



CORROSION-RESISTANT FASTENERS FOR CONSTRUCTION

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Introduction

Certain fastener types are recommended in construction for specific reasons. The configuration of the fastener is related to its function, its appearance and its structural performance in the completed assembly. Wherever fastener configuration is critical to performance, APA recommendations specify accordingly.

Corrosion resistance of fasteners is of primary importance for construction applications that are exposed to the weather or other high moisture conditions, particularly in certain cases where the wood is treated. The bases of APA fastener recommendations for some of these applications are described in this technical note.

A zinc coating (galvanized) on a steel fastener is a sacrificial protection. This means that when corrosive conditions exist, the zinc is the first metal to corrode, saving the steel. Over time, however, the protection provided by the zinc can diminish considerably in damp, corrosive environments. When subjected to high-salt spray, for instance, the heads can corrode completely off galvanized nails, severely compromising the nails' ability to hold.

Aluminum fasteners are not satisfactory for use in pressure-preservative treated wood or other highly corrosive environments.

Exterior Siding

APA has historically recommended corrosion-resistant fasteners for exterior wood structural panel or lap siding, an application that is obviously subject to weathering and frequent high moisture conditions. Although corrosion of fasteners can ultimately affect structural performance, a more immediate consideration for siding is to prevent unsightly staining.

Based on outdoor exposure and accelerated laboratory tests, APA has determined that greater-than-minimum corrosion resistance is required for siding fasteners in order to preserve the desired appearance of exterior siding when exposed to weather. The typical electroplated zinc coating is relatively thin. For this reason, nails should be hot-dip galvanized steel, or Type 304 or 316 stainless steel. Although aluminum nails perform satisfactorily in untreated wood, they are not as easily driven by hand. Aluminum, hot-dip galvanized (conforming to ASTM A153) and stainless-steel nails are available for use with power-driving (pneumatic) fastener tools.

Even high-quality galvanized fasteners described above may sometimes react under wet conditions with the natural extractives of some wood species, and may cause staining if left unfinished. Such staining can be minimized if the siding is finished in accordance with APA recommendations, or if the roof overhang protects the siding from direct exposure to moisture and weathering. For best performance in such cases, however, use of aluminum or stainless steel fasteners should be considered. For ocean-front structures, where salt spray is likely, only Type 304 and 316 stainless steel fasteners are recommended.

Permanent Wood Foundations

Accelerated laboratory corrosion tests show that fasteners other than stainless steel can corrode in preservative-treated material at moisture contents which may occur in wood foundation components below grade. Plywood and lumber in wood foundation walls must be permanently attached to act structurally in providing shear-wall resistance to resist earth, wind and seismic loads, and to restrain the lumber studs so they do not buckle under applied vertical loading. Since plywood-to-lumber fasteners must have long-term durability, Type 304 or 316 stainless steel fasteners are required by the 2003 International Residential Code (IRC) for attaching plywood to

lumber below grade. Above grade, where the material will normally be dry, the 2003 IRC permits hot-dip or hot-tumbled galvanized steel, stainless steel, silicon bronze or copper fasteners. Note, however, that at least one major forest-products trade association and at least one preservative-treatment producer recommend against using standard carbon-steel, aluminum, copper or copper-based (e.g., brass or bronze) metal products in direct contact with pressure-treated wood anywhere unless specifically recommended or permitted by the manufacturer. This consideration is important in light of the new preservative treatments (see Note below). Electrogalvanized steel nails and galvanized steel staples are not permitted below grade by the 2003 IRC to attach panels to treated wood (R402.1.1).

The lumber-to-lumber connections above grade must perform structurally to carry long-term loads from the soil. The lumber-to-lumber fasteners above grade will be in a dry environment, and hot-dip galvanized nails may be used if permitted by local codes and recommended by the fastener manufacturer. Hot-dip galvanized fasteners should conform to ASTM A153. Connectors (such as joist hangers, plate connectors, sheet-metal anchors, etc.) should be of the same type as the fasteners (e.g., hot-dip nails with hot-dip hangers, stainless-steel nails with stainless-steel hangers).

Lumber knee walls are sometimes used to support brick veneer. In those cases, the studs are toenailed to the wood foundation wall, and are directly exposed to the soil. Lumber-to-lumber fasteners in

brick knee-wall assemblies, therefore, must be Type 304 or 316 stainless steel. Again, check local codes and fastener manufacturers for specific fastener requirements.

For complete construction details and recommendations for the Permanent Wood Foundation (PWF) system, contact the Southern Forest Products Association, P.O. Box 641700, Kenner, LA 70064-1700, or download the *Permanent Wood Foundations Design and Construction Guide* from www.southernpine.com.

Fire-Retardant-Treated Plywood

Fire-retardant treating of panels involves a secondary production process involving impregnation of proprietary chemical formulations by treatment companies. Chemicals used in fire-retardant-treated (FRT) plywood are typically inorganic or organic salts that may become corrosive when used in high moisture conditions. The hygroscopic nature and corrosion characteristics may vary between treatments. Therefore, APA recommends that fastener recommendations be obtained from the company providing the treatment and redrying service.

Note: Some new preservative treatments may be corrosive to silicon bronze, copper, aluminum and galvanized steel fasteners. As of this writing, testing is ongoing to determine the corrosiveness on fasteners of recently revised wood-treating requirements. The recommendations above represent a summary of the recommendations of the wood, fastener and treating industries and are subject to

change without notice. Some proprietary fasteners may provide satisfactory performance (conforming with ASTM A153) where hot-dip galvanized and Types 304 and 316 stainless steel are recommended above. Check with manufacturer and treater. Also check requirements of local building codes as they may be more restrictive than the recommendations above. In all cases reviewed, Types 304 and 316 stainless steel fasteners are acceptable.

We have field representatives in many major U.S. cities and in Canada who can help answer questions involving APA trademarked products. For additional assistance in specifying engineered wood products, contact us:

**APA – THE ENGINEERED
WOOD ASSOCIATION
HEADQUARTERS**

7011 So. 19th St.
Tacoma, Washington 98466
(253) 565-6600 • Fax: (253) 565-7265



www.apawood.org

PRODUCT SUPPORT HELP DESK

(253) 620-7400
E-mail Address: help@apawood.org

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