Guardrails vs. Handrails

Q What is the difference between a guardrail and a handrail on a set of stairs, and how do the building code requirements for them differ? When can a guardrail and a handrail be the same component?

A Glenn Mathewson, a building inspector in Westminster, Colo., and a former deck builder, responds: The 2006 International Residential Code defines a guard as "a building component or a system of building components located near the open sides of elevated walking surfaces that minimizes the possibility of a fall from the walking surface to the lower level"; and a handrail as "a horizontal or sloping rail intended for grasping by the hand for guidance or support."

Note there is no requirement for a "guardrail," but simply for a guard — which can be any building component that provides the required level of protection, such as a wall, a half-wall, a planter box, a bench, or more typically, a railing.

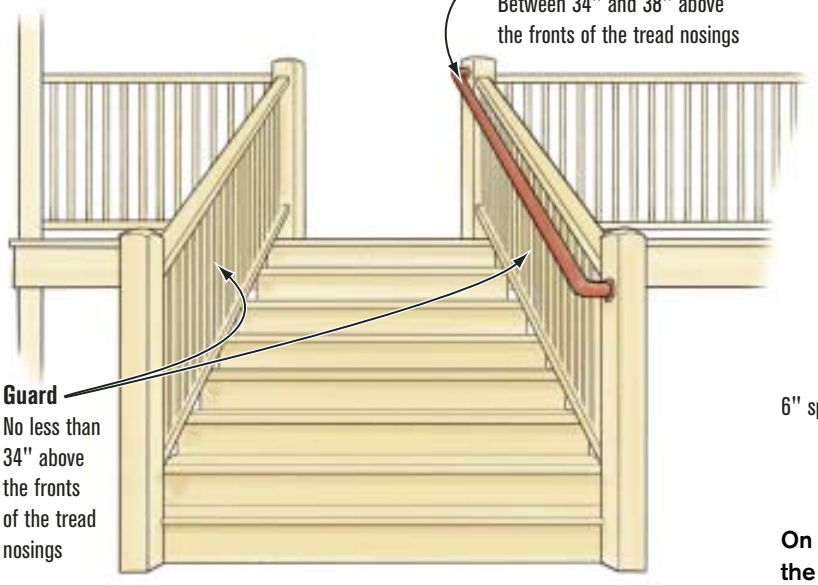
A handrail, however, is specifically defined as a "rail." Its purpose is to give you something to hold; the purpose of the guard, on the other hand, is to keep you from falling over the edge. Thus, the IRC requirements relating to them are different.

Guards are referred to in Section R312.1 in the 2006 IRC: "Open sides of stairs with a total rise of more than 30 inches above the floor or grade below shall have guards not less than 34 inches in height measured vertically from the nosing of the treads." It's important to highlight that this requirement is based on the height of a fall, not the number of rises in the stairs. For example, a set of stairs with four rises — each 7.75 inches high for a total rise of 31 inches — would require a guard on both sides. On the other hand, a set of stairs with 10 rises, each 3 inches high for a total rise of 30 inches, would not require a guard.

Infill — balusters, pickets, solid wall, and the like — between the 34-inch minimum height and the nose of the stairs is considered part of the guard assembly, and is required only when guards are required. (Remember that guards on level areas such as decks, when required, must be a minimum of 36 inches high.)

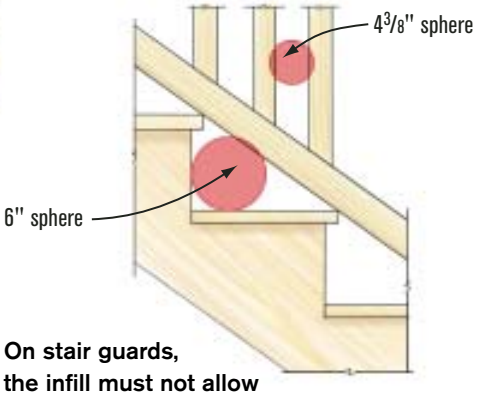
Unlike the requirement for guards,

Guards and Handrails Differ



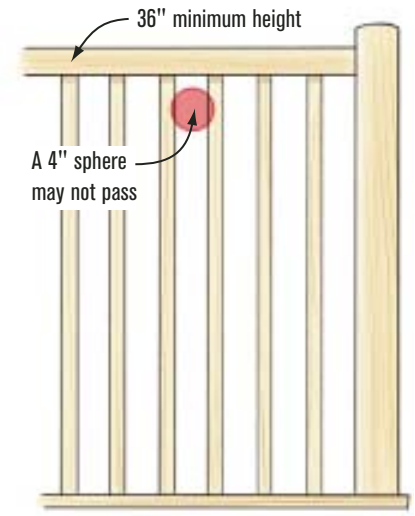
A guard is required when a stair rises more than 30 inches above the underlying surface. A handrail is required on stairs of four or more rises.

Infill Spacing



On stair guards, the infill must not allow passage of a 4 3/8-inch sphere. In the triangular space below a shoe rail, a 6-inch sphere may not pass.

Level Guards Differ



On decks more than 30 inches above grade, guards are required.

the one for handrails (Section R311.5.6 of the 2006 IRC) considers the number of rises: "Handrails shall be provided on at least one side of each continuous run of treads or flight with four or more rises." This is because the need for handrails is based solely on the movement of the human body, not on the height of the stairs. The more times you must lift your legs and place your feet squarely on a tread, without an intervening landing, the more likely you are to trip or become tired. Also note that unlike guards, a handrail is required on only one side of the stairs.

Consider the two examples given earlier: The stair with four rises of 7.75 inches would require guards on both sides because the overall rise exceeds 30 inches, and it would require a handrail on one side because it has four rises.

Although the second stair, with 10 3-inch rises, wouldn't require guards (total rise doesn't exceed 30 inches), it would need a handrail on one side because of the number of rises. And since guards aren't required, there's no requirement for infill beneath the handrail.

Where both guards and handrails are required, as in the first stair, the top of guard can be constructed to also function as the handrail. The three subsections of section R311.5.6 detail the height, continuity, and grip size that regulates the construction of handrails. The Stairway Manufacturers' Association provides excellent details and visual examples of these sections in its *Visual Interpretation of the International Residential Code,* available at www.stairways.org.

As always, consult the building department in the jurisdiction where the work is being performed. Some jurisdictions have adopted amended versions of the IRC or published their own code, or they may interpret these sections differently.

Pressure-Treated Wood Rotting

Q I have seen pressure-treated lumber that has rotted only a couple of years after decks were built. How did this happen? I thought treatment was supposed to prevent that.

A Andy Engel, editor of *Professional Deck Builder,* responds: Several factors affect the life span of treated wood in outdoor use. To begin with, what's the preservative retention level of the lumber? That's expressed in pounds per cubic foot (pcf). Depending on the type of preservative (e.g., ACQ, CA-B, MCQ, CCA), a retention level of .20 pcf might earn a rating for aboveground use, whereas .40 pcf might earn approval for ground-contact use. A certification tag on the end of the lumber will specify its approved use. In many areas of the country, particularly in the north, dimensional lumber treated for ground contact — other than post stock such as 4x4s and 6x6s — is difficult to find.

A disturbing article, "Brown-Rot Decay of ACQ and CA-B Treated Lumber," appeared in the June 2007 issue of *Forest Products Journal.* The authors describe the results of accelerated-decay testing on CA-B- and ACQ-treated lumber, in which wood samples were inoculated with four common species of brown rot fungus and subjected to ideal heat and moisture conditions (**see table page 3**).

Both ground-contact- and above-ground-rated CA-B-treated southern yellow pine samples were tested. The aboveground samples performed only marginally better than the untreated control sample. The ground-contact-rated sample fared better, but still lost about a third of its mass to two fungi and nearly half its mass to another.

The ACQ-treated samples included SYP treated for aboveground use, and Douglas fir treated for ground contact. Both generally fared better than the CA-B-treated samples, but the ground-

contact-rated Douglas fir exhibited the best overall rot resistance.

According to the study's chief author, Barry Goodell, professor of biological science and wood science and technology at the University of Maine, Orono, "The decay testing represents many years of exposure in severe climates that would be conducive to decay." Also, the experiment was intended to test the durability of the samples under more severe conditions than the aboveground-rated samples were treated to endure. Nonetheless, given that many of the treated samples decayed, it would seem that there is reason to question the effectiveness of these preservatives.

Here's the final rub: Ground-contact conditions typically dictate that a relatively high constant moisture level is present in the wood, while also moderating temperature extremes that would discourage decay. It is entirely possible to create similar conditions above grade — between 2x10s sandwiched together as a beam, for example, or anywhere dirt and moisture have collected. And, it's rare for preservatives to fully penetrate thick lumber — if you cut through the middle of larger pieces of lumber, you will likely expose untreated wood.

All of which is a long-winded way for me to say, "Yup, no surprise that you're occasionally finding rotted treated wood." While the current crop of preservatives may be more environmentally acceptable than the old CCA, Dr. Goodell suggests "... they may not be as efficacious in all circumstances."

Best practice suggests that whenever you assemble two pieces of wood in a deck in ways that can trap moisture — built-up beams, post-to-beam connections, and even decking joined to joists — some sort of moisture-resistant membrane or flashing should be used to keep out water in the first place. And for cut ends of treated wood, of course, always dip or brush-flood the cut surface with a preservative solution. ❖

	Mass Loss			
	Gloeophyllum trabeum	*Postia placenta*	*Serpula lacrymans*	*Meruliporia incrassata*
	(%)			
SYP untreated controls	58.6 (5.2)[a]	55.7 (8.7)	54.7 (6.6)	60.2 (2.1)
SYP CA-B (above ground)	29.5 (15.7)	47.3 (19.7)	56.0 (6.1)	53.1 (7.1)
SYP CA-B (ground contact)	3.9 (3.2)	33.0 (23.2)	47.4 (15.9)	34.0 (6.1)
SYP ACQ (above ground)	6.3 (4.9)	19.2 (15.3)	36.2 (14.7)	55.0 (3.2)
Douglas-fir ACQ (ground contact)	0.7 (0.9)	4.5 (3.0)	6.4 (9.3)	29.5 (16.5)

[a]Values in parentheses = standard deviations.

FOREST PRODUCTS JOURNAL

The figures above show the average percentage of mass lost to rot in treated-wood samples that were inoculated with four common decay fungi and kept in ideal conditions for 16 weeks. (Standard deviations closer to zero represent more consistent results in a group of samples).