



Metal Roof and Wall Panel Components in Contact with Preservative Treated Lumber

A position paper

Copper-containing preservative-treated lumber is corrosive toward certain types of metal roof or wall panels and most of the recommended fasteners. With the exception of copper or copper alloys, where metal roof or wall panels and accessory materials must be installed in contact with copper-containing preservative-treated lumber, the Metal Construction Association suggests the use of a polymeric membrane material as a barrier between the metal panel and the wood. In those types of installations, the choice of compatible metal fasteners is also critical to the integrity of the metal roof or wall assembly.

Background

Wood preservatives and treatments have been used for decades to prevent damage by termites and other insects, decay from fungi, and damage from fire. One of the more popular treatments was Chromate Copper Arsenate (CCA) which was invented in 1933. It was not widely used until the late 1960s. At that time the other preservatives in use were creosote made with coal and tar, and pentachlorophenol (penta) which was an oil based preservative containing dioxin.

CCA gained popularity over creosote and penta because it penetrated wood products better. However in 2003, the EPA announced it would phase out the use of CCA for residential and consumer applications because of the presence of arsenic in the preservative. In response, the American Wood Preservers Association (AWPA) announced a voluntary change to the formulations of wood preservatives. Lumber treated with CCA is still used for building poles, saltwater and guard rail posts. However, it is no longer use for decking and most applications involving 2X4s, 2X6s, and common dimension lumber.

The wood preservative industry responded by offering a new assortment of treatments that included Alkaline Copper Quaternary (ACQ), Copper Azole (CA) and Ammoniacal Copper Zinc Arsenate (ACZA). These chemicals contain biocides that do not include arsenic or chromium, and are currently acceptable to the EPA.

The newer products had a similar appearance and performance compared to CCA treated wood. However, it was soon discovered that they can be twice as corrosive toward metal, other than copper or copper alloys, in situations where the lumber will be exposed to moisture.

Corrosivity of Preservative-Treated Lumber

Corrosion of metals in an aqueous environment is an electrochemical process involving two steps. 1) Water and oxygen, must diffuse to the metal surface, and 2) the reactants must have enough energy to complete the reaction. Some of the preservative chemicals bond to the wood and a small percentage of them remain in ionic form in the wood. The ionic components increase the corrosiveness of the wood product toward metal. At higher moisture contents, wood conducts electricity and ions better, and therefore, the corrosion reaction occurs at a faster rate. It is believed that corrosion activity within wood requires a moisture content of 20% or greater. (1)

Many of the new preservative formulations contain twice as much copper as CCA. Copper ions can accelerate the corrosion of steel and aluminum.

The potential for corrosion of hardware in contact with treated wood occurs when metals in the preservative (such as copper) are different from the metals in the hardware (the iron in steel, or aluminum). In a wet environment these dissimilar metals create a small electrical current that triggers a chemical reaction resulting in galvanic corrosion. This is the challenge in selecting proper fasteners and connectors to be used with pressure treated wood. The MCA's Technical Bulletin on Fastener Selection Guideline addresses this for metal panels as follows: (2)

“ACQ, Penta, CA or CBA preservative-treated lumber can be incompatible with certain types of fasteners. In those cases where any type of metal roof or wall cladding materials are being attached to preservative treated lumber, the following fasteners are not compatible: zinc plated screws, zinc-alloy headed screws, stainless capped screws, aluminum, copper and copper alloy. Metal panel fasteners that are compatible with preservative-treated lumber are stainless steel fasteners, or hot dip galvanized nails manufactured to ASTM A153 class D or heavier. Other types of fasteners coated with proprietary anti-corrosive technologies are also available for use with preservative-treated lumber.”

Industry Positions

The manufacturers of the new wood preservative chemicals are specific in their recommendations regarding unpainted galvanized or Galvalume sheet panels – generally they advise that it should not be in direct, long-term contact with wood that contains ACQ or other new water-based preservatives. The preservative manufacturers recommend stainless steel fasteners or hot-dipped galvanized fasteners that meet ASTM International A153 *Standard Specification for Zinc coating (Hot-Dip) on Iron and Steel Hardware*. Connectors should be ASTM A653, *Standard Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process*, Class G185 sheet or better for protection against the effects of moisture often present where treated wood is used.

The manufacturers also recommend that aluminum should not be used in direct contact with this type of wood. Instead, they suggest that metal, other than copper or copper alloys, should be separated from the treated wood with a physical barrier such as rubber, vinyl, plastic sheeting, asphalt roofing paper, or a maintained industrial coating. (3)

Steel Industry recommendations

Wheeling Corrugating

A study by Wheeling Corrugating was done to determine what kind of barrier may be effective in preventing the corrosive attack on metal wall panels.(4) The research was conducted by H.L. Stauver of Touchstone Research Laboratory, Ltd, in Triadelphia, W. VA. The conclusion from that study was:

“Water and ice shield material was most effective in preventing a corrosive reaction between any of the steel products tested and either type (ACQ and copper azole) of pressure-treated lumber. Effectively, there was no surface damage where the water/ice shield contacted the metal or painted surfaces. The use of 30-pound roofing felt was somewhat effective in minimizing the corrosion of the various steel products, but does not appear to offer substantial improvement over direct metal to wood contact. Direct contact with the pressure-treated lumber grades had the anticipated effect of corrosion on both the galvanized products and two of the painted steel materials in that the paint and the base steel were damaged by direct contact with the treated lumber...it is recommended that all galvanized be protected with water/ice shield membrane or with a similar product in any construction.”

U.S. Steel

U. S. Steel has also tested preservative-treated lumber in contact with architectural sheet steel products commonly used for metal roofing and siding applications. Those products included G90, Galvalume, acrylic-

coated Galvalume, prepainted HDG, and prepainted Galvalume. The preservative-treated lumber included CCA and ACQ chemicals. The results showed that ACQ was generally more corrosive to most coated steel products.

They concluded that isolating the steel from preservative-treated wood by using water resistant barrier materials is an effective way to minimize corrosion. Those types of materials would include peel-and-stick polymeric membranes, polymer tapes, masking and lining materials. They also concluded that isolating with materials with a paper or felt component should be avoided since they can retain moisture which can increase corrosion. (5)

National Frame Builders Association Recommendations

Most metal component manufacturers recommend that panels or flashing should not come into contact with preservative-treated wood. Many manufacturers recommend installing a barrier material that will stop all electrical current between the treated lumber and metal. Furthermore, NFBA suggests that water should not drain off of treated wood onto panels or flashing. (6)

National Roofing Contractors Association Recommendations

The NRCA recognizes the lack of long-term corrosion performance of newer preservative-treated lumber in contact with metal fasteners, panels and flashing. Their guidelines include the following

- *“Aluminum fasteners, flashings and accessory products should not be used in direct contact with any treated wood. ACQ-treated wood is not compatible with aluminum.*
- *Uncoated metal and painted metal flashings and accessories, except for 300-series stainless steel, should not be used in direct contact with treated wood. Metal products, except stainless steel, may be used if separated from treated wood by a spacer or barrier, such as single-ply membrane or self-adhered polymer-modified bitumen membrane material.” (7)*

NRCA also states ... *“In many instances, the use of non-treated, construction-grade wood is suitable for use in roof assemblies as blocking or nailers, provided reasonable measures are taken to ensure the nontreated wood remains reasonably dry when in service. Where a specific construction detail provides for a secondary means of waterproofing, NRCA now considers the use of nontreated, construction-grade wood to be an acceptable substitute for treated wood.”*

Steel Deck Institute Recommendations

The SDI conducted tests of G60, G90, and primed steel deck in contact with ACQ and copper azole preservative-treated lumber. They also evaluated the performance with a barrier between the pressure treated lumber and the steel specimens. The barriers were 30 pound felt paper and water/ice shield. Using

the AWWA procedure E12 “Standard Method for Determining Corrosion of Metal in Contact with Treated Wood”, the SDI found the following:

“The results of this study found that the use of water and ice shield material was most effective in preventing a corrosive reaction between any of the steel products tested and either type of pressure treated lumber. Effectively, there was no surface damage where the water/ice shield contacted the metal or painted surfaces. The use of 30 pound roofing felt was somewhat effective in minimizing the corrosion of the various steel products, but does not appear to offer substantial improvement over direct metal to wood contact. Direct contact with the pressure treated lumber grades had the anticipated effect of corrosion on both the galvanized products and the painted steel materials in that the zinc coating and/or the paint and the base steel were damaged by direct contact with the treated lumber.” (8)

As a result, the Steel Deck Institute recommends a barrier of water-and-ice shield or equivalent be used between pressure treated lumber and steel deck products or accessories.

MCA Comments

Based on the contents of this position paper, it is clear that the use of copper-containing preservative-treated wood would be corrosive to certain types of metal and affect the long-term integrity and performance of a metal roof or wall system. Generally, ACQ and other copper containing preservative-treated lumber should not be used in direct contact with metal components (other than copper or copper alloys) where moisture will be present. The only way to avoid corrosion in those circumstances would be to install a special and costly barrier between the metal roof or wall panel and the pressure-treated wood.

With the exception of copper or copper alloys, where metal roof or wall panels and accessory materials must be installed in contact with copper-containing preservative-treated lumber, the Metal Construction Association suggests the use of a polymeric membrane material as a barrier between the metal panel and the wood. Until long-term performance data are available, the MCA can not recommend the use of copper-free wood preservatives (eg. borates) in direct contact with metal roofing or wall panels.

The Metal Construction Association will continue to monitor the recommendations from the wood preservative industry before they can complete their investigation and make any final recommendations.

REFERENCES

- (1) Flynn, K., Quarles, S., and Shelly, JI, Non-Biological Deterioration of Wood, Forest Products Laboratory, University of California, 1995.
- (2) *Fastener Selection Guideline*, Metal Construction Association Technical Bulletin, May 2008.
- (3) H. DeVenizio, Treated Wood, *The Construction Specifier*, May 2005.
- (4) Tests Shed Light on Corrosion, *Rural Builder*, May 2005.
- (5) *ACQ Pressure Treated Lumber Effect on Sheet Steel*, United States Steel Corporation Technical Bulletin, TBP 2005.19.
- (6) *Pressure-Treated Wood for Post-Frame Construction*, published by the National Frame Building Association.
- (7) *Use of Treated Wood in Roof Assemblies*, published by the National Roofing Contractors Association, February, 2005.
- (8) *Steel Deck Products in Contact with Pressure Treated Lumber*, Steel Deck Institute Position Statement, August 2006.