

CORROSION INFORMATION

UNDERSTANDING THE ISSUES

Metal anchors and fasteners will corrode and may lose load-carrying capacity when installed in corrosive environments or exposed to corrosive materials. There are many environments and materials which may cause corrosion including ocean salt air, fire-retardants, fumes, fertilizers, preservative-treated wood, dissimilar metals, and other corrosive elements.

The many variables present in a single building environment make it impossible to accurately predict if, or when, significant corrosion will begin or reach a critical level. This relative uncertainty makes it crucial that specifiers and users be knowledgeable of the potential risks and select a product coating or metal suitable for the intended use. It is also important that regular maintenance and periodic inspections are performed, especially for outdoor applications.

It is common to see some corrosion on anchors and fasteners especially in outdoor applications. Even stainless steel can corrode. The presence of some corrosion does not mean that load capacity has necessarily been affected or that a failure will occur. If significant corrosion is apparent or suspected, then the wood, anchors and fasteners should be inspected by a professional engineer or general contractor and may need to be replaced.

In the last several years, preservative-treated wood formulations have changed significantly. Many of the new formulations are more corrosive to steel anchors and fasteners than the traditionally used formulation of CCA-C. Simpson Strong-Tie testing has shown that ACQ-C, ACQ-D (Carbonate), CBA-A and CA-B treated woods are approximately 2 times more corrosive than CCA-C, while SBX-DOT (Sodium Borate) treated woods were shown to be less corrosive than CCA-C. (See technical bulletin T-PTWOOD for details).

Due to the many different preservative-treatment formulations, fluctuating retention levels, moisture content, and because the formulations may vary regionally, or change without warning, understanding which anchors and fasteners to use with these materials has become a complex task. We have attempted to provide basic knowledge on the subject here, but it is important to fully educate yourself by reviewing our technical bulletins on the topic, and also by viewing information and literature provided by others. Additionally, because the issue is evolving, it is important to get the very latest anchor and fastener information on the topic by visiting our website at www.simpsonanchors.com/corrosioninfo.

Stainless steel is always the most effective solution to corrosion risk. However, it is also more expensive and sometimes more difficult to obtain. To best serve our customers, Simpson Strong-Tie is evaluating the options to identify the safest and most cost-effective solutions. Based on our testing and experience there are some specific applications that are appropriate for hot-dip galvanized (HDG), mechanically galvanized (MG) or electroplated anchors (see chart below).

Because increased corrosion from some newer preservative-treated wood is a new issue with little historical data, we have to base our recommendations on the testing and experience we have to date. It is possible that as we learn more, our recommendations may change, but these recommendations are based on the best information we have at this time.

See www.simpsonanchors.com/corrosioninfo for additional critical information.

GENERAL SIMPSON STRONG-TIE RECOMMENDATIONS

- Outdoor environments are generally more corrosive to steel. If you choose to use MG or HDG on an outdoor project (i.e. deck, patio cover), you should periodically inspect your anchors and fasteners or have a professional inspection performed. Regular maintenance including water-proofing of the wood used in your outdoor project is also a good practice.
- For wood with actual retention levels greater than 0.40 pcf for ACQ and MCQ, 0.41 pcf for CBA-A, or 0.21 pcf for CA-B (ground contact), stainless-steel anchors and fasteners are recommended. Verify actual retention level with the wood treater.

- Testing indicates wood installed dry reduces potential corrosion. If dry wood is used, see our website for additional information.

Due to the many variables involved, Simpson Strong-Tie cannot provide estimates on service life of anchors or fasteners. We suggest that all users and specifiers also obtain recommendations for HDG, MG, or other coatings from the treated-wood supplier for the type of wood used. However, as long as Simpson Strong-Tie recommendations are followed, Simpson Strong-Tie stands behind its product performance and the standard limited warranty (page 10) applies.

GUIDELINES FOR SELECTING THE PROPER ANCHOR OR FASTENER

1 Evaluate the Application.
Consider the type of structure and how it will be used. These recommendations may not apply to non-structural applications such as fences.

2 Evaluate the Environment.
Testing and experience indicate that indoor dry environments are less corrosive than outdoor environments. Determining the type of environment where an anchor or fastener will be used is an important factor in selecting the most appropriate material and finish for use on the anchors and fasteners. To help in your decision making, consider the following general exposure information:

Interior Dry Use: Includes wall and ceiling cavities, and raised floor applications of enclosed buildings that have been designed to ensure that condensation and other sources of moisture do not develop.

Exterior - Dry: Includes outdoor installations in low-rainfall environments and no regular exposure to moisture.

Exterior - Wet: Includes outdoor installations in higher moisture and rainfall environments.

Higher Exposure Use: Includes exposure to ocean-salt air, large bodies of water, fumes, fertilizers, soil, some preservative-treated woods, industrial zones, acid rain, and other corrosive elements.

3 Evaluate and select a suitable preservative-treated wood for the intended application and environment.

The treated- wood supplier should provide all the information needed regarding the wood being used. This information should include: the specific type of wood treatment used, if ammonia was used in the treatment, and the chemical retention level. If the needed information is not provided then Simpson Strong-Tie would recommend the use of stainless-steel anchors and fasteners. You should also ask the treated-wood supplier for an anchor or fastener coating or material recommendation.

4 Use the chart on the right, which was created based on Simpson Strong-Tie testing and experience to select the anchor or fastener finish or material.

If a preservative-treated wood product is not identified on the chart, Simpson Strong-Tie has not evaluated test results regarding such product and therefore cannot make any recommendation other than the use of stainless steel with that product. Manufacturers may independently provide test results or other product use information; Simpson Strong-Tie expresses no opinion regarding any such information.

Low = Use Simpson Strong-Tie® zinc plated anchors or fasteners as a minimum.

Med = Use MG (ASTM B695, Class 55), HDG or Type 410 stainless steel as a minimum.

High = Use Type 304 or 316 stainless steel anchors and fasteners as a minimum.

Anchor and Fastener Minimum Coating Recommendation - Structural Applications								
Environment	Untreated Wood	SBX/DOT & Zinc Borate	MCQ	ACQ-C, ACQ-D (Carbonate), CA-B & CBA-A			ACZA	Other or Uncertain
				No Ammonia	With Ammonia	Higher Chemical Content ¹		
Interior Dry	Low	Low	Low	Med	Med	High	High	High
Exterior - Dry ⁵	Med	N/A ²	Med	Med	High	High	High	High
Exterior - Wet ⁵	Med	N/A ²	Med ^{3,4}	Med ^{3,4}	High	High	High	High
Higher Exposure ⁵	High	N/A ²	High	High	High	High	High	High
Uncertain ⁵	High	N/A ²	High	High	High	High	High	High

1. Woods with actual retention levels greater than 0.40 pcf for ACQ and MCQ, 0.41 pcf for CBA-A, or 0.21 pcf for CA-B (Ground Contact level).
2. Borate treated woods are not appropriate for outdoor use.
3. Test results indicate that MG/HDG will perform adequately, subject to regular maintenance and periodic inspection. However, the test method used is an accelerated test, so data over an extended period of time is not available. If uncertain, use 304 or 316 stainless steel.
4. Some treated wood may have excess surface chemicals making it potentially more corrosive. If you suspect this or are uncertain, use 304 or 316 stainless steel.
5. Mechanically-galvanized Titen HD® anchors are only recommended for temporary exterior applications.

5 Compare the treated wood supplier's recommendation with the Simpson Strong-Tie recommendation.

If these recommendations are different, Simpson Strong-Tie recommends that the most conservative recommendation be followed.