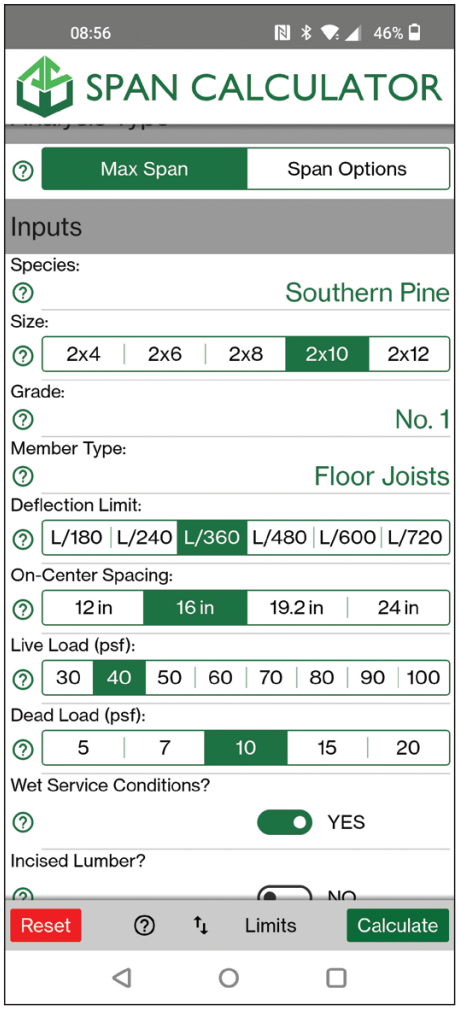
Q Will "up-sizing" deck joists so that they exceed code requirements result in a safer or stiffer deck?



The AWC's Span Options Calculator for Wood Joists and Rafters (awc.org) can be used to determine joist and rafter spans for most species and grades of softwood and hardwood lumber under different loading conditions. The free app (shown here on an Android phone) is also available in a web-based browser version for desktop.

A *Mike Guertin, a builder and remodeler in East Greenwich, R.I., and frequent presenter at DeckExpo and JLC Live, responds:* Some deck builders oversize their deck framing by sizing joists greater than code requires or limiting their joist and cantilever spans to less than code allows. A common reason they cite for exceeding the code is that the joist tables are a "minimum standard," and they're concerned about the deck feeling bouncy. Other deck builders use up-sizing the framing members as part of their marketing and sales effort.

But there is no structural benefit to beefing up the framing for safety or stiffness. The tables in the IRC are conservative, with a substantial safety factor already built in and an L/360 deflection limit. That deflection translates into about 3/8 inch on a 12-foot joist span when a deck is fully loaded at 40-psf live load—something that rarely happens unless you have a heavy snowfall. And the same would be true for higher loads if joists were sized per the new joist sizing tables in the IRC that provide for 50-, 60-, and 70-psf snow loads (see "Right-Sizing Deck Joists," Mar/23).

But even the L/360 limit is a bit conservative, because the IRC tables are based on #2-grade treated lumber, while some lumberyards stock mixed #1- and #2-grade treated lumber and others stock all #1 grade. When you use better than #2-grade lumber, the allowable span based on the American Wood Council's joist sizing tables is greater than the span in the tables published in the IRC. For example, the span difference between #2- and #1-grade 2x8 southern pine treated lumber used for deck joists is 7 inches. So your decks are already stiffer with less deflection when you purchase better-grade treated lumber and size the joists based on the code table. If you want to take advantage of the even greater spans allowed when using #1 treated lumber for deck joists, you can size your joists using the AWC's free joist- and rafter-span calculator (see screenshot, left).

I usually right-size deck joists to the maximum span that can be eked out of the table. I haven't noticed—nor have my clients—any bounciness or excessive deflection. I won't fault any deck builder for building stronger decks, but rather than overbuilding the frame, I like to right-size the footings, beams, and joists, and spend more time and money on safety elements that the building code doesn't have prescriptive requirements for, like guardrails and stairs. And I take steps that make a deck last longer, like treating field cuts with a topical wood preservative (a frequently overlooked code requirement east of the Rockies) and capping joists and beams to help shed water. To me, these measures offer better value to my clients than oversized deck framing, which I think is a waste of money and materials.

Q Is it OK to leave a tool battery—specifically a lithium-ion battery, which I assume is what most tool batteries are these days—on its charger for extended periods of time, even after it is fully charged? (By extended, I mean for a day or a week or even longer.) Does it harm the battery to leave it in a cold truck or shop overnight, or longer?

A *Dave Veprek, vice president of product development at SBD Inc. (DeWalt), responds:* It is OK to leave batteries in DeWalt chargers, because our lithium chargers stop charging once the battery reaches a fully charged state. To the best of my knowledge, this is true industry-wide with lithium-ion batteries and chargers, and not specific to our company.

Generally speaking, Li-ion batteries have a low self-discharge rate of 2% to 3% per month. In comparison, the self-discharge rate for a standard lead-acid battery (the kind that is used in cars) is between 4% and 6% per month; earlier-generation NiCad or NiMH tool batteries were plagued with much higher self-discharge rates—as much as 20% per month for NiCad batteries and 30% per month for NiMH batteries. As a result, the battery chargers used for most modern Li-ion tool batteries don't have a "trickle charge" mode; they just shut off once the battery is charged.

Another advantage of Li-ion batteries over older NiCad or NiMH batteries is that they don't have what is called a battery memory effect, in which the battery "remembers" where it was in the charge/discharge cycle when it was most recently recharged, and tends to return to that point during the next recharge. Because a Li-ion battery doesn't have a memory, you don't have to worry about damaging or shortening the life of a partially discharged battery by throwing it onto a charger at lunchtime. And you don't have to worry about "killing" a DeWalt battery by fully discharging it because our system has a cut-off that stops the tool from damaging the battery. I assume that this is true of the Li-ion batteries of other tool manufacturers, as well.

Cold weather affects how quickly any battery will charge, because it increases the battery's impedance, or internal resistance, so that the battery isn't able to accept the same amount of charging current as it can when it is warmer.

This is especially true of Li-ion batteries that are made with conventional organic carbonate solvents, which are more susceptible to reduced ion mobility than aqueous solvents found in NiCad and lead-acid batteries. This can lead to lithium plating during charging and also sluggish reaction and reduced power output in cold weather. It is a little hard to generalize, though, since there are many types of battery chemistries, though one positive effect is that cold temperatures reduce the self-discharge rate of Li-ion batteries even further, making it actually advisable to store a Li-ion in the cold.

Still, for best performance, it is a good idea to warm up a cold battery before use. In general, our recommendation is to store batteries in a location that is between 32°F and 104°F, and not to store or use the tool and battery pack in locations where the temperature may reach or exceed 104°F (40°C). However, I advise to always check the instruction manual for your batteries.

In this cut-away image of a DeWalt 20-volt lithium-ion battery, the five rectangular silver objects are 4-volt pouch cells that are wired together in series to provide 20 volts of power. The green board is the module that electronically controls the battery.

Photo courtesy DeWalt