Common Code Violations

Some are more obvious than others, but all are dangerous and can easily be avoided

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As a building inspector, I see a lot of decks that aren't built to code — despite the plan review process, the purpose of which is to identify any code issues before construction commences. But field changes are common, so an inspector is likely to find a different deck constructed at the site than what was detailed on the permit.

Only a few provisions in the International Residential Code specifically relate to building a deck. (The International Code Council is currently forming a committee to develop an appendix to the IRC that addresses deck construction.) For many specifications, like those for spans and guardrails, you have to apply general code requirements.

Consequently, a deck contractor may not be aware that certain changes could result in a code violation. Below are five common reasons decks fail inspection.

No Protection Against Decay

IRC Section 319 requires all structural elements exposed to weathering to be protected against decay, which usually means using preservative-treated lumber (requirements can be found in IRC Section R502.1.1).

It's a simple issue, usually noted on the plans and reiterated by the permit staff, but inspectors often find a completed deck built of standard-grade lumber. The contractor or owner must then apply an approved on-site treatment (per IRC 319.1.1) to the open and exposed ends and paint the rest to bring the deck into compliance (**Figure 1, page 2**).

Figure 1. Untreated lumber, or above-ground-certified lumber used in ground contact, can trigger a failed inspection. Always check for appropriate treatment levels.

Figure 2. Corrosion-resistant hardware is a code requirement. It's doubly important when in contact with ACQ treated lumber.

Too Few or Inadequate Fasteners

In recent years, insufficient attachment — which includes the use of non-weather-resistant fasteners — to the existing structure has caused several decks to collapse. Fastener specifications aren't usually called out on the construction plans, and inspectors often find undersized nails, or untreated nails that will be nothing but rust in a year.

To resist corrosion, all fasteners used in deck construction must be hot-dipped zinc-coated galvanized steel, stainless steel, silicon bronze, or copper. Joist hangers and anchoring straps are subject to the same requirements as fasteners. IRC table R602.3 (1), "Fastener Schedule for Structural Members," specifies the correct type, size, and number of fasteners required in common construction elements (**Figure 2**).

IRC Section R502.2.2 requires positive anchoring of non-freestanding decks to the primary structure and prohibits toenailing or using nails to make this connection. In the 2007 IRC Supplement, Section R502.2.2.1 was just adopted to clarify this provision (**Figure 3, page 3**). It specifies the use of lag screws, or bolts and washers when attaching the deck ledger to the primary structure.

TABLE R502.2.2.1

Fastener Spacing for a Southern Pine or Hem-Fir Deck Ledger and A 2-Inch Nominal Solid-Sawn Spruce-Pine-Fir Band Joist Deck Live Load = 40 psf, Deck Dead Load = 10 psf

Joist Span	6' and less	6'-1" to 8'	8'-1" to 10'	10'-1" to 12'	12'-1" to 14'	14'-1" to 16'	16'-1" to 18'
Connection Details	On-Center Spacing of Fasteners						
1/2" diameter lag screw with 15/32" maximum sheathing	30"	23"	18"	15"	13"	11"	10"
1/2" diameter bolt with 15/32" maximum sheathing	36"	36"	34"	29"	24"	21"	19"
1/2" diameter bolt with 15/32" maximum sheathing and 1/2" stacked washers	36"	36"	29"	24"	21"	18"	16"

Figure 3. The International Code Council adopted Table R502.2.2.1 in May 2007 (see "New Ledger Attachment Requirements Adopted," *PDB*, July/August 2007). The fastener schedule is based on research done at Virginia Tech and Washington State University.

Figure 4. Solid lumber such as a 4x4 or a 4x6 can no longer be used as a beam. Most beams must be built up from layers of 2-by material.

Inadequate or Non-approved Structure

The IRC (Section and Table R502.5 (1)) no longer allows 4x4s or 6x6s to be used as girders (**Figure 4**). All structural beams and girders must be constructed with multiple 2x4s to 2x12s, with the depth and the number of layers of the members determined by the span and spacing.

Composite decking materials are becoming very popular, but many have been tested and approved for installation on joists spaced 12 inches on center, not 16 inches or 24 inches. You will need to check with the individual manufacturer's specifications.

Deck joists often cantilever beyond the outer girder. The old-school rule of thumb was that as much as one-third of the length of the joists could cantilever beyond the beam. But about 10 years ago, the building codes reduced the allowable spans for most softwood lumber because of declining material quality, and now cantilevers shouldn't extend more than 24 inches beyond the beam, unless by specific engineered design.

Insufficient Support and Anchoring

Whether attached to the existing structure or freestanding, all decks are required to be anchored against uplift and braced laterally to prevent racking and to prevent the deck from becoming a projectile in high winds or an earthquake.

Deck footings or piers and their posts not only support normal loads, they also help provide the needed uplift resistance. Concrete footings, at or below the locality's frost line, can be as basic as a pad in the bottom to support the column, with stone backfilled around it, or a solid-concrete pile with an anchor bolt installed on top to hold the column in place (**Figure 5, page 4**).

Figure 5. Frost footings do more than support the deck's downward load, they also anchor it against wind uplift. A positive hardware connection between the footing and the deck is needed.

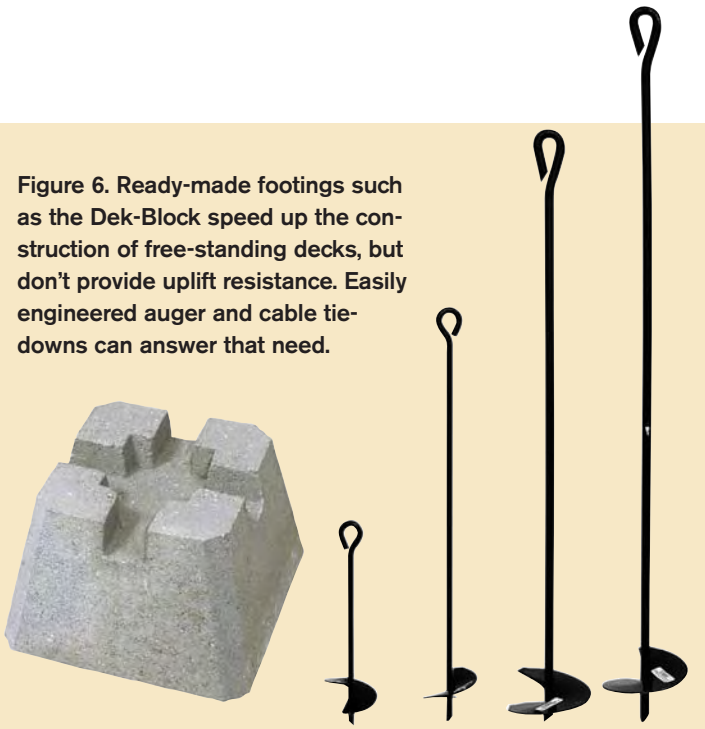

Figure 6. Ready-made footings such as the Dek-Block speed up the construction of free-standing decks, but don't provide uplift resistance. Easily engineered auger and cable tie-downs can answer that need.

Figure 7. Railings need be no higher behind a bench than anywhere else, but a bench alone cannot serve as a guardrail.

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Precast footings are a recent innovation (**Figure 6**). No holes need to be dug for footings, as the precast blocks are set on grade, and the posts or beams fit in pockets cast in the concrete block. To meet the uplift anchoring requirements, straps or augers are also required. If using precast footings, be sure to determine what additional equipment or devices are needed.

Missing or Noncompliant Guardrails and Handrails

Many owners don't want a guardrail to affect the view from their deck. They want something not too tall and often ask for benches or planters to act as guards.

IRC Section R312 requires a guardrail for porches, balconies, or other raised floor areas where the floor surface is more than 30 inches above the adjoining grade. Required guardrails cannot be less than 36 inches in height. The guards are to be constructed with infill rails or balusters no more than 4 inches apart. A bench can be installed against a guard, but if the deck is more than 30 inches above grade, a flat bench cannot be the guard (**Figure 7**).

Porches and decks enclosed with insect screening, if 30 inches or more above grade, must also have guards.

Handrails are not guardrails, although the terms are often thought of at the same time. Per section R311.5.6, a handrail is required when there are four or more risers in the stair run. When the stair is more than 30 inches above grade or above the floor below, a guard is also required. A compliant handrail is either circular with a minimum $1\frac{1}{4}$-inch and maximum 2-inch diameter or $1\frac{1}{2}$ inches square (conveniently the size of a dressed 2x2). ❖

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