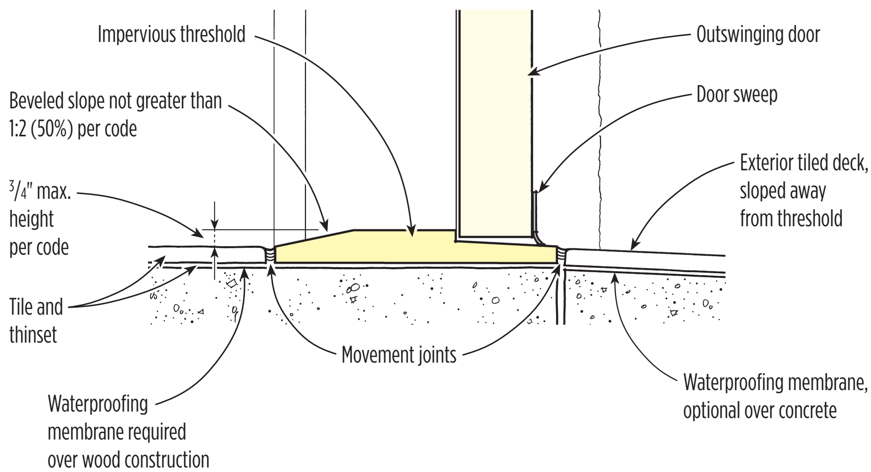
Q&A

Q. Tile Doorway Detail

When there's an entry between an exterior tiled deck and an interior living space, how should the threshold be detailed so that the doorway doesn't leak? My client uses a wheelchair and would like the interior and exterior floors to be in approximately the same plane.

Barrier-Free Tile Entry



A. *Contributing editor Michael Byrne, moderator of the* JLC *online tile forum and an industry consultant in Los Olivos, Calif., responds:* Unless there is frequent precipitation that makes it impractical, I usually build tiled decks so that the finished floor at the threshold is level with — or slightly below — the interior floor. Since this detail works best with outswinging doors that don't have an integral threshold, the door must have an effective sweep to prevent water from blowing in.

For a true barrier-free installation in a dry climate, I eliminate the threshold completely and separate the interior and exterior tiles with a movement joint at the doorway. In wetter climates, or if the deck is regularly exposed to wind and stormy weather, I use a stepped threshold to better resist leaks (see illustration). I typically have these thresholds fabricated out of a durable impervious stone, like granite, in a profile that provides weather resistance while meeting code requirements.

The exterior waterproofing should be joined to the threshold with an appropriate long-life sealant. Water will still occasionally get past the threshold, but this shouldn't be a problem if the interior floor is covered with tiles installed over a waterproofing membrane.

However, if the interior floor is covered with wood strip flooring or another absorbent material, a flush deck is probably a bad idea. Instead, the deck should be designed so that there is a full 4- to 7-inch step up to the threshold. The exterior deck membrane will then resemble a shower pan, with upturned walls and the upturned membrane flashed and sealed at the threshold to prevent wicking.

Q. Snow Loads on Roofs

I've always thought that building codes leave a pretty generous margin for error when specifying allowances for snow loads, but a series of recent storms and a lot of drifting have resulted in some collapsed roofs in my area. I've seen some roofs with large loads on one side and virtually none on the other. Is a roof that has been unequally loaded due to blowing and drifting snow more prone to failure?

A. *Christopher DeBlois, a structural engineer with Palmer Engineering in Tucker, Ga., responds:* Most roof collapses from heavy snow loads are caused by connection failures, not failure of framing members. In fact, actual breakage of rafters is fairly uncommon except for with flat roofs.

To help visualize loading-connection issues, picture

Weight of Snow

Snow Depth	Design Weight	Estimated Actual Weight
6 inches	7.5 psf	6–9 psf
12 inches	16.1 psf	12–18 psf
18 inches	26.1 psf	18–24 psf
24 inches	37.8 psf	24–36 psf
30 inches	51.8 psf	30–45 psf
36 inches	69 psf	36–54 psf
42 inches	90 psf	42–63 psf
48 inches	117 psf	48–72 psf

Snow design loads are based on figures published by the ASCE; estimates for the actual weight of snow range from 1 to 1.5 psf per inch of depth. Note that the density of snow increases as depth increases. In a 6-inch snowfall, an inch of snow has a design density of 1.25 psf per inch, and a real-world density closer to 1 psf per inch; in 48-inch-deep snow, the design density is more than 2.4 psf per inch while the actual density is probably 1.5 psf per inch or more.

two extension ladders leaning against each other. If two people of about the same weight want to climb them, one on each side, the system is stable so long as the bottom of each ladder is braced and can't kick out. This is a balanced loading situation, and illustrates the importance of a good connection at the base of the rafters.

For an unbalanced situation, picture the same two ladders, but imagine only one person climbing up one side (again with the bases braced). If the ladders aren't too steep, the system might still be stable. But as the ladders get steeper, the ladder opposite the climber will likely be pushed over as the climber ascends to the top — a ridge-connection failure. So to ensure good roof stability when there is unbalanced loading, it's important to make sure there is also a good connection at the ridge.

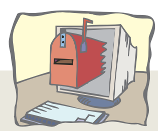
In fact, if you think about the ladder analogy, with a good connection at the top and the two sides tied together, you've just imagined an ordinary stepladder. Without the top connection and the cross ties to keep the two sides from pushing out, a stepladder would be unstable for the unbalanced load of a single climber.

Likewise, unbalanced snow loads — whether the result of wind drifts, uneven melting effects from the sun, or uneven snowfall based on variable protection (usually from trees) — aren't necessarily more likely to cause a roof collapse, but they do stress a roof and its connections in places that balanced loads do not.

Nevertheless, if rafters, valleys, ridges, and hips are properly sized for the balanced snow condition, and if connections between members, at ridges, and at the attic or ceiling are sound, most residential roofs should be able to handle both balanced and unbalanced snow loads.

There are of course special cases — like deep drift loads on large flat roofs; and sliding loads, where snow slipping off a higher roof inundates a lower one — that should be looked at carefully by a structural designer. The building codes don't attempt to account for all possible snow load scenarios. Instead they reference ASCE-7, a specification published by the American Society of Civil Engineers and the Structural Engineering Institute called "Minimum Design Loads for Buildings and Other Structures"; it includes formulas for calculating snow design loads for various locations and roof configurations. Generally, loads get higher where more snow falls, when roofs are shallower rather than steeper, and where drift loads can accumulate.

ASCE-7 includes a formula that can be used to convert snow depth to weight, which was used to create the chart on page 30. Note that while a 30-inch-deep snowfall corresponds to a design load of about 52 psf, the actual weight of that snow is probably somewhat less, in the neighborhood of 40 psf. (For obvious reasons, engineers err on the high side when calculating design loads.) Just the same, that's a lot of weight — engineers use a design live load of 50 psf for parking decks — so it's no surprise that an improperly designed or built roof can fail in a big snowstorm.



GOT A QUESTION?

Send it to Q&A, *JLC,*
186 Allen Brook Lane,
Williston, VT 05495; or
e-mail to jlc-editorial@
hanleywood.com.