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Decks: Unsafe at Any Age

Research has revealed that 90% of decks inspected by Home Inspectors are unsafe based on the provisions and intent of the 2003 International Residential Code (IRC) or have known structural deficiencies, even when brand new and built to county guidelines.

One of the authors of the deck research, Dr. Frank Woeste of Virginia Tech University, is currently working with local building officials and National building code committees to have relative sections of the national model code amended to include their research findings as quickly as possible. In three cases, Virginia, Georgia and Indiana have already amended their respective state codes to include the Virginia Tech test data on deck ledger connections.

Attachment of the Deck to the House

The best construction method is to construct a deck that does not rely at all on the connection to the house for support, a “Free Standing” deck with support posts and beams close to the house. This is the only construction method now permitted in some jurisdictions.

If the deck does rely upon the house for structural support, there

are several things that **must all** be present for the deck to be secure:

Flashing

Flashing diverts moisture away from the load transfer points, i.e., where the bolts connect to the house. It has been shown that without flashing, the affects of moisture reduce the ability of the House’s member to “hold” the connection is substantially reduced over time, and eventually the connection has almost no remaining strength. A very small occupant load can cause a decayed

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ledger-to-house-band connection to fail, allowing the deck to fall from the house.

Vinyl siding is NOT flashing. This is talking about just moisture, the end result of moist wood, decay, exacerbates and accelerates the problem further.

Fasteners

Decks need sufficient, correctly



Ten partygoers were injured when this deck on Martha’s Vineyard collapsed in August 2003.

sized, carriage bolts or lag bolts, in the correct pattern. Regular screws can pull out, and nails are not acceptable at all. The deck must be through-bolted to the house, with sufficient bolts to support the load and must have washers to prevent pull through. Bolts “in a line” create ideal conditions for cracking and greatly weaken the supporting member.

Support

The house member must be able to support the load of the deck: Many newer houses are built with non-structural rim boards that have no ability to maintain a pulling or withdrawal force. Overhangs or cantilevers are not engineered to carry any additional load other than the existing. Plywood, I-joists, pressboard, fiberboard and other such rim



An adult falling into this railing could easily cause it to pull away from the deck, causing an accident.

commonly used details failed at 100 pounds or less. The laboratory tests at Virginia Tech used the test safety factor of 2.5 required by testing provisions of the 2003 International Building Code.

There are only two *documented* construction methods that do not fail the test.

- The railing posts are continuous from the ground, i.e. through posts.
- The railing posts are connected to the structural deck members with an approved STEEL connector installed according to the manufactures specifications.



Example of a steel connectors that prevents railing post failures.

The Virginia Tech research did not pursue the attachment of railing elements such as rails or balusters/pickets, but it can be assumed that any attachment method that relies on the withdrawal strength of smooth shank fasteners will be weak and could lead to failure.

Additionally, the effects of aging, non-appropriate materials including non-decay resistant lumber, non-corrosion resistant fasteners or connectors, or other such inappropriate uses of materials are assumed to accelerate or exacerbate the conditions leading to failure.

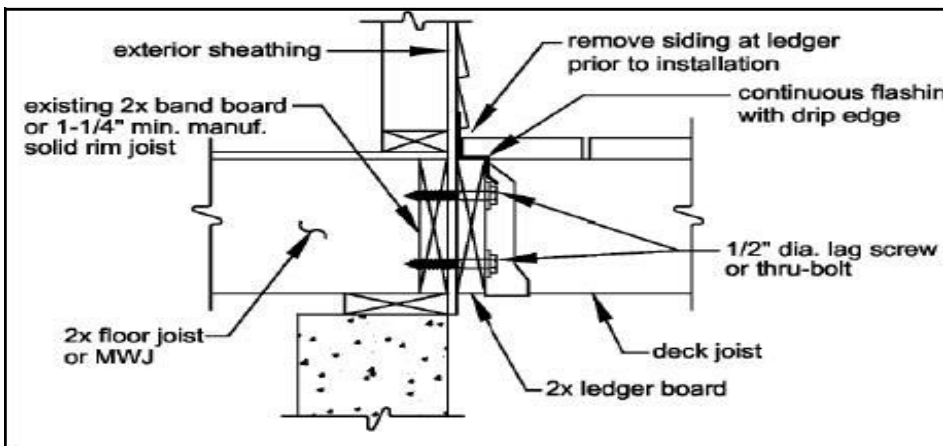
board materials do not have the strength to support a deck. Note that many of these components many not be visible to an inspector in the course of normal inspection and thus must be considered to not be present.

Attachment of the Railings to the Deck

The current code requirement anticipates the application of a 200-pound force applied to the top rail at any point. The force should not cause failure with near

certainty. Several people leaning against a railing, a running toddler, children playing, or a tripping adult can create significant forces on the guard rail system.

There is no known documented attachment method using fasteners alone that withstood laboratory tests of a guardrail post connection to a simulated deck floor framing. Bolts, lag screws and screws, between connecting the post and deck members, all failed well below the 500-pound threshold needed to pass the test. Some



An example of a common deck to house ledger board detail from a county building web site