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Construction Concerns: Pressure-Treated Lumber and Joist Hangers

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The chemicals used in pressure-treating lumber, including fire-retardant chemicals, are corrosive to bare steel. The joist hangers used in construction with both sawn lumber and manufactured joists are usually galvanized (zinc-coated). Photos 1 and 2 show galvanized steel joist hangers supporting nontreated lumber joists. Until recently, the zinc coating on the steel joist hangers prevented corrosion by the most common wood preservative, chromated copper arsenate (CCA), and by some fire-retardant chemicals (usually boron- or borax-based). Stainless steel joist hangers are available for contact with more corrosive treated lumber.

Photo 1

Photo 2

CCA-treated lumber has been used extensively when it will be in direct contact with soil or concrete foundations, as in posts, columns, mud-sills, and bottom plates of stud walls attached to concrete, and as joists in crawl spaces under buildings and supporting decks and exterior stairways.

Because of increased concern about the health and environmental hazards from the use of arsenic salts like CCA in wood preservatives, arsenic-free preservatives have been developed for residential and general use. CCA may still be used for industrial and commercial applications, as in poles, pilings, and guardrail posts. It is not required that existing wood with CCA preservatives in most residential locations be immediately replaced. Since CCA was used for decades, it will be present in buildings and other structures, both residential and commercial, for many years to come.

The preservatives that take the place of CCA are more corrosive to steel, and even to the zinc coating. They include the following:

- Alkaline Copper Quaternary, types C and D-carbonate (ACQ-C and ACQ-D carbonate)
- Copper Azole, types A and B (CA-A and CA-B)
- Sodium Borate (SBX)
- Disodium Octoborate Tetrahydrate (DOT)
- Sodium and Potassium Silicate compounds
- Zinc Borate compounds

If these preservatives are ammonia-based for better penetration of the wood, they will be even more corrosive to steel. Since these preservatives are relatively new, it is not yet known how rapidly the strength of galvanized steel joist hangers will be reduced. It is known that hot-dip galvanizing provides the most corrosion resistance and that the thicker the zinc coating from galvanizing, the more corrosion resistant the steel will be.

Stainless-steel 304 and 316 alloys, used in some joist hangers and connectors, are known to perform well with most wood preservatives, and are often required for use with preservatives with high copper content (ACQ and CA). Other stainless and steel alloys may corrode more quickly, as does aluminum.

Because of the galvanic action (electrolytic corrosion) between two dissimilar metals, joist hanger manufacturers recommend that galvanized and stainless steel NOT be placed in contact with each other. Stainless steel nails, screws, or bolts must be used with stainless steel joist hangers. Galvanized steel nails are preferred with galvanized joist hangers, although ordinary coated-steel nails are also acceptable (*photo 1*).

Damp locations like decks, balconies, crawl spaces, and areas near leaky pipes and roof leaks can accelerate the corrosion (rusting) of galvanized steel joist hangers. In any type of construction, the potential for failure is greatest at fasteners and connectors that are inferior or deteriorated by rust, corrosion, or rot. Galvanized steel joist hangers corroded by wood preservatives or from the use of the wrong nails or screws have been weakened. They will fail in a shorter time when exposed to fire or to the live load of a group of firefighters and cause a partial or complete structural collapse.

Visit the Web site of the American Wood Protection Association www.awpa.com for more information on these wood preservatives. Search the Internet for “pressure-treated lumber” for information on manufacturer Web sites.

Although CCA in the concentration used in wood preservatives is not as toxic to humans as some other arsenic compounds, it is released from burning wood and may react chemically at the temperatures in free-burning fires to form other more toxic compounds. These toxic arsenic compounds are in addition to the soup of chemicals present in smoke at every fire: water vapor, carbon dioxide, carbon monoxide, cyanides, acids, unburned hydrocarbons, ash particles, and the residue of whatever the fire burned in addition to its primary fuel. This should be another argument in favor of the use of self-contained breath apparatus at all fires; the gross decontamination of turnouts and SCBA after use at a fire, before any parts are removed; and the frequent laundering of turnouts.

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