

Fastening timber and composite decking to either timber or steel joists can be a challenge. There are a number of potential issues with timber and composite decking materials that need consideration when selecting an appropriate fastener.

Moisture effect on timber

Timber shrinks and swells as it loses and gains moisture, respectively. In timber decking, virtually all of the moisture-related dimensional change occurs in the cross section of the board (thickness and width), while at the same time there is a negligible change on length. Timber shrinkage and swelling occurs in the moisture range between “fibre saturation point” and zero moisture content. Above the fibre saturation point, there is no change in dimension regardless of moisture gain or loss. The “fibre saturation point” is the moisture condition where the timber cell walls are fully saturated with water, and there is no free water in the cell lumens. This condition is between 25% and 30% moisture for most timber species. In addition to shrinkage and swelling in the cross section, timber can warp, twist, and bow as it gains and loses moisture between fibre saturation point and zero moisture. However, it does not change dimension or shape as the moisture content fluctuates above the fibre saturation point.

The moisture content of a timber deck in service depends on the season of the year, local environment and exposure, and the deck board manufacturing. A timber deck could be as low as 6 percent moisture content in the summer in some New Zealand locations, and it might exceed 20% at other times of the year. Timber that is sheltered from rain will only shrink and swell with relative humidity because it is not exposed to liquid water.

Some timber decking and timber framing products are treated with preservative chemicals. The types of chemicals used for exterior timber decking and framing are carried in water, and the result is that chemically treated timber probably has an elevated moisture content when it goes to the timber yard or it might be kiln dried to remove the excess moisture after treatment. Preservative chemicals minimally affect the shrinkage and swelling characteristics of the timber.

Fastener selection

Fastening timber and composite deck boards to steel or timber framing involves several significant challenges. When fastening timber decking to steel framing the fastener has to drive through the timber and steel. Also, for the fastener to perform in service, the screw needs to have corrosion resistance and ductility. This means that the fastener needs to have an appropriate metallurgy and protection so that it can resist corrosion, stress corrosion, hydrogen-assisted stress corrosion, and fatigue. These requirements conflict with the properties that make the screw drive through timber and metal.

The best result in fastening timber decking to timber joists, is achieved with decking screws or stainless steel fasteners. This is recommended firstly to deal with corrosion issues that may occur due to the treated timber. Secondly, the moisture content in the timber will fluctuate and cause the fasteners to be loaded by dimensional changes due to shrinkage and swelling. We recommend that the best long-term solution for timber-to-timber deck fastening is 300-series stainless steel screws which have the ductility to allow for shrinkage and expansion of the timber and provide good corrosion resistance. Use 304 or 305 stainless steel screws away from marine environments, and use 316 stainless steel screws near the ocean.

The best fasteners for fixing timber and composite deck materials to steel framing are bi-metal screws or specially designed composite decking screws. The bi-metal screws have a hardened drill point and leading threads that are fused to stainless steel shanks and heads. This type of screw can drill through soft and hard materials, form threads in steel, and provide corrosion resistance and ductility, which contribute to long lasting deck surfaces. The screws must be long enough that the drill point and the first three threads protrude through the steel framing.

If you require further information on the appropriate fastener for your decking project please contact Simpson Strong-Tie on 09 477 4440.