

STRUCTURAL BUILDING COMPONENTS MAGAZINE

December 2004

Technical Q & A

Swimming Pools & Trusses by Ryan J. Dexter

Can metal plate connected wood trusses be used in moist environments such as over an indoor swimming pool?

Over the last month, we have received several questions regarding the use of wood trusses in different applications ranging from above a swimming pool to above a car wash. Environments with continuous wet/dry cycles are generally not suitable applications for wood trusses even without the new preservative treatment/plate corrosion issue discussed in the November Technical Q&A article. However, trusses can be used in swimming pool and similar environments with some precautions.

QUESTION:

My architectural firm is designing several buildings with indoor swimming pools. The roof above the pool area will be framed with metal plate connected wood trusses. How do we design for this situation? How do we prevent plate corrosion? Are there any vapor barrier requirements?

ANSWER

There are many factors to consider when using lumber and metal connectors over an area that could be considered corrosive, such as swimming pool environments. Notice we didn't say trusses, because all wood and metal parts, whether they are in a truss or I-joist/hanger or rafter/nail, will react the same way.

The critical design issues will include:

- Moisture migration of water vapor into the truss space.
- Ventilation of the truss space.
- What the ongoing moisture content of wood in the truss space will be.

The key to long term performance will be to design an environment that will keep the humidity in the truss space to less than 100 percent on an ongoing basis and the moisture content of the lumber less than 19 percent. Since we are not specialists in water vapor transmission nor ventilation, we will leave the answers to those questions to building design specialists in those professions.

There are three main concerns if the moisture content of the lumber is going to exceed 19 percent for prolonged periods of time:

- Wet service factors must be used for the lumber design.
- Lumber must be treated to prevent decay.
- Metal must be treated to prevent corrosion (like the plates you mentioned)

As far as plate corrosion is concerned, check ANSI/TPI 1-2002. ANSI/TPI 1 is the National Design Standard for Metal Plate Connected Wood Truss Construction which is referenced throughout the International Building Code (IBC) and International Residential Codes (IRC). Section 6.5.3 states:

“metal connector plates, including types 304 and 316 stainless steel plates, shall not be exposed to swimming pool environments unless adequate provision is made to prevent stress corrosion cracking. in lieu of use of a stainless steel that is not susceptible to stress corrosion cracking (see commentary below), trusses shall be separated from the pool environment by a vapor barrier and shall be separately ventilated from the pool environment.”

The Commentary to Section 6.5.3 states:

“stress corrosion cracking (scc) is an issue for components in swimming pool building atmospheres, which are safety-critical and load-bearing, but are not washed or cleaned frequently. types 304 and 316 stainless steel have been found to fail due to scc in highly aggressive chloride environments and have been affected by scc in some swimming pools. more highly alloyed grades of austenitic stainless steel have a much greater degree of scc resistance. two grades have been tested and found to be resistant to scc under laboratory conditions, namely 317 lmn and 904 l.”

Wood trusses will perform satisfactorily in most construction environments provided that after permanent installation they are protected with the traditional materials and roofing practices. However, special protection measures may be required when wood trusses are used under adverse conditions. These conditions include exposure to high humidity, as in truss installations over swimming pools. Certain agricultural environments also pose problems, as do highly caustic chemical atmospheres above salt storage buildings or near salt water environments. Protection of the connector plate is an important concern.

Where special protection is necessary, protective coatings such as Epoxy Polyamide, Coal Tar Epoxy and Asphaltic Mastic may be applied to the connector plates after the trusses are installed, and may afford a better long-term solution. The coating seals the plate to the wood, fills between the slots, coats the edges of the exposed raw steel, and provides a synergistic protection to the plate. Its use has been tested on steel structures subjected to direct salt contact at ocean front locations on rolled steel members or exposed metal connector plate joints.

Highly acidic or alkaline environments also require special considerations. In such circumstances,

where the environmental effect on the trusses is unknown, consultation with an experienced wood truss consultant is recommended.

According to ANSI/TPI 1-2002 Section 6.5.1, "The following coatings are recognized as providing increased corrosion protection to metal connector plates:

- (a) Epoxy-Polyamide Primer (SSPC-Paint22)
- (b) Coal-Tar Epoxy-Polyamide Black or dark Red Paint (SSPC-Paint 16)
- (c) Basic Zinc Chromate-Vinyl Butyral Wash Primer (SSPC-Paint27) and cold applied Asphaltic Mastic (Extra Thick Film) Paint (SSPC-Paint12)
- (d) Post-plate-manufacture hot dip galvanizing per ASTM A153."

You can find more information about the plate coatings in ANSI/TPI 1-2002 section 6.5, which is available for purchase through WTCA's online publications catalog (www.woodtruss.com) or through the Truss Plate Institute (www.tpinst.org).

To pose a question for this column, email us at techincalqa@sbcmag.info. To view other questions visit the [WTCA web site](http://www.wtca.org).

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