





Steel Corrosion Testing with Preservative Treated Wood



Why discuss this issue ?

- Many of our products used in exterior/outdoor applications
- Combination with preservative treated wood is common – CCA treated standard for 30 years
- CCA is going to be withdrawn from consumer market at end of 2003
- Some new treatments are likely more corrosive than CCA
- Customers/Specifiers/Industry Groups are asking us what we know and for a recommendation



What actions are we taking ?

- Developing treating industry contacts and relationships-encouraging cooperation of Chemical Suppliers
- Researching available facts and information
- Raising issue awareness – pop bulletin
- Salt Spray testing – 500 hour exposure
- AWWA E12 testing – 5 woods with 5 steels
- Osmose Research Protocol – Nails, screws, hangers



TECHNICAL BULLETIN
Corrosion Resistant Options

Stainless Steel (SS)
Stainless steel is a family of iron alloys containing a minimum of 10.5% chromium. The chromium forms a thin, protective oxide film on the surface of the metal, which prevents further oxidation and corrosion.

Aluminum (AL)
Aluminum is a lightweight metal that is highly resistant to corrosion. It is commonly used for hangers in corrosive environments.

Galvanized Steel (GAL)
Galvanized steel is steel that has been coated with a thin layer of zinc. This coating provides excellent protection against corrosion.

Material	Grade	Thickness	Notes
Stainless Steel	304	1/8"	Standard
Stainless Steel	316	1/8"	Marine grade
Aluminum	6061-T6	1/8"	Standard
Aluminum	5052-H32	1/8"	Marine grade
Galvanized Steel	A36	1/8"	Standard
Galvanized Steel	A572-50	1/8"	Standard



USP Structural Connectors™
A GEBRALTAR COMPANY

Triple Zinc G-185 Connector Guide

www.USPconnectors.com

Why should I use Triple Zinc Connectors with treated lumber?
USP Structural Connectors™ wants to make sure that you are offered the safest and strongest structure. We are committed to providing structural connectors to meet the changing needs of the industry. USP Structural Connectors™ offers a complete line of Triple Zinc G-185 connectors to address the changing practices of the treated wood industry.
For minimum corrosion protection, we recommend you use Triple Zinc G-185 connectors in all outdoor applications and with treated lumber.

What is Changing?
Treated lumber chemical suppliers, in cooperation with the Environmental Protection Agency (EPA), have voluntarily agreed to stop producing CCA treated lumber for residential and consumer use by January 1, 2004. CCA Lumber will still be produced for use in industrial, highway, and agricultural applications. It is not intended for use with decks, swing sets, picnic tables, or similar leisure activity gear.

What alternatives do I have?
The treated wood industry has decided to voluntarily make several new alternative wood preservatives available:
Alkaline Copper Quat (ACQ) – uses ethanoline or ammonia to act as the carrier solution. Typical brand names are: Proseco™, Proseco Plus™, NatureWood™ and ACQ™.
Copper Azole Type A and B (CBA-A and CBA-B) – contain copper and boron in the preservative. Brand name is Natural Shield Wood™.
Sodium Borate (SBX) – utilizes boron as an active ingredient. One brand is Insecticide Plus™.

What effect do the preservatives have on Structural Connectors and Fasteners?
In general, connectors, including anchors and fasteners, installed in corrosive environments or exposed to corrosive materials, or chemicals, can be damaged possibly resulting in the reduction of load values. Standard Q10 connectors should not be installed in potentially corrosive environments.
Due to the marketing of new types of treated lumber, USP Structural Connectors™ has developed a line of Triple Zinc G-185 connectors, which can be used with the new preservative alternatives.
For maximum corrosion protection, USP recommends consumers use the new Triple Zinc G-185 connectors with treated lumber as well as exposed or outdoor applications. Fasteners used with Triple Zinc G-185 connectors should be hot-dip galvanized steel.

For more information on the Triple Zinc G-185 connectors, please call USP Structural Connectors™ at 800-355-6154.

USP Structural Connectors™
A GEBRALTAR COMPANY

Where is our testing occurring ?

- In back yards all across America
- Laboratory testing – Stork Twin Cities in Minneapolis – independent third party
- Retention verification and consultation with TPI

USP Structural Connectors™
A GEBRALTAR COMPANY

When will test results be available ?

- E 12 samples being prepared 1st week of March – 672 hour (28 day) exposure period – Preliminary results in hand
- Osmose Research Protocol samples in preparation around end of March – 2160 hour (90 day) exposure period - Preliminary Results end of July
- What are we likely to learn ?



**AMERICAN WOOD-PRESERVERS' ASSOCIATION
STANDARD
E12-94¹**

(This Standard is promulgated according to a consensus procedure under the purview of ASTM International.)

**E12-94¹
STANDARD METHOD OF DETERMINING CORROSION OF METAL IN
CONTACT WITH TREATED WOOD**

Note: ASTM Standard E12-94 consists of two pages.

Scope:
This method describes a laboratory procedure for determining the corrosion of metal in contact with treated wood. The procedure requires burial of metal coupons in wood under test conditions and the corrosion rate is determined by weighing the coupons after a specified period of exposure. The test can be completed in 48 hours, depending on the permeability and type of the wood to be investigated.

1. Test Material

1.1 Metal: Test pieces, 15 x 75 mm (5/8 x 3) and 5 x 25 x 3 mm (3/16 x 1 3/8 x 1/8) thick, of each of the materials shall be used. The test pieces shall be SAE 1010 steel, A513 mild steel, 2024-T3 aluminum alloy, and 304 stainless steel. The metal shall be prepared in accordance with the material specifications. Each metal coupon shall have been stored after treatment and then tested in an atmosphere equivalent to 40 to 75% relative humidity for 48 hours prior to use. Control of atmospheric humidity is to be held in well-ventilated rooms, such as, CCA, storage, or permeability test chambers.

2. Metal Finishing

The metal strips shall be cleaned, prior to use, with fine-grit sandpaper and washed with distilled water. The specimens must be stored in a clean, dry environment until ready for use. The weight of the metal strips shall be weighed to the nearest milligram.

3. Testing Method

Change processes shall be applied to the samples to insure complete contact of the surface of the wood pieces and metal. Each wood block shall have a mass of 10 to 15 kg and shall be cut to the dimensions of 150 x 150 x 100 mm (6 x 6 x 4 in.). The metal strips shall be placed in the wood blocks per unit surface area in 100 x 100 x 25 mm (4 x 4 x 1 in.) squares. The standard was initially adopted in 1986.

© 1993 American Wood Preservers' Association

This table is meant to roughly estimate a relative value and is not intended to be used to compare the data. Each test is performed in triplicate.

4. Reporting
The test results shall be reported to an appropriate authority at 40 to 75% RH and a relative humidity of 50 to 75 percent for a minimum of 48 hours. Specifics, figure should not be included in any reports submitted to the appropriate authority. The standard has been used for the results that be reported.

5. Final Checking

At the end of the exposure period the samples shall be removed from the test strips, thoroughly washed with distilled water, and treated again to remove loose corrosion products. The remaining corrosion products shall then be removed by immersion in one of the following reagents. Aluminum (10 water) 10 parts weight, 100 parts alcohol, 100 parts water and 100 parts 20% aqueous ammonia solution. All the specimens per ASTM (E12-94) are 7.5. The sample shall then be dried in a oven, dried and weighed to the nearest milligram.

6. Calculations

The corrosion rate is calculated as follows:

$$\text{CORROSION RATE} = \frac{W - W_0}{A \times T \times D} \times 10^6$$

Where:
 W = mass (in g) to the nearest mg
 W₀ = mass (in g) to the nearest mg
 A = area (cm²)
 T = time in hours
 D = density (g/cm³) of metal

Aluminum 2.70 grams per cc
 Steel 7.85 grams per cc
 304 stainless steel 7.93 grams per cc



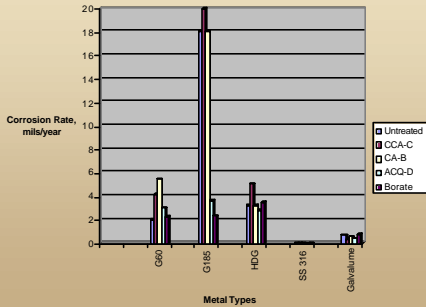
**AWPA E12-94
Corrosion Rates From Tests
Mils / year**

Steel	Wood	Untreated SYP	CCA-C	CA-B	ACQ	Borate
G60		2.01	5.62	5.65	3.84	2.41
		2.06	2.73	5.25	2.16	2.08
G185		19.16	20.27	24.63	3.19	2.35
		17.03	19.68	11.48	4.15	2.29
HDG		4.22	4.63	5.86	2.75	3.73
		2.13	5.53	0.88	2.78	3.24
SS		0.01	0.03	0.00	0.00	0.00
		0.04	0.01	0.04	0.00	0.03
Galvalume		0.34	0.31	0.45	0.43	0.65
		1.01	0.40	0.80	0.43	0.90

CCA-C - Ground Contact - 0.40 pcf retention
 CA-B - Ground Contact - 0.21 pcf retention
 ACQ - Ground Contact - 0.40 pcf retention
 Borate - Ground Contact

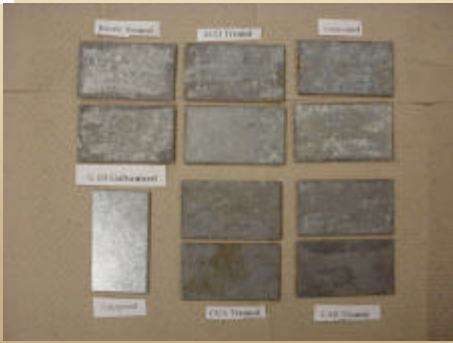


AWPA E 12-94 Test Results



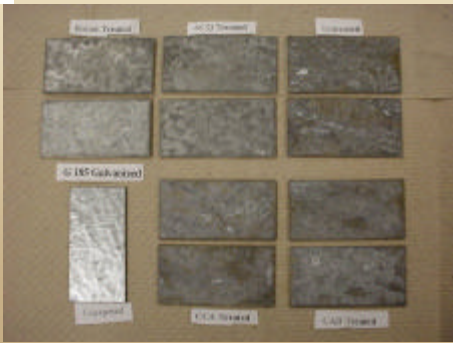


Test Result Photo



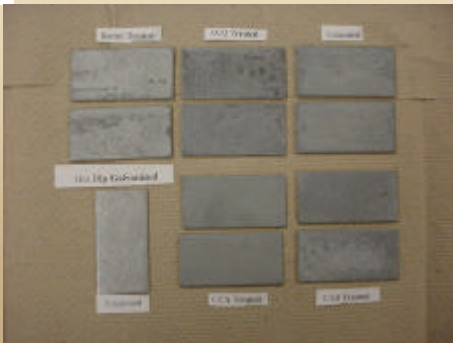


Test Result Photo



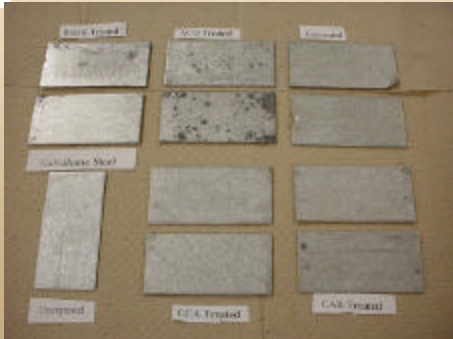


Test Result Photo



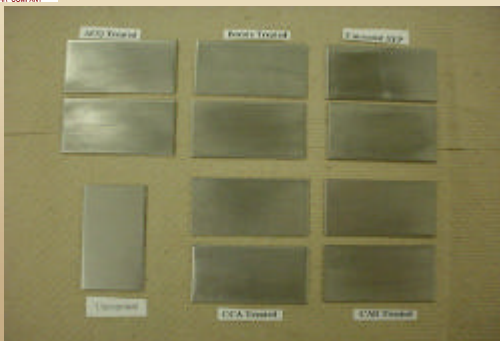


Test Result Photo





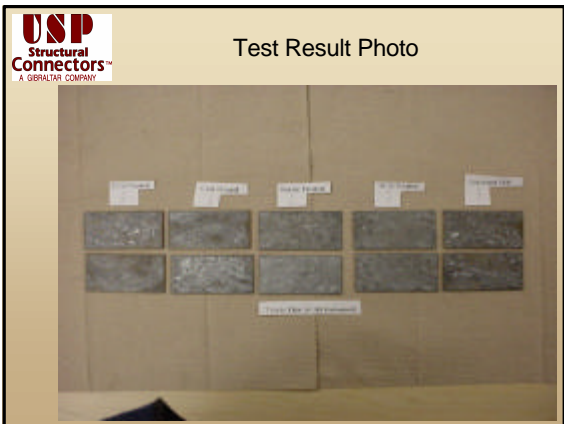
Test Result Photo

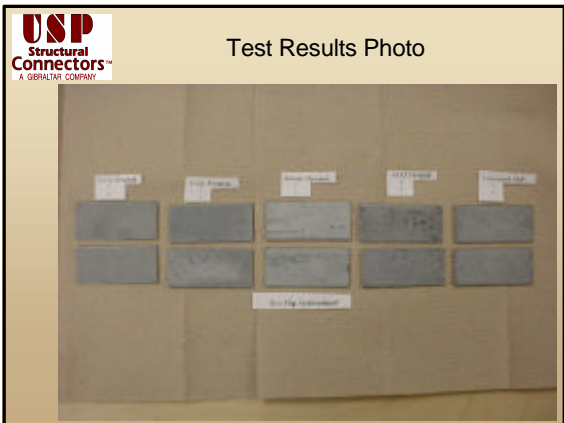


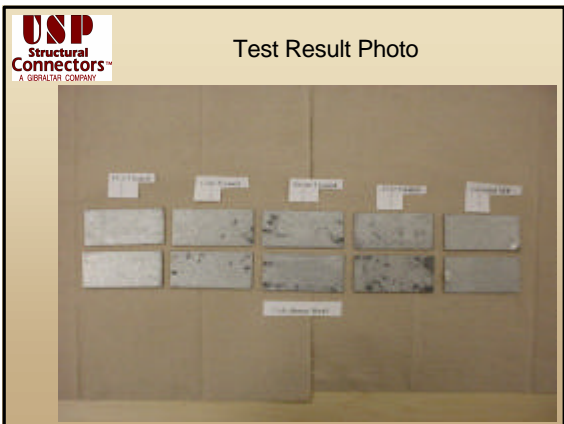


Test Result Photo











Test Result Photo





Test Result Photo





Test Results Photo





Test Result Photo





Test Result Photo





Test Result Photo





Current USP Guidelines on Corrosion

- Corrosion Potential should be part of connector selection criteria
- Best available option is to use stainless steel connectors and fasteners
- For exterior applications, use of HDG or G185 Triple Zinc connectors with HDG fasteners is advised as minimum corrosion protection
- Ask for and follow the recommendations of the preservative wood company for use of connectors and fasteners in contact with their brand of treated wood
- Connectors and their fasteners should be of like materials
- USP WS wood screws are not recommended for use with preservative or fire retardant treated wood
- For further questions contact USP Technical Services
