

QUESTION & ANSWER

Moisture Wreaks Havoc With Hardwood Decking

Q Hardwood decking I installed two years ago is cupping and gapping severely (see photos). The customer wants it fixed and I want to do the right thing, but I'm not sure how to proceed. The deck gets full sun, though there are some water problems underneath: The grade slopes downhill to a point under the deck before draining to one side, and one gutter discharges under the deck. Originally the deck was to be enclosed with lattice, but the customer insisted on solid tongue-and-groove siding as skirting instead. Hidden fasteners secure the decking.

A Andy Engel, editor of *Professional Deck Builder*, responds: I suspect you already know that moisture is at the root of your problems. I'll talk about the cupping first and get to the gapping later — that's also moisture related, but in a different way.

Cupping. The downspout and grade deliver a lot of water to the area below the deck, and the solid skirting, by blocking air movement, discourages drying. That raises the humidity below the deck, which raises the moisture content (MC) of the bottom of the decking, causing it to swell. The top of the decking, on the other hand, gets full sun, which dries the boards out and shrinks them. The combination of the swelling below



Differences in moisture content between their tops and bottoms has caused these boards to cup.

and the shrinking on top causes the cupping.

While it's nearly impossible to perfectly balance the MC between a deck board's top and bottom, there are steps you can take to minimize the difference. Before doing anything else, you need to address the water issues under the deck. Extend the leader so the downspout drains well away from the deck and, if at all possible, change the grade to direct water out from under the deck. Also, replace the solid skirting with lattice to encourage air flow.

Another suggestion is to cover the ground below the deck with 2 to 4 inches of $\frac{3}{4}$ -inch clean crushed stone. Even when water isn't running under the deck, the exposed ground can transpire a lot of water, which moves upward through the soil by way of capillary action. When the water reaches the surface, it evaporates, thereby increasing the humidity below the deck, particularly since it is enclosed.

One interesting characteristic of capillary action is that water only moves in that way from larger pores and openings to smaller ones. The crushed stone creates a layer of larger pores, stopping the capillary movement at the top of the soil. And whether the source of the water is capillary action from the ground or surface drainage, the stone will help. Relatively little air moves through



Decking installed green has shrunk to the point where its concealed fasteners have almost disengaged.

a layer of stone, so very little evaporation can take place as long as the water is a couple of inches below the top of the stone layer.

Yet another option would be an under-deck drainage system with a distinct pitch. It would not only handle rainwater, but also provide a moisture-resistant layer between the decking and the ground. I would still recommend the lattice, though.

One final point, about the deck design: Some of the most severe cupping seems to be near the ends of the boards. That's probably because there's a double rim joist, or a fascia board fastened tight to the rim. The joints between these members hold a lot of water, which can keep the

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underside of the decking wet. When you're building a deck, cap such joints with a waterproof membrane or corrosion-resistant flashing to keep the water out.

Once you've dealt with the moisture issues, give the decking a year or so to re-acclimate. The existing decking might flatten out on its own as it dries, and if it doesn't, it can be leveled with a floor sander. Don't be tempted to sand it without giving it this time to dry, though, because if you sand the decking flat before it reaches equilibrium, most likely it will take a cross-grain crown as it continues to dry. Your customer probably won't like this time line, but the alternative is to replace all the decking. You could take the sting out of the year-long wait by including a free coat of sealer after sanding — that would cost

you a lot less than new decking.

Gapping. As for the gapping, my guess is that when the decking was installed, its MC was too high. Hardwood decking is often supplied green, and each board can shrink as much as $\frac{3}{8}$ inch before reaching equilibrium with its environment, depending on the species and its MC.

Had you face-screwed the decking, the positive connection between the boards and the joists would have caused the shrinkage to happen more evenly on each side of the board. The gaps still would have widened, but more or less uniformly (it's the unevenness of gaps that people notice, not so much their width). However, hidden fasteners that don't positively connect the decking to the joists allow shrinking boards to float between the fasteners. As these

boards narrow, the widths of the gaps between them can vary. If two adjacent boards shrink away from each other, for example, the gap will be twice the average width.

Once the wood's MC has reached equilibrium (it will take about a year), pry the boards over until the gaps are even, then secure them with screws in the center of each board. I would counterbore and plug the holes with the same species of wood. Alternatively, you could remove and reinstall all the boards, after your moisture control measures have had time to work. If you take this route, be forewarned that the dried boards will cover less area than they did originally.

Next time, use kiln-dried decking to avoid shrinkage; solve the underlying moisture issues before building the deck; and allow for ventilation. ❖