

Minimum Details and Specifications for Permitting Residential Decks

Frank E. Woeste Ph.D., P.E., and Joseph R. Loferski, Ph.D.

Based on a survey of media sources over the past five years, we believe that more injuries and deaths are related to deck failures than to all other wood building components and loading cases combined. This is made even more significant in light of the estimate put forth by a panelist at the 2004 DeckExpo in Reno, Nevada, that 2.5 million new and replacement decks had been constructed in the previous year. Whatever the exact numbers, there is no question that injuries and deaths resulting from deck-related accidents are likely to increase as more decks are constructed and existing ones deteriorate.

The two major sources of such injury accidents stem from a failure of the connection between the deck ledger and house band joist or a failure of some part of the guardrail system. We believe that the most effective way to curb these and similar problems is through an adequate deck permitting and inspection process combined with education and training of professional deck builders on structural design requirements and construction details that impact occupant safety.

The purpose of this article is to suggest the minimum details and specifications that we believe should be included in all plans submitted by a homeowner or contractor to obtain a residential deck permit.

Details, Details

In order to obtain a permit to build a deck, many jurisdictions require details such as a plan view and nearest lot lines; the size and type of the decking; the size and spacing of floor joists; the size, location and spacing of posts; and the size of beams or girders. Too often, critical connection details are not required and issues such as protection against fastener and connector corrosion and protection against decay are not addressed. Further, a lack of specific details and fastener schedules for ledger and railing connections in the model codes contributes to a wide range of construction practices in the field—some of which are grossly inadequate in meeting the applicable loading requirements for deck and railing systems.

Some localities have taken a proactive lead on this issue by publishing deck details to guide contractors and do-it-yourself builders in the construction of safe decks. One example is Fairfax County, Virginia, which gave us permission to use selected information from its “Typical Deck Details” web page (www.fairfaxcounty.gov/decks/) in producing our proposed minimum details and specifications for permitting residential decks.



Proposed Minimum Details and Specifications for Permitting Residential Decks

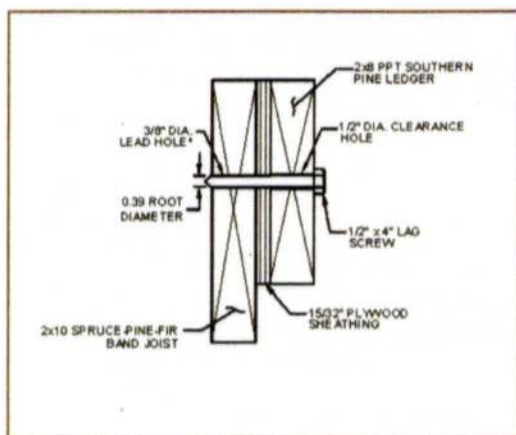
1.0 The owner, homebuilder or deck contractor, hereafter referred to as the contractor, shall submit plans, specifications and other documents as required by the jurisdiction having authority; obtain a permit; and schedule the required inspections of the residential deck. Decks shall not be used or occupied until a final inspection approval is obtained. As a minimum, deck plans shall contain all elements of Section 2.0.

2.0 The contractor shall submit deck plans that include the intended use and loading (40 pounds-per-square-foot live load plus 10 pounds-per-square-foot dead load), and details and specifications that address the structural issues listed in Section 2.1 through 2.13.

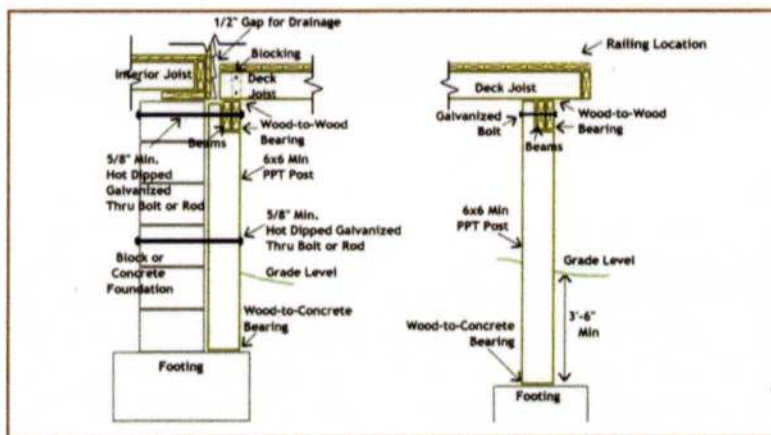
2.1 Plan view of deck and residence, including post locations.

2.2 Joist spans, size, species or species group, grade, and preservative pressure treatment and retention (or heartwood of decay-resistant species per "2000 International Residential Code®" Section R323.1 or 2003 IRC® Section R319.1). The ledger board should be treated to a ground contact preservative retention level because it creates a water trapping joint when placed against the house and is likely to collect debris and soil. Ground contact preservative retentions are 0.21 pounds per cubic foot for CA-B treatment and 0.40 pounds per cubic foot for ACQ-C or ACQ-D treatment.

2.3 Ledger to house band joist connection detail that includes the band and ledger joist material and thicknesses (Example 2.3a) or detail of connection of deck joists to girder and girder to posts (Example 2.3b). The details should include fastener specifications (type, size and number or spacing). Decks should not be attached to brick veneer. (Note that some communities have banned direct connection of the deck to the house to eliminate the possibility of complete collapse due to future decay or inadequate fasteners.)



Example 2.3a. Detail illustrating 1/2 x 4 lag screws at 15" o.c., staggered, 15/32" plywood wall sheathing. (Flashing is not shown in this connection specification and detail, but is always required to protect the wall sheathing and house band from decay.)

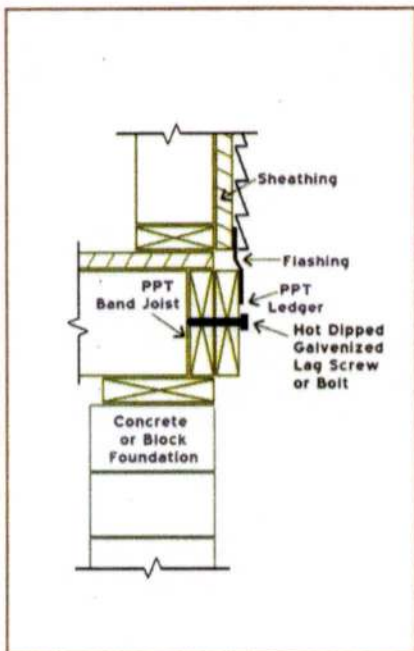


Example 2.3b. Detail illustrating load path and connections from the deck joists to the footings.

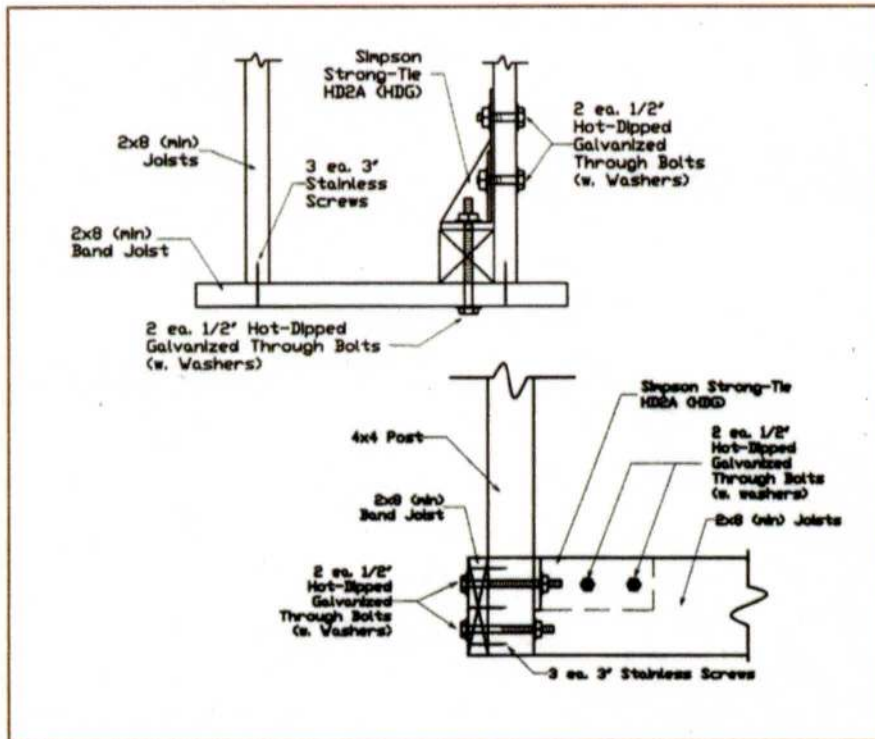
2.4 Flashing at ledger detail and flashing material (Example 2.4a).

2.5 Protection of fasteners and connectors against corrosion (for example: "fasteners hot dip per ASTM A153" or "316 series stainless steel").

2.6 Guardrail and stair handrail details showing spacing of pickets and sizes of openings. Connections between top rail and posts shall be specified. For plastic, vinyl or wood-plastic composite railing systems, a copy of the ICC-ES Evaluation Report for the specific product to be used—available from the manufacturer or at www.icces.org/Evaluation_Reports/index.shtml—should be included as part of the deck plan submittal. ▶▶▶



Example 2.4a. Detail illustrating flashing at ledger. An explanation such as "flashing material is copper with plastic laminate on deck side" should be provided and a specific product named.



Example 2.7a. Detail illustrating 4 x 4 PPT No. 2 Southern Pine rail posts attached to 2 x 8 PPT No. 2 Southern Pine band joist.



THE ASHI® ENDORSED HOME INSPECTOR E&O INSURANCE PROGRAM

PROGRAM FEATURES INCLUDE:

- Premium credits for both ASHI Members and ASHI Candidates
- Claims made policy with 60 day automatic tail
- Coverage for claims resulting in bodily injury or property damage occurring at the inspection site
- Referral coverage for Real Estate professionals and other referring parties
- No additional premium for **Prior Acts coverage** (maintains your current retroactive date without any additional premium)
- No additional premium for radon inspections
- No additional premium for commercial inspections (if 10% or less of services)



**WE'RE KNOWN FOR OUR RESPONSIVE SERVICES AND
COMPETITIVE RATES.**

For more information or to apply for insurance, visit us at WWW.INSPECTORINSURANCE.COM



BUSINESSRISKPARTNERS

Insurance is underwritten by Business Risk Partners, on behalf of an A-Rated (Excellent) by A.M. Best Carrier and serviced by Capitol Special Risks. For more information please call 1-866-268-1327.

- 2.7 Connection detail of rail post to deck support structure (Example 2.7a) for both wood and plastic railing systems that utilize a sleeve which slides over a solid-sawn 4 x 4 post. (Note: some Evaluation Reports rely on a professional to design the guardrail post to deck connection in accordance with state law, regulations and local codes.)
- 2.8 Detail of the lateral bracing system if the deck construction does not provide adequate support against lateral loads. (Note: the IRC does not give values for lateral loads for decks, so the designer must address the issue based on assumed loads and analysis, experience and judgment.)
- 2.9 Footing size and depth to bottom of footer.
- 2.10 Post size, species or species group and grade, and preservative pressure treatment type and retention.
- 2.11 Connection detail of girders to posts.
- 2.12 Connection detail of posts to footings.
- 2.13 Stair details showing riser heights, tread widths, openings between treads, illumination and graspable handrail.

Summary

While based on our professional experience and the input of several building officials, these proposed details and specifications for obtaining a residential deck permit should only be viewed as a starting point for local jurisdictions in formulating their requirements for deck construction. Deck designers should also be aware that in addition to the requirements for permitting established

by the local authority, they should address all possible loads (hot tubs, planters, wind and seismic loads) in addition to the minimum occupancy live load of 40 pounds per square foot. ■

Frank E. Woeste, Ph.D., P.E., is Professor Emeritus at Virginia Tech University, Blacksburg, and a wood construction and engineering consultant.

Joseph R. Loferski, Ph.D., is Professor in the Wood Science and Forest

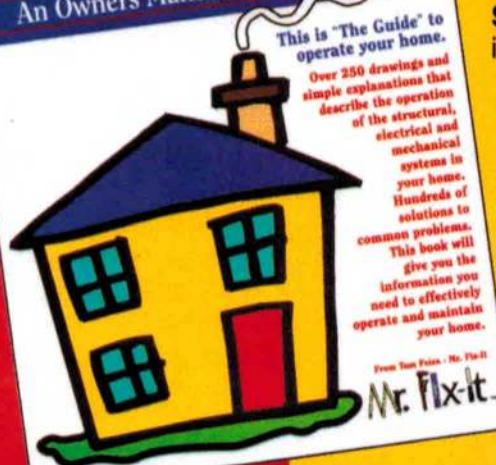
Products Department at Virginia Tech University, Blacksburg.

Questions, comments and suggestions for future "Wood Bits" topics are welcome and may be sent to Dr. Woeste via e-mail at fwoeste@vt.edu.

Reprinted with permission from Building Safety Journal.

HOW TO OPERATE YOUR HOME

An Owners Manual for Your Home



Build your business – Give your customers the best!

The \$24.95 Book: 224 pages, over 250 drawings, 8 1/2" x 11", full color cover. **Your cost is \$6.00 to \$9.00.** A sample book is available for \$20.00 including shipping and handling. (Pictured Here)

The \$12.95 Booklet: 96 pages, 8 1/2" x 11", staple-bound, 3-hole drilled. **Your cost is \$3.00** in boxes of 80 booklets. A sample booklet is available for \$10.00 including shipping and handling.

Newsletter: Keep in touch with your customers with a 4-page newsletter printed with your name, logo, and contact information. \$125.00 quarterly.

Use the illustrations: You can now buy the illustrations from *How To Operate Your Home* 2005 edition on a CD for use in your reports and print materials. CD and reference manual-\$200.00

Custom Illustrations: We draw the illustrations you need-\$100.00

Tom Feiza - Mr. Fix-It Inc.
4620 South Raven Lane
New Berlin, WI 53151
Phone: 262-786-7878

More details at www.htoyh.com
Phone orders accepted with charge card
Toll Free: 800-201-3829 Fax: 262-786-7877
email: tom@misterfix-it.com

Mr. Fix-It™
Tom Feiza, "Mr. Fix-It", Inc.

THE CASE OF THE YELLOW TAGS

Or the Wooden Deck Treated with Alkaline Copper Quaternary Compounds Compatibility Mystery

Dr. Glenn C. Welch, PE

Case History: New construction inspection, house completed

On March 15, 2005, I inspected a new Craftsman-style house with a deck across the front and another along the rear. As I inspected the exterior, I pulled off several YellaWood® tags from the ends of the decking lumber for future reference.

The yellow tags on YellaWood® (pressure treated pine from Great Southern Wood Preserving, Inc.) have a lot of information of interest to home inspectors, as does the company's Web site, www.greatsouthernwood.com.

On the back of this tag, about the fifth bullet down under the Important Information heading, it reads, "DO NOT USE PRESERVED WOOD IN DIRECT CONTACT WITH ALUMINUM."

Guess what the builder had used for flashing under the decks of this brand-new house? Aluminum—rolls of aluminum!

YellaWood® used for decking is treated with alkaline copper quaternary compounds as a preservative. When metals from near the top of the Electromotive Series, such as aluminum, come in contact with metals on the lower end of the series, such as copper, there will be rapid corrosion when surrounded by an electrolyte, such as water.

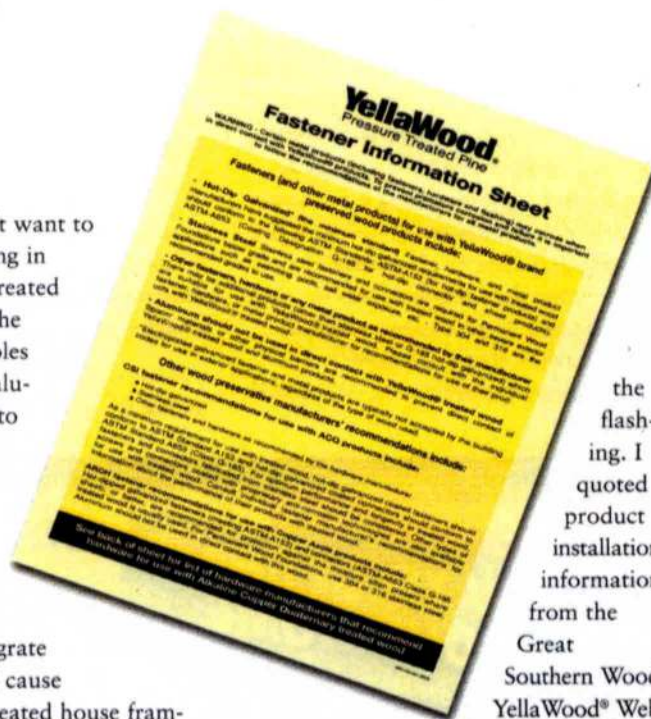
That's why you don't want to put aluminum flashing in contact with wood treated with copper. When the materials get wet, holes will be eaten in the aluminum flashing due to corrosion.

Why is it a problem?

Code requires flashing on decks so water will not migrate under the siding and cause rot/decay in the untreated house framing. If the material used for flashing develops holes, the water will pass through it. This is what will happen once the copper eats holes in the aluminum flashing.

The building superintendent stopped by near the end of this inspection to ask if there was anything that needed fixing. I handed him one of the YellaWood tags and asked him if he had ever read one? He said that he had been building decks for years and didn't need any instructions. When I told him that because he hadn't bothered to read the tags, he might have to remove most of the front and rear decks to repair the flashing problem, he was angry.

In my report, I recommended to my client that she ask the builder to repair



the flashing. I quoted product installation information from the Great Southern Wood YellaWood® Web site to support the recommendation.

The report was sent to the selling agent, who didn't take it seriously, saying the flashing was not a problem.

When the builder/selling agent refused to make the repairs to the flashing, we called Great Southern Wood Preserving, Inc. (YellaWood®). The sales department put us in touch with the engineering >>>

**DOWNLOAD THE
YELLAWOOD® FASTENER
INFORMATION SHEET AT:**

[www.greatsouthernwood.com/
uploadedFiles/Fastener.pdf](http://www.greatsouthernwood.com/uploadedFiles/Fastener.pdf)

department and with the communications manager for their chemical preservative supplier.

We summarized what we had found in the field and asked for their recommendation for repairing the aluminum flashing that was in contact with the copper alkaline-treated wood decking.

The communications manager responded as follows:

"I understand that you have examined decks built with NatureWood® (ACQ)-treated wood products, which were built using aluminum flashing. Aluminum is not recommended for use with copper-based products such as NatureWood®-treated wood. The aluminum will corrode. The aluminum flashing should be replaced with a compatible flashing or a physical barrier such as 10 mil poly plastic should be installed between the aluminum flashing and the treated wood."

The engineer from YellaWood® concurred with the communications manager's recommendation and added his own:

"I would further recommend that any physical barrier resist corrosion as well as abrasion, sunlight, and have a good weathering characteristic."

My client and the buyer's agent presented this information to the builder/sales agent along with the engineer's additional recommendation that the deck boards be pulled up and approved flashing be installed. My client requested the correct flashing be installed per information on the back of the YellaWood® tag. The builder agreed to replace the flashing.

Case of the yellow tags closed. ■

Dr. Glenn C. Welch, PE, Welch Engineering, LLC, Canton, Ga., is an ASHI Candidate, master plumber, electrical contractor, conditioned air contractor and registered engineer

Let us show you what you can't see With the BI2200 Moisture Meter Designed For the Home Inspector

Pinless electromagnetic wave technology penetrates through paint, varnish, wallpaper, tiles and roofing felt and provides relative moisture content readings



Includes Ballistic Carrying Case With Belt Loop



Measuring Relative Moisture Content

- Selectable material range includes stucco, plaster, drywall, tile, shingles, roofing, linoleum, wood and more
- Large, bright digital display contains a data hold feature and low battery indicator
- Teflon® pad protects sensor plate from abrasive surfaces
- Smart autopower off saves battery life
- Lightweight and compact design

WAGNER
ELECTRONICS
World Leader in Moisture Measurement Technology

Call 1-800-795-9913
www.moisturemeters.com



METAL TO METAL

The starting point for the study of the corrosion between dissimilar metals is the "Electromotive Series of Metals." This is simply a list of metals ranked in an order of how easily they corrode relative to each other. Below is a condensed list of metals ranked with the most active (corrosive) metals at the top and the most stable metals (metals that do not corrode easily) toward the bottom.

ELECTROMOTIVE SERIES

POTASSIUM
MAGNESIUM
ALUMINUM
ZINC
STEEL
IRON
LEAD
TIN
NICKEL
HYDROGEN
BRASS
COPPER
STAINLESS STEEL
TITANIUM
SILVER
GOLD
PLATINUM

In general, when two of these metals are in contact with each other and surrounded by an electrolyte (water), the metal closer to the top of the list will corrode (called the Anode) and the metal toward the bottom of the list will be protected from corrosion (called the Cathode). The corrosion caused by the coupling of two dissimilar metals is called galvanic corrosion. In a galvanic cell using copper and aluminum, the aluminum will be consumed. This is the reasoning for not using aluminum as a flashing material for wood treated with copper compounds.