TECHLINE
Properties and Use of Wood, Composites, and Fiber Products

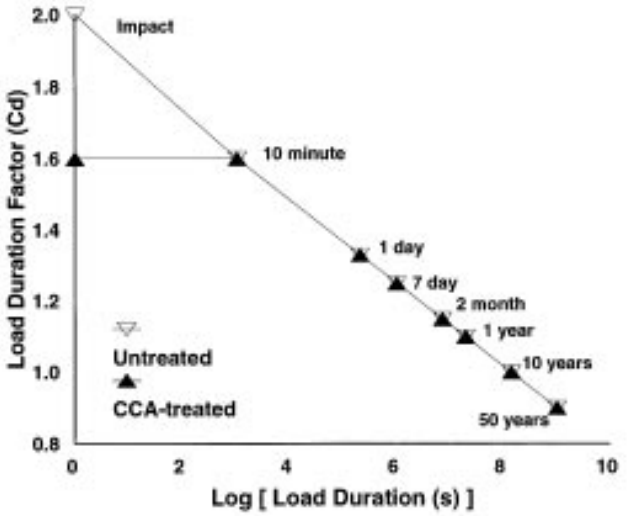
Effects of Waterborne Preservative Treatment on Wood Strength

Waterborne preservative treatment of wood produces a clean, odor-free, paintable/stainable product. Yet, waterborne preservatives can reduce wood strength. Several key factors, such as preservative chemical, redrying temperature, and incising affect the extent of this impact.

The strength loss caused by a waterborne preservative relates directly to its chemistry and the severity of its fixation/precipitation reaction. Ammoniacal copper preservatives affect strength similarly to chromated copper arsenate (CCA). The differences between various CCA formulations appear to be related to chromium content.

All terrestrial preservative retention levels appear to have similar effects on strength when redried at comparable temperatures. However, the higher retentions required for marine use (2.50 lb/ft³ (40 kg/m³)) do significantly reduce bending and impact strength and reduce compression strength when redried above 140°F (60°C).

Redrying temperature appears to be the most decisive single processing factor affecting strength. Air drying after treatment appears to have little practical effect on strength. The higher the redrying temperature, the greater is the negative effect on mechanical properties. As a result, the American Wood Preservers' Association has adopted limits on redrying temperatures to preclude strength loss.



Revised engineering design factor for waterborne-preservative-treated wood.

Design value	Adjustment ratio for incised material	
	Green	Dry
Modulus of elasticity	0.95	0.90
Ultimate bending stress	0.85	0.70
Ultimate tensile stress	0.85	0.70
Maximum crushing strength	0.85	0.70
Shear stress	0.85	0.70

Incising improves preservative penetration and distribution with difficult-to-treat species, but also reduces strength. However, this strength loss is more than offset by the improved performance of the incised treated product.

The engineer designing with treated wood must make two adjustments to regular design procedures. First, the impact load adjustment does NOT apply to allowable design stress values for treated material (see figure). Second, allowable design stress values should be adjusted with incised material as shown in the table.

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Reference

Winandy, J.E. 1995. The effects of waterborne preservative treatment on mechanical properties: A review. *In*: Proceedings, American Wood Preservers' Association; Woodstock, MD: Vol. 91: 17-33.

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