

by Bill Bolton

As a deck designer and builder on the West Coast, I occasionally build decks in what's called the wildland-urban interface. The geography here is a little different from, say, the woodlands of New England. Winter rains on the California coast support plentiful vegetation, which then dries out in the summer to become a tinderbox (Figure 1). This large fuel source, coupled with high winds in the surrounding mountains and canyons, creates an environment ripe for the wildfires you see on the evening news.

Despite the danger, people continue to build homes in these fire-prone

areas. Fortunately for them, a growing awareness of wildfire risk has led the International Code Council to develop the International Wildland-Urban Interface Code. The IWUIC provides criteria for rating an area's fire potential as moderate, high, or extreme, and spells out prescriptive measures for building within those zones. Local jurisdictions often use this code or adopt something similar. Before building a deck in a zone requiring fire-resistant construction — before you even begin to price out the job — it's important to talk with the local building department.

The main goal of the IWUIC requirements is to prevent a deck from catching fire and — acting as kindling — igniting the house. Thus, freestanding decks built 50 feet or more away from the house are generally exempt from the IWUIC, because fires on those decks are less likely to spread to the residence.

### Igniting a Deck

Normally, decks catch fire one of two ways. A burning brand landing on the surface of the deck is all that's required, particularly if the decking is dry or has wide gaps between the



Figure 1. Dried by the summer sun, wildland vegetation becomes the perfect fuel. Add a slope or canyon and its attendant winds, and you've got the makings of a devastating fire.

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boards, which can permit airflow and harbor embers (Figure 2). Similarly, space between the first deck board and the house can provide airflow and catch embers, increasing the risk that the siding will ignite.

The other common cause of deck fires is flames from unmaintained vegetation igniting the deck from below, or a burning brand igniting debris below the deck. Again, dry or widely spaced deck boards will speed the spread of fire.

Once the deck ignites, it may in turn set the house on fire. Heat from the deck fire, for example, may break the glass in a sliding door, permitting flames to enter the house's interior. Or, combustible siding or soffits can ignite, carrying the fire to the house. The end result is the same. And even if the house itself doesn't ignite, the deck can lose structural integrity and become hazardous to anyone walking on it.

### Codes

In any regulated area, building codes specify a particular class of construction depending on several conditions. In the 2006 IWUIC (Table 503.1, right), these include the fire classification of the area (moderate, high, or extreme), access to adequate water, and what's called "defensible space" — an area cleared of excessive vegetation and other fuel for a specified distance from the house (see illustration, page 3).

Not much can be done to modify the first two conditions, but a property owner can control the defensible space. Wildland fires travel fast — in just five or six minutes, the majority of the flame front moves through — and minimizing the amount of nearby fuel reduces the chance that a fire will ignite a structure.



**Figure 2. Burning brands blown by a flame front or dropped by overhead trees are a common source of ignition. One test designed to determine the flammability of decking replicates that scenario in a controlled environment.**

The distance the defensible space must extend from the house varies with the fire classification. Deadwood, dried leaves, and so forth should be removed from the defensible space, but fire-resistant vegetation is allowed, as

are isolated islands of more flammable greenery and ornamental ground covers such as green grass and ivy — that is, assuming they don't provide a means to transmit fire from the native vegetation to the structure.

**Table 503.1  
Ignition-Resistant Construction**

	Fire Hazard Severity					
	Moderate Hazard		High Hazard		Extreme Hazard	
	Water Supply <sup>b</sup>		Water Supply <sup>b</sup>		Water Supply <sup>b</sup>	
Defensible Space <sup>c</sup>	Conforming <sup>d</sup>	Nonconforming <sup>a</sup>	Conforming <sup>d</sup>	Nonconforming <sup>e</sup>	Conforming <sup>d</sup>	Nonconforming <sup>e</sup>
Nonconforming	IR 2	IR 1	IR 1	IR 1 N.C.	IR 1 N.C.	Not Permitted
Conforming	IR 3	IR 2	IR 2	IR 1	IR 1	IR 1 N.C.
1.5 x Conforming	Not required	IR 3	IR 3	IR 2	IR 2	IR 1

- a. Access shall be in accordance with Section 402
- b. Subdivisions shall have a conforming water supply in accordance with Section 402.1.  
IR 1 = Ignition-resistant construction in accordance with Section 504.  
IR 2 = Ignition-resistant construction in accordance with Section 505.  
IR 3 = Ignition-resistant construction in accordance with Section 506.  
N.C. = Exterior walls shall have a fire-resistance rating of not less than 1-hour and the exterior surfaces of such walls shall be noncombustible. Usage of log wall construction is allowed.
- c. Conformance based on section 603.
- d. Conformance based on section 603.
- e. Conformance based on section 603.

COURTESY INTERNATIONAL WILDLAND-URBAN INTERFACE CODE

COURTESY UNIVERSITY OF CALIFORNIA FOREST PRODUCTS LABORATORY

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Once the fire classification of the property is determined, Chapter 5 of the 2006 IWUIC defines Class 1, 2, and 3 Ignition Resistant Construction. For decks, the requirements for Class 1 and Class 2 construction are identical. The IWUIC has no prescriptive requirements for decks in Class 3 construction.

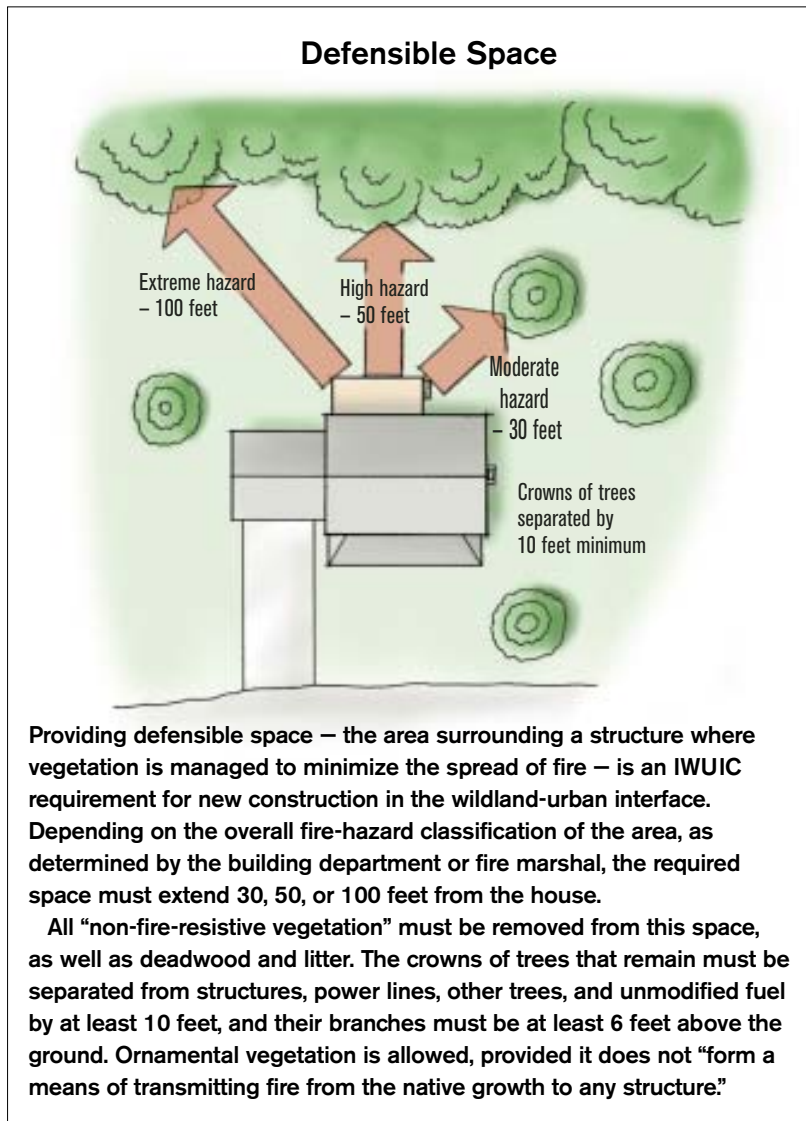
The essential Class 1 and 2 requirements, as written in the 2006 IWUIC, are the following:

- ... decks shall be a minimum of 1-hour fire-resistance-rated construction, heavy timber construction, or constructed of approved noncombustible materials or fire-retardant-treated wood identified for exterior use and meeting the requirements of Section 2303.2 of the International Building Code.
- When ... any portion of [the deck] projects over a descending slope surface greater than 10 percent, the area below the structure shall have all underfloor areas enclosed to within 6 inches of the ground, with exterior wall construction in accordance with ... [see next].
- Exterior walls ... shall be constructed with materials approved for a minimum of 1-hour fire-resistance-rated construction on the exterior side or constructed with approved noncombustible materials.

### One-Hour Fire Resistance

The first option above, building a 1-hour fire-resistive deck, isn't simple. Brian Thompson, an engineer with Aegis Engineering in Seattle, says, "[That's] in part because most decks are of combustible wood construction supported in part by the exterior wall of a structure that is not 1-hour rated." In other words, a strict reading of the code suggests that building a 1-hour fire-resistive deck simply isn't possible if it's attached to a house that's not built in a like manner.

Even if that problem is surmounted, achieving a 1-hour fire rating is difficult. Neither the IWUIC nor the IRC



Providing defensible space – the area surrounding a structure where vegetation is managed to minimize the spread of fire – is an IWUIC requirement for new construction in the wildland-urban interface. Depending on the overall fire-hazard classification of the area, as determined by the building department or fire marshal, the required space must extend 30, 50, or 100 feet from the house.

All "non-fire-resistive vegetation" must be removed from this space, as well as deadwood and litter. The crowns of trees that remain must be separated from structures, power lines, other trees, and unmodified fuel by at least 10 feet, and their branches must be at least 6 feet above the ground. Ornamental vegetation is allowed, provided it does not "form a means of transmitting fire from the native growth to any structure."



Figure 3. Building a deck that meets the IWUIC's 1-hour fire-resistive construction requirement is a challenge. Wrapping the structure with a Type X gypsum sheathing is one approach; additional cladding will be needed to protect the gypsum board from the elements.

PHOTO BY GLENN MATHEWSON

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provides much in the way of details for decks, so code in most jurisdictions reverts to the more commercial-construction-oriented International Building Code.

The IBC offers a plethora of ways to build a 1-hour fire-resistive structure. Most of these approaches, however, involve masonry, or they call for multiple layers of fire-rated gypsum board, which generally isn't meant to be used outside and must be protected from the elements (Figure 3, page 3).

### Framing

The other two methods of complying with the code — using heavy timber and using noncombustible or fire-retardant-treated materials — are easier to apply. According to Glenn Mathewson, a building inspector in Westminster, Colo., it may even be possible to combine the two to build a code-compliant deck.

Heavy timber is specified because it has a larger ratio of mass to surface area than smaller dimensions of lumber have; in other words, bigger is better (Figure 4). Even if the surface of a bigger timber catches fire, burning



**Figure 4. Heavy timber is one way to frame a fire-resistant deck. The larger the lumber, the harder it is to ignite, and the less intense the heat it contributes. National codes specify a minimum of 4x6 joists, 6x10 beams, and 8x8 posts.**

through the member takes considerably more time and contributes less intense heat. Think of starting a fire in a fireplace — the big logs take a long time to get going.

For heavy-timber construction, the IWUIC again references the IBC: Posts must be at least nominal 8x8s, beams at least nominal 6x10s, and joists at least nominal 4x6s on at most 16-inch centers; 2-by lumber isn't permitted. That's not so bad — a little expensive, maybe, but at least the materials are familiar.

The last option — fire-retardant-treated framing lumber — is perhaps the easiest. It's available in standard dimensions, and 2-by lumber may be used. However, you may need to search for it. Hoover Treated Wood Products (800/531-5558, [www.frtw.com](http://www.frtw.com)) makes a variety of fire-retardant-treated lumber products. Arch Wood Protection (866/873-3789, [www.frxwood.com](http://www.frxwood.com)) distributes an exterior fire retardant to a number of treaters nationally. A phone call to either should help to find local distribution.

Fire-retardant-treated lumber must be marked as such and carry an additional mark that shows it's intended for exterior use (Figure 5). Note that this lumber usually loses some strength in the treating process, so reg-

ular span tables don't apply. Follow the appropriate span tables from the manufacturer for the products you use.

### Decking

Heavy-timber flooring would clearly be problematic on decks. The IBC calls for a minimum of nominal 3-inch tongue-and-groove or splined decking, covered with a second layer of at least 1-inch-nominal tongue-and-groove flooring, laid perpendicular to or diagonally across the subfloor. If that's not a recipe for rot outdoors, I don't know what is.

Fortunately, the county where I do most of my work offers other acceptable choices. We can use 2-by T&G planks, 1<sup>1</sup>/<sub>8</sub>-inch T&G plywood, 3-by lumber set on edge with no more than 1/8-inch space between members, or noncombustible decking with a Flame Spread Index not to exceed 80 and Smoke Developed Index not to exceed 285.

Several brands of composite lumber may satisfy the latter requirement, but confusion remains regarding this material's suitability in the wildland-urban interface. One attempt to clear this up can be found in a recent change to the IRC that includes the adoption of a uniform ASTM standard for composite lumber's perfor-



**Figure 5. Standard sizes of dimensional lumber can satisfy code requirements if they've been factory treated with a fire retardant. The stamp on the member must identify it as having been so treated and as being suitable for exterior use.**

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mance in fires. This change will be part of the 2007 supplement to the IRC, and will be fully embodied in the 2009 IRC.

Currently, though, requirements vary among jurisdictions. Local building departments are likely to want to know the Flame Spread and Smoke Developed Index of a particular composite decking before allowing its use in the wildland-urban interface. Most manufacturers post this information on their Web sites.

There are some inherently noncombustible decking options that would satisfy most codes, as well (Figure 6). Ceramic tile, precast concrete, and aluminum are a few examples (see “Sources of Noncombustible Decking,” page 6). Also, ipe carries a Class A fire rating and may satisfy your local building department.

Finally, there's the option of building a beefed-up frame and pouring a concrete slab on top of it.



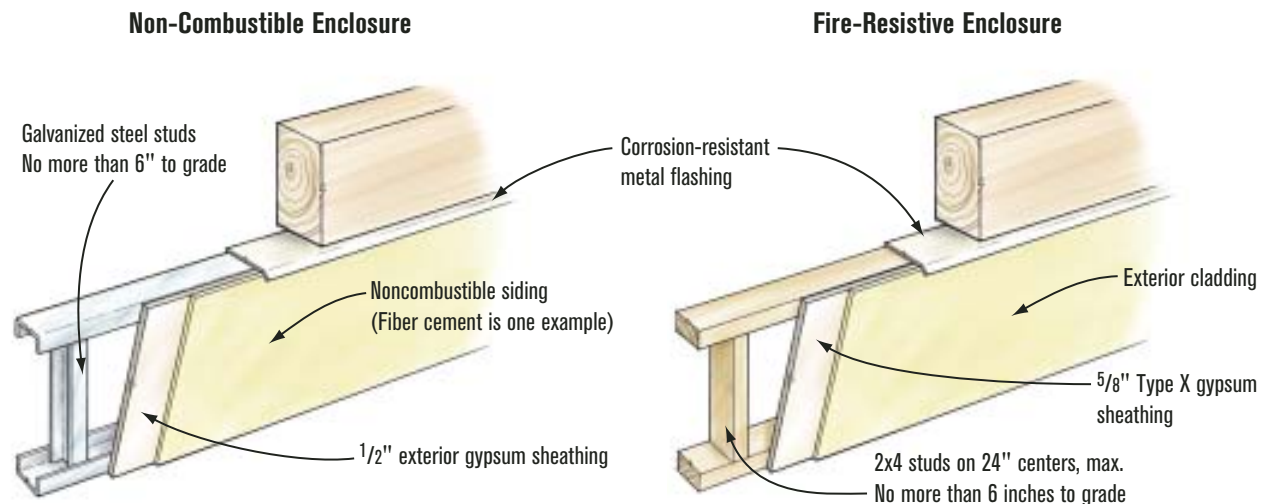
**Figure 6.** It's hard to figure out the code requirements for decking in the wildland-urban interface. For heavy-timber construction, the IBC prescribes a layer of T&G 3-inch-nominal decking topped by a layer of 1-inch-nominal T&G flooring run perpendicular – not a very practical application. Aluminum, tile (left), or precast concrete decking products, on the other hand, are inherently noncombustible.

### Slopes

Because of induced drafts, wildfires burn hottest and fastest going up a slope. The IWUIC requires any deck that has even a small portion over a slope of 10 percent (that's a 1-foot rise over 10 feet of run) or greater to be enclosed to within 6 inches of the ground with a 1-hour fire-resistive wall (Figure 7).

A strict interpretation of the code,

according to Mathewson, requires that “you use an assembly such as described in the IBC, or tested by the Gypsum Association, UL, or some other ICC-recognized organization. Your installation must match the assembly.” Such a description from the Gypsum Association ([www.gypsum.org](http://www.gypsum.org)) follows: *Two-by-four wood studs at 16 inches with double top plates, single bottom plate; interior and exterior sides covered with*



**Figure 7.** Decks requiring Class 1 and 2 construction that are built over a slope of 10 percent or more must be enclosed to within 6 inches of the ground with a 1-hour fire wall or a wall of approved noncombustible materials. The International Building Code, which the IWUIC refers to, describes many such assemblies. Other options are offered by the Gypsum Association; the two above may satisfy local building departments.

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*5/8-inch Type X gypsum wall board and sheathing, respectively, 4 feet wide, applied horizontally or vertically with vertical joints over studs, and fastened with 2 1/4-inch Type S drywall screws, spaced 12 inches on center. Cavity to be filled with 3 1/2-inch mineral wool insulation.*

Mathewson goes on to say, “Most inspectors would probably be fine with simply covering the studs with 5/8-inch rock for an installation on a below-the-deck wall. They probably would not ask for the assembly.” That’s one inspector’s view; it’s important that you verify the details of your own projects with your local authority.

One problem with any gypsum product, even one such as Georgia-Pacific’s ([www.gp.com](http://www.gp.com)) DensGlass Gold exterior sheathing (which comes in a 5/8-inch Type X configuration for fire resistance), is that it’s not intended to be exposed to the elements for longer than a few months. It’s easy enough to protect the face with a noncombustible product such as fiber-cement siding, but you need to weatherproof the top, as well. Use a noncombustible flashing — some sort of metal — that is corrosion resistant.

Such flashing will have to be com-



PHOTO BY RANDY VARGA

**Figure 8. Code requirements for railing combustibility are sketchy and subject to interpretation. One sure approach is a noncombustible system made from metal.**

patible with any preservatives or metals used in the framing. For example, if you’re using heavy timber treated with ACQ for rot resistance, you’re pretty much limited to copper. If you use steel studs, though, to build the enclosure wall, copper won’t work unless it’s isolated from the steel by, say, a layer of gypsum. Make sure the building inspector approves.

### Railings

Railings aren’t specifically addressed in

the IWUIC. Mathewson reads exception 2 in the 2006 IBC, Section 1406.3, to mean that railings limited to 42 inches in height don’t have to be noncombustible. Nonetheless, that interpretation should be confirmed locally.

There are many ways that a fire-resistant or noncombustible railing system could be built. Metal rails, cable rails, glass, fire-retardant lumber, heavy timber, or a combination of these systems could all qualify (Figure 8). According to the 2006 IBC, composite or plastic railing systems with a self-ignition temperature greater than 650°F and a Smoke Developed Index not greater than 450 should also fly.

Requirements for decks built in high-fire-risk areas are an evolving part of the codes and confuse even building officials. Add to that the fact that codes differ throughout the country, and it’s obvious that this article is only a starting point. When faced with building a deck in these zones, it’s critical that you understand your local building department’s requirements. ❖

*Bill Bolton is a deck builder in Santa Barbara, Calif.*

## SOURCES OF NONCOMBUSTIBLE DECKING

The companies below manufacture inherently noncombustible products that may be good choices for use in high-fire-risk zones, subject to approval by the local building department. This is by no means a complete list.

### Aluminum Decking

AridDek; 877/270-9387, [www.ariddek.com](http://www.ariddek.com)  
FSI LockDry; 800/711-1785, [www.lockdry.com](http://www.lockdry.com)  
Last Deck; 866/527-8332, [www.lastdeck.com](http://www.lastdeck.com)  
Veltech Corp; 651/408-0003, [www.veltechcorp.com](http://www.veltechcorp.com)

### Tile and Precast Concrete Systems

North American Tile Tool Co.; 859/525-8891, [www.nattco.com](http://www.nattco.com)  
Stepstone; 800/572-9029, [www.dekstone.com](http://www.dekstone.com)  
Stone Deck; 651/459-3049, [www.stonedeck.biz](http://www.stonedeck.biz)