

METAL ROOF AND WALL PANEL COMPONENTS IN CONTACT WITH PRESERVATIVE-TREATED LUMBER

A Position Paper of The Metal Construction Association



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 (MCA) 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 chromated 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 from coal-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 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 guardrail posts and posts in salt-water. However, it is no longer used for decking and most applications involving 2 x 4s, 2 x 6s, and other 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 could 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; 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 (aluminum or the iron in steel). 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 Compatibility of Fasteners with Metal Roof and Wall Panels* addresses this issue for metal panels as follows:

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 A 153 class D or heavier. Other types of fasteners coated with proprietary anticorrosive technologies are also available for use with preservative-treated lumber.²

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 A 153, *Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*. Connectors

should be ASTM A 653, *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.

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

Wheeling Corrugating

A study by Wheeling Corrugating was done to determine which 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, WV. The conclusion from that study was:

Water and ice shield material was most effective in preventing a cor-

rosive 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.



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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, and masking and lining materials. They also concluded that isolating materials with a paper or felt component should be avoided since these products can retain moisture, which can increase corrosion.⁵

National Frame Builders Association

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 from treated wood onto panels or flashing.⁶

National Roofing Contractors Association

The NRCA recognizes the lack of long-term corrosion performance of newer preservative-treated lumber in contact with metal fasteners, panels, and flashing. The association's 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 nontreated, 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

The SDI conducted tests of G60, G90, and primed steel deck in contact with ACQ and copper azole preservative-treated lumber. SDI 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 AWP procedure E12, "Standard Method for Determining Corrosion of Metal in Contact with Treated Wood," the SDI found the following:

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 cannot recommend the use of copper-free wood preservatives (e.g., 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 completing its investigation and making any final recommendations. ☐

REFERENCES

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- 3 H. DeVenzio, "Treated Wood," *The Construction Specifier*, May 2005.
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- 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*, National Frame Building Association.
- 7 *Use of Treated Wood in Roof Assemblies*, National Roofing Contractors Association, February, 2005.
- 8 *Steel Deck Products in Contact with Pressure-Treated Lumber*, Steel Deck Institute Position Statement, August 2006.