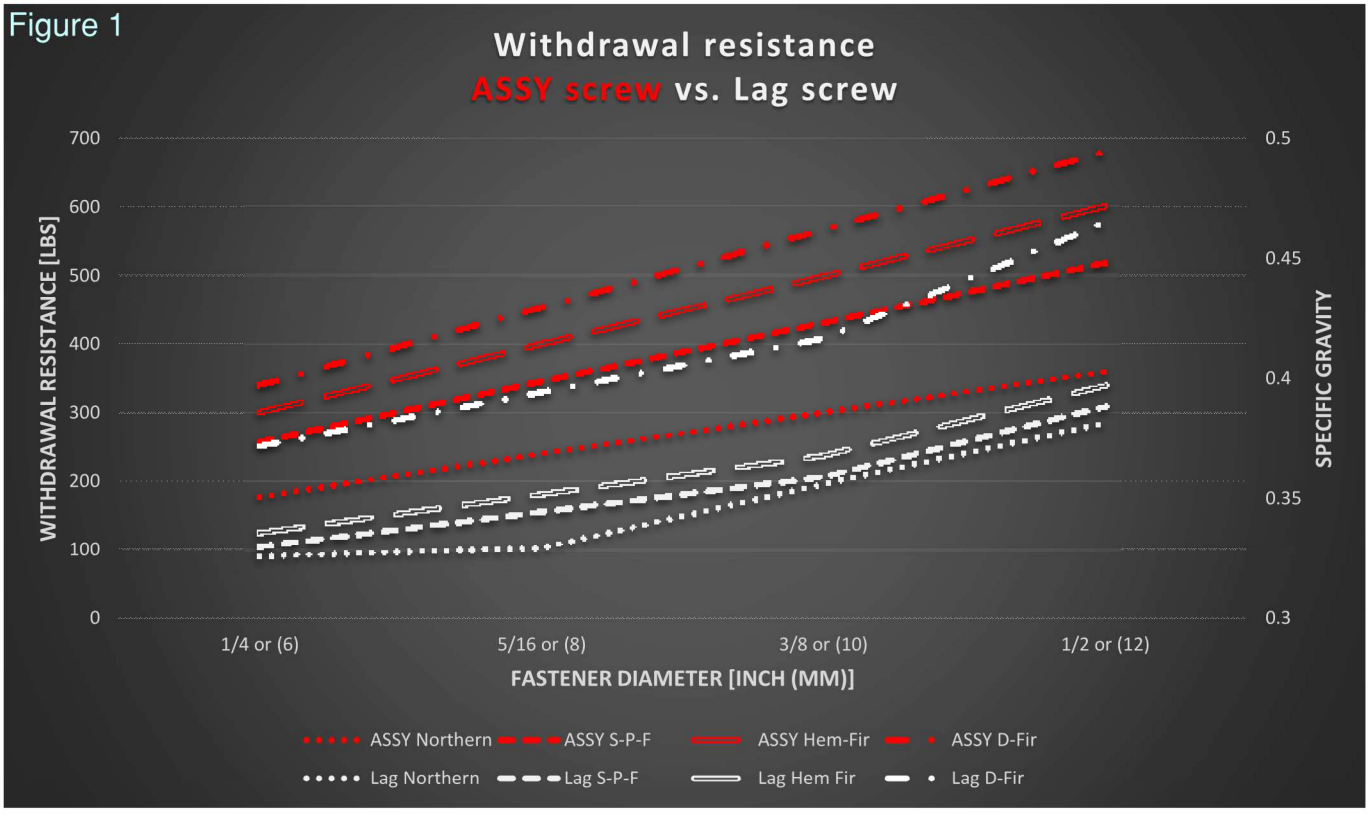
ASSY® Screw vs. Lag Screw

Modern and traditional fastening technologies are typically compared from a pure price perspective at a rate of per piece cost. As an example we may compare code approved ASSY structural screws to a commonly available lag screw. A structural wood screw may not seem to provide much benefit when evaluated from a pure visual perspective. However when considering superior strength properties from a structural perspective, major differences are found in withdrawal and shear strength. A major advantage of modern structural wood screws against common lag screws is their superior withdrawal resistance. Figure 1 below highlights the apparent withdrawal resistance differences between ASSY and Lag screws in major timber species.

Figure 1



Note: Above chart applies to screw-in angles of 90° between fastener axis and wood grain direction

ASSY® Screw vs. Lag Screw

Modern structural screws are subject to a special heat treatment after the cold forming process and therefore provide superior bending yield strength values against common lag screws. Due to the high bending yield strength outstanding performances in wood to wood and wood to steel shear connections can also be achieved. Fastener yielding shall be the failure mode in control to fully utilise the advantages of structural screws with high bending yield strength . Figure 2 shows the bending yield strength differences with observed capacity differences shown in Figure3.

Figure 2

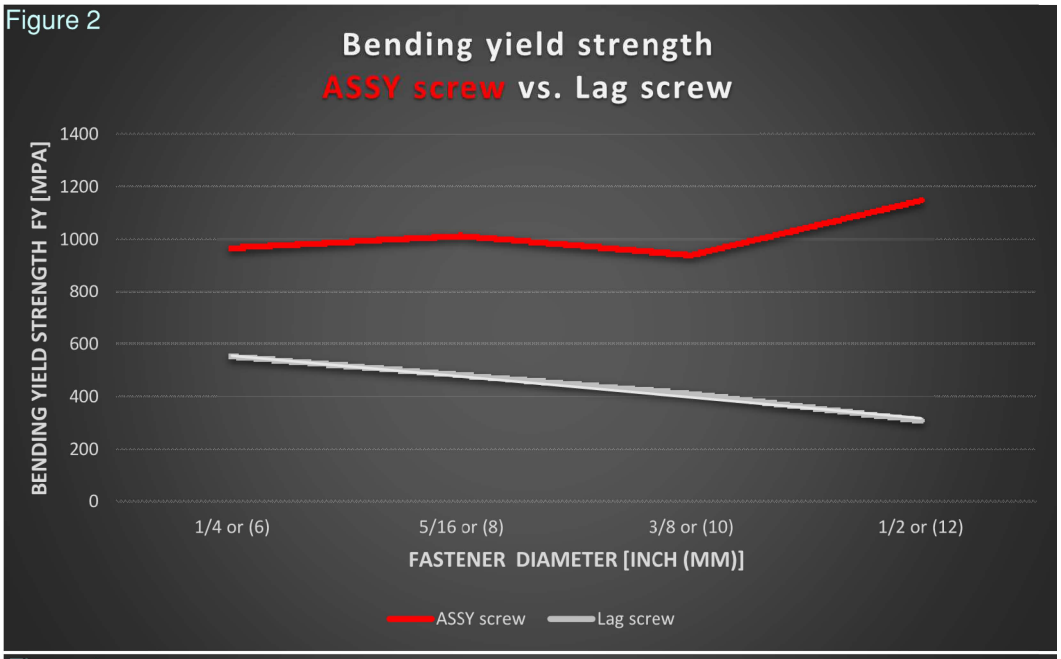
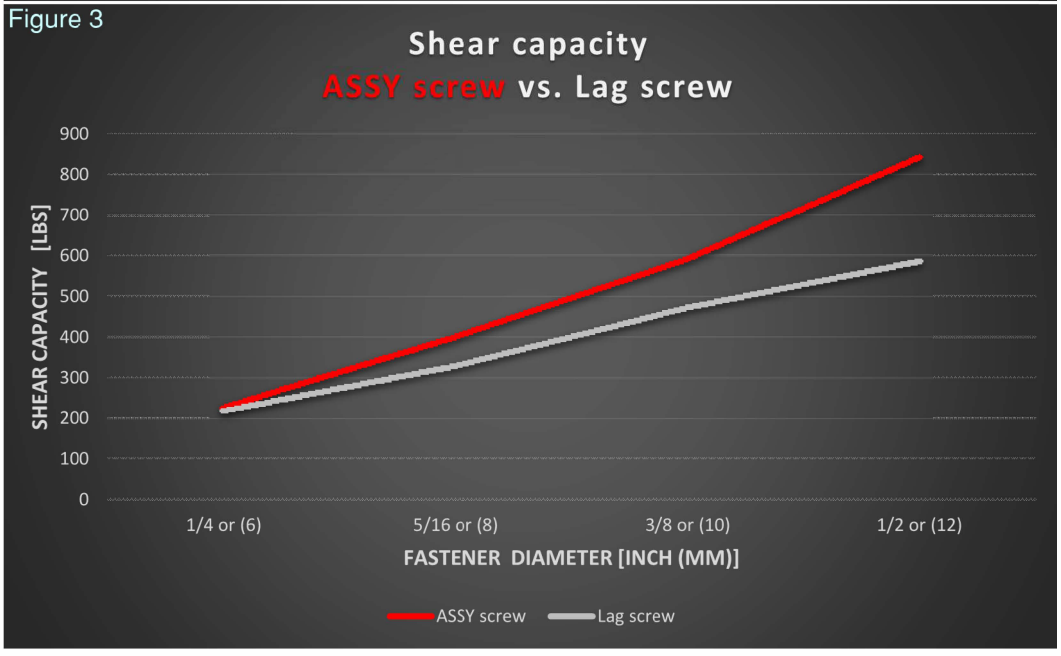


Figure 3



Note: Shear capacity compared for main and side member loaded parallel to grain

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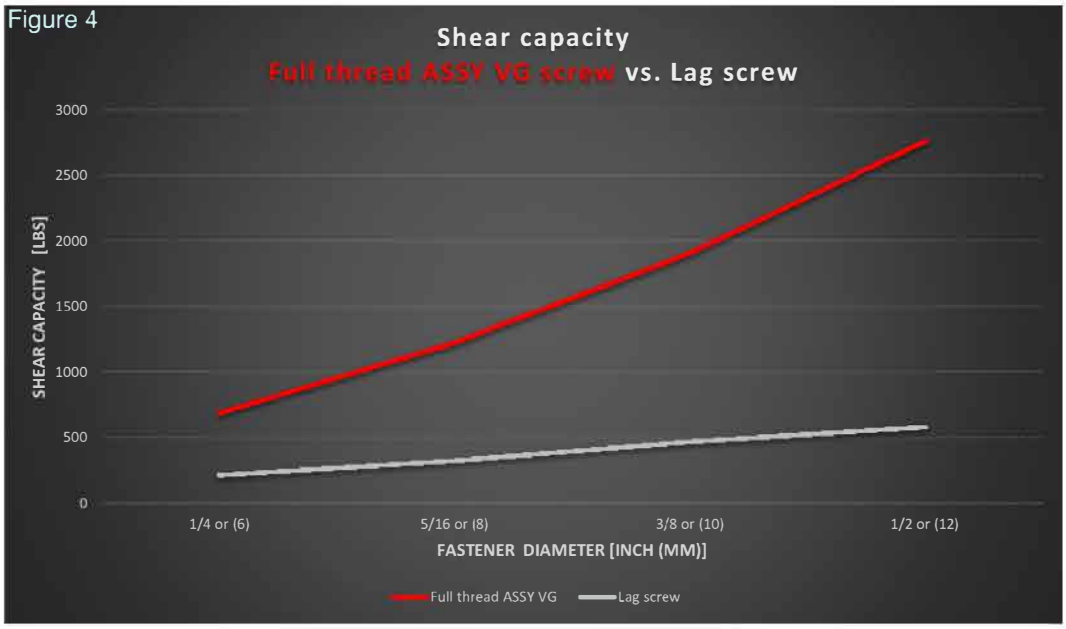
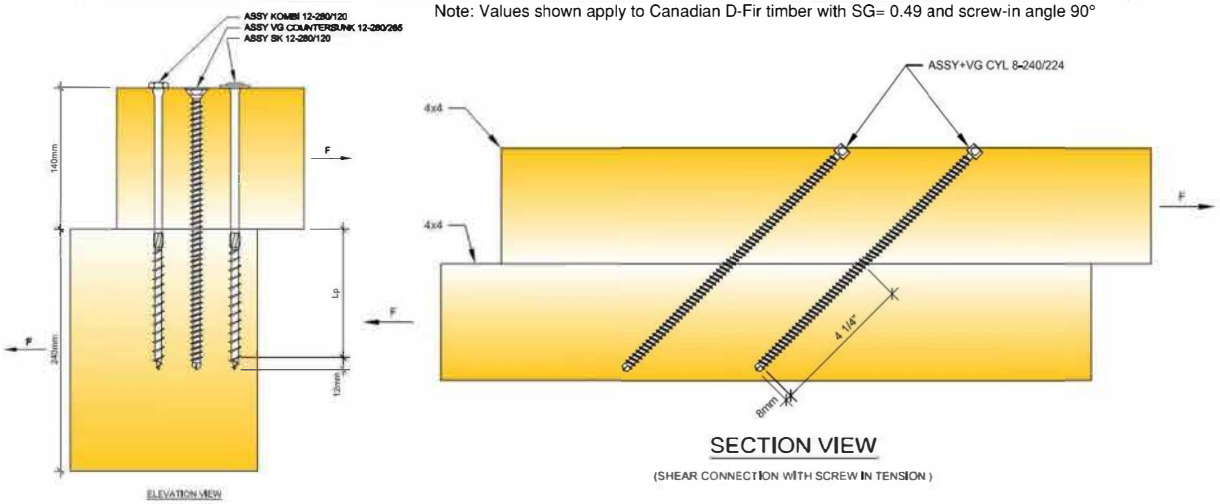
In Figure 1 we already visualised the superior performance of structural wood screws in withdrawal applications. The withdrawal resistance, the strongest property of structural wood screws, may also be used in the design of shear connections where high connection capacity and stiffness is required. The concept to utilise the withdrawal resistance over the fasteners shear capacity is simple and can be achieved by installing the fastener at an angle to the wood grain. Typically this installation angle is at 45° and fully threaded wood screws are suggested to be used. The fully threaded screws provide thread embedment in side and main member and therefore yield high withdrawal resistance in each connection element. Figure 4 highlights capacity differences among common lag screws in shear and full thread ASSY screws in tension i.e. withdrawal.

Figure 4



Note: Values shown apply to Canadian D-Fir timber with SG= 0.49 and screw-in angle 90°



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