

Urethane Coatings Product Knowledgebase

Why does poor adhesion and delamination occur with some coatings on hardwoods?

- From time to time the topic of adhesion and delamination arises as an interesting point of discussion. Several factors influence and contribute to poor adhesion and/or delamination of many coatings, including TIMBERSEAL and TUNGSEAL.

As detailed on the TIMBERSEAL label and documented in Urethane Coatings literature, TIMBERSEAL is a fast drying sealer for cork, particle board and ALL species of timber. Its primary function is to seal timber cells and thereby ensure that the subsequent coat/s of polyurethane or oil based finish remain laminated to the timber surface. TIMBERSEAL bonds to ALL timber species, even oily timbers such as Brush Box, Back Butt, Tallowwood and Spotted Gum, however adhesion will be compromised if natural contaminants (resins/oil/wax) accumulate on the surface to be coated.

Causes – i.e. Factors that influence poor adhesion (both separately and in combination);

Ageing/acclimatisation of timber. Sap is the blood or juice of timber, which contains a broad mixture of chemicals as detailed above as natural contaminants. Regardless of the amount of time from felling the tree to coating the subsequent timber, there will always remain some residual sap in the timber.

Accordingly over time a portion of this sap will migrate from the timber. Atmospheric conditions. Relative humidity – moisture in the air relative to temperature – constantly changes. Timber expands and contracts as cycles between taking up and releasing moisture. After each cycle, contaminants from residual sap condense on the timber surface.

Temperature/Climate. Temperature and climate influences the time and the rate that residual sap continues to migrate from within timber to the surface. During summer higher temperatures force timber cells to expand assisting sap to migrate. Direct sunlight warms the surface it is shining onto, further expanding cells and slightly reducing pressure. Sap moves from the cooler high pressure within the timber to the warmer lower pressure on the timber surface. Natural contamination. All of the above have potential to leave natural contaminants (resins/oils/waxes) on the surface to be coated. Oily timbers, particularly Brush Box, Black Butt, Tallowwood and Spotted gum are more prone to these contaminants and have, have acquired a reputation as 'difficult'. Surface preparation. Overly fine sanding hardwoods will polish or burnished the surface and close the grain (cells on the timber's surface), preventing penetration of the first coat. Slow curing coatings

Artificial contamination Thinning TIMBERSEAL. TIMBERSEAL should not be thinned - thinners compromise the physical properties (reduces flexibility = greater edge bonding) and assists migration of oil from within the timber to its surface. Thinners should only be used if timber seal has thickened.

- Solutions – i.e. Factors to improve adhesion (both separately and in combination);
Removal of Natural Contaminants. Generally, removal is best effected by dampening a rag with cleaning solvent (dampen with mineral turpentine when coating with TUNGSEAL or MODIFIED OILS) and wiping down the surface. Ensure the rag is thoroughly rinsed or replaced with a clean rag every 4 – 6m². In this scenario removal should be repeated between 1st and 2 coats and 2nd and 3rd coats. Furthermore, this procedure must be followed when recoating oily timbers (recoating means additional coats onto timber that has been previously coated – regardless of the time elapsed since the last coat.) Timber, particularly oily hardwoods, should be sanded with nothing finer than 120 grit paper or equivalent, and not burnished. The grain must be left sufficiently open to allow penetration of the first coat. Artificial contaminants Adding Thinners to Timberseal. Thinners should only be used if timber seal has thickened. In this scenario removal should be repeated between 1st and 2 coats and 2nd and 3rd coats.

Furthermore, this procedure must be followed when recoating oily timbers (recoating means additional coats onto timber that has been previously coated – regardless of the time elapsed since the last coat.)

High levels of natural oil and wax (antioxidant) in some timbers will retard the curing process. This is particularly applicable to oil based finishes that cure by the process of 'autoxidation' as the oils and antioxidants significantly slow the process of oxygen absorption, inhibiting curing.

In circumstances of slow curing, natural oil has time to accumulate onto the surface such that when the subsequent coat is applied the presence of oil between coats can significantly reduce adhesion and contribute to delamination.

When recoating high traffic and/or high stress (e.g. surfaces subjected to dragging furniture) oily timbers, extra attention should be given to identify adhesion/lamination damage, and if present repair damage by sanding back prior to recoating.

<http://www.urethanecoatings.com.au/kb/questions.php?questionid=6>