

Protect Your Outdoor Outlets

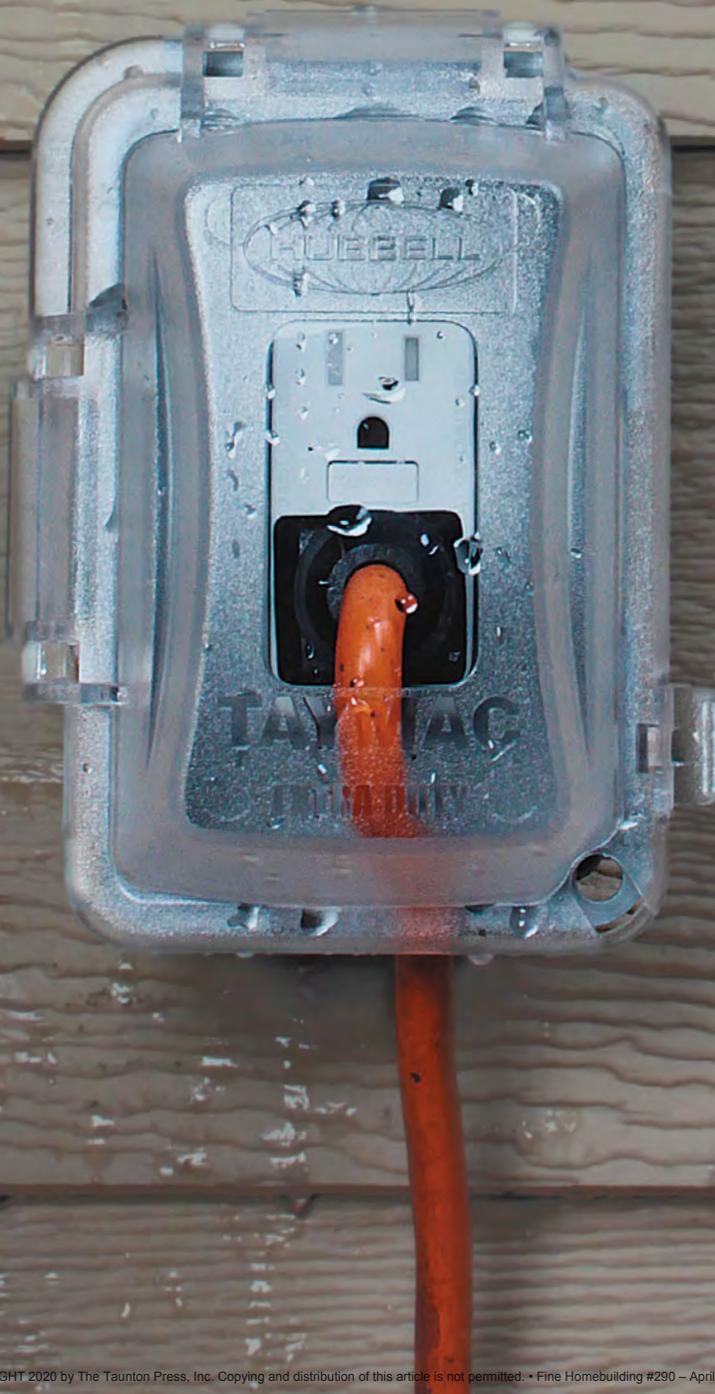
What you need to know when selecting weatherproof boxes and covers

BY MATTHEW MILLHAM

If you ever need to plug in a saw or compressor for an outdoor building project, having a receptacle available outside, rather than running an extension cord into the house or garage, is a great convenience. It's also safer, so model building and electrical codes require receptacles outside of new homes. But because codes are constantly changing, many older receptacles are not up to current standards. If you want to replace one that's broken or outdated or add more, you can't rely on what's there as a template for what right looks like.

My house is a great example. My wife and I bought it a few years ago, not long after the previous owners added a new deck. The deck had a code-required receptacle with a ground-fault circuit interrupter (GFCI), but it wasn't a weather-resistant type. On top of that, it had the wrong kind of cover installed in the wrong orientation, so water had probably been streaming in from day one. The receptacle never had a chance.

That this happened isn't particularly surprising. For a novice, figuring out the right boxes and covers for outdoor electrical outlets can be a head-scratcher, which explains why many jurisdictions require that electrical



work be left to the pros. With that in mind, what we're discussing in this article is meant to provide an understanding of what goes into selecting boxes and covers for outdoor receptacles, and is not a substitute for local code requirements.

Before getting into specifics, it's important to understand the intent of the National Electrical Code (NEC) with regard to outdoor receptacles. The two biggest threats to the safety of outdoor electrical installations are water and physical damage. To stand up to them, code and common sense require that exposed boxes and covers be sturdy and able to shed water. But these installations don't need to be totally waterproof; like the rest of the house, they just need to be weatherproof. The NEC defines this as: "Constructed or protected so that exposure to the weather will not interfere with successful operation." What's required to achieve that intent varies depending on where you put the device.

Yes, the rules are more complicated than they used to be, but they make things safer and longer-lasting so that power is there when you need it. □

Matthew Millham is deputy editor. Photos by Melinda Sonido.

BOXES ON THE WALL, OR IN IT?

SURFACE MOUNTED

Surface-mounting, as the name implies, means attaching the box to the surface, which leaves it exposed. This requires the use of listed weatherproof boxes, which are labeled to indicate their weathertightness, often with the words “suitable for wet locations” somewhere on the box. In addition, weatherproof covers are needed to keep water from getting in through the front.

Surface-mounted boxes are typically screwed to the siding or trim through external lugs that are either cast or molded into the boxes or screwed on prior to installation. Additionally, some metallic boxes have “knockouts” in the back that can be drilled through to mount the box without visible fasteners, though there are caveats to this approach. First, any holes other than approved weep holes must be waterproofed. Second, these may not pass muster in some jurisdictions because the holes fundamentally compromise the weatherproof integrity of the box—even the best sealants can fail. And just because the knockouts—or what look like knockouts—are there doesn’t mean the manufacturer intends for them to be used. Many nonmetallic boxes, for example, have what look like knockouts molded in, but metal fasteners are generally prohibited in these boxes. Check the printed instructions or call the manufacturer to find out what they allow.



TayMac
MKG420CS
Complete In-Use
Cover Kit (with
box and GFCI)
\$23

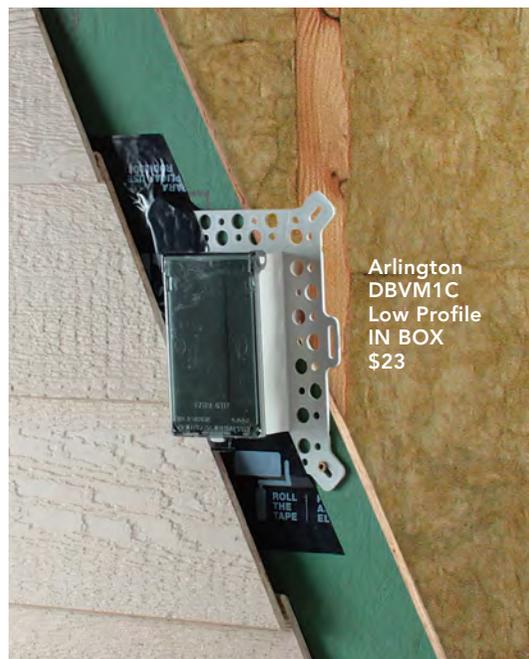
FLUSH MOUNTED

Flush-mounted installations are a different animal. A hole is cut so the box can be recessed, leaving the front of the box flush with the surface. Because it’s protected, a flush-mount box doesn’t need to be weatherproof itself if it’s in a location that would be dry but for the hole cut for the box; only the covers must be weatherproof and must seal against the finished surface to keep water out. In these kinds of installations, it’s common to use the same kind of box that’s used inside the house, but that’s not always a great idea. Interior boxes tend to leak a lot of air and are difficult if not impossible to properly integrate with water and air control layers on exterior walls, particularly when there’s an air gap behind the siding. Luckily, there are purpose-built exterior flush-mount boxes that are far easier to integrate and seal.

Purpose-built flush-mount boxes

Purpose-built flush-mount boxes are in a class all their own. The versions I’m familiar with—from Arlington Industries and TayMac—are superior to the type of flush-mount installations mentioned above because they can easily be flashed to integrate with water-resistant barriers on exterior walls. While they seem expensive compared to the standard way of doing things, they include integral in-use covers, so there’s one less thing to buy and separately install.

Arlington has a wider selection for a range of conditions, including exterior rigid foam, but both companies’ products work with various exterior claddings and wall systems, and can be used in new work or retrofit applications. Most of these boxes are made entirely of UV-resistant plastic, though Arlington makes versions with metal inserts for compatibility with metallic conduit.



Arlington
DBVM1C
Low Profile
IN BOX
\$23

Better flush-mount boxes. Preventing air and water infiltration is key to any wall’s performance. Purpose-built boxes like this one are easy to flash and seal to keep out the elements, while also protecting electrical devices.

WEATHERPROOF-BOX BASICS

Weatherproof boxes—the type required for surface-mounting—come in both metallic and nonmetallic versions, in a range of colors, depths, materials, and gang sizes—gang number being the industry term for how many devices the box can hold. A one-gang rectangular box can hold a single device, such as a duplex receptacle. The limiting factor

in the number of gangs for rectangular boxes serving outdoor locations is often the cover. While you can find three- and four-gang boxes, weatherproof covers for anything bigger than two-gang is usually a custom order. Round boxes are typically 4 in. in diameter and, while generally used for lighting, can also serve as receptacle boxes with the use of adapter plates.

All of these boxes have hubs—the equivalent of knockouts on metallic boxes used indoors—to attach conduit and run wires or cables. Most of these hubs are threaded to accept various fittings and conduit, but there are also PVC boxes with smooth hubs designed to be cemented to PVC conduit or fittings.



Weatherproof metallic boxes typically come with a **GROUND SCREW** either preinstalled or in the package.



Many weatherproof boxes and covers include sealing instructions that must be followed for code compliance.

Sigma Electric
14251-5
Metal Box
\$6

METALLIC VS. NONMETALLIC

An important difference between metallic and nonmetallic boxes is their compatibility with conduit, which is required for some outdoor wiring projects (and indoors in some jurisdictions). With rare exceptions, metallic conduit can only connect to metallic boxes; nonmetallic conduit can be used with either metallic or nonmetallic boxes. Metallic boxes also need to be grounded, while nonmetallic boxes, which aren't electrically conductive, don't.

Compatibility with existing wiring is another issue, especially in retrofits. If the new outdoor box is tapped into an existing circuit, it's generally simpler to use a box that easily integrates with what's already there. If the house is wired with armored or metal-clad cable, metallic boxes will make the job easier; if the wiring is nonmetallic sheathed cable, nonmetallic boxes will require fewer fittings and less time to install. Cables and wires rated for interior use can't be used in conduit, but they can enter through the back of weatherproof boxes attached to walls.



PVC boxes with smooth hubs are designed to be cemented to PVC conduit and fittings.

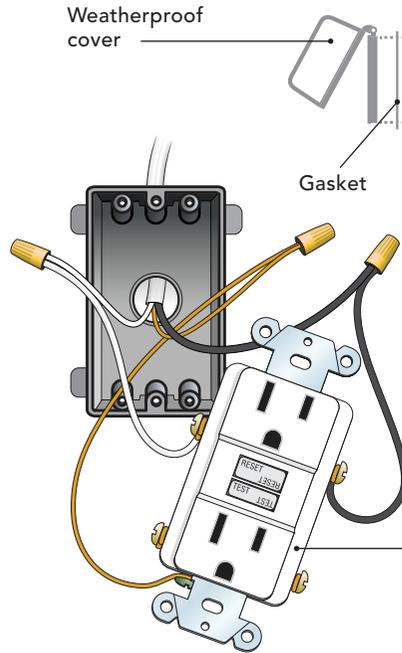
Carlton
E982DFN
PVC Box
\$5

Don't use Teflon tape on metal conduit; seal on the outside with silicone, or use conductive sealants to maintain bonding.

TAP AN EXISTING CIRCUIT, OR ADD A NEW ONE?

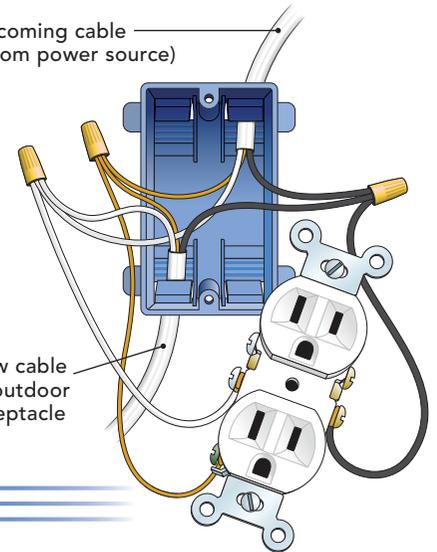
If you're running a new circuit to power your outdoor electrical installation, your options for where to put a new exterior receptacle, switch, or light are almost endless. A new circuit is optimal if you plan to plug in power-hungry tools, but probably isn't necessary for lower-draw electronics like radios and battery chargers. In many cases, you may be able to tap an existing circuit with unused capacity rather than run a whole new cable back to the service panel. There are some circuits you cannot tap into, though: Circuits serving kitchens and bathrooms, and dedicated circuits for single appliances, are all off limits. Any new cables and receptacles that tap into existing interior outlet boxes should have the same gauge and ampere ratings as the cables and receptacles already on that circuit.

If you tap into an existing receptacle at the end of a circuit, there should be enough room inside the box to bring a cable to feed the new outdoor receptacle. However, if there are already two cables in the box—incoming and outgoing—you may need to replace the existing box with a larger one.



Incoming cable (from power source)

New cable to outdoor receptacle



GFCI receptacles are larger than standard duplex receptacles, so there may not be enough room in a single-gang box if you also need to splice an outgoing cable to feed another outdoor outlet downstream. In that case, install a deep box or an extension to the single-gang box.

GROUND-FAULT PROTECTION

Receptacles installed outdoors must be rated for weather resistance (listed and labeled as "WR"), and have ground-fault-circuit-interrupter (GFCI) protection. GFCIs monitor current on the hot and neutral legs of the circuit for imbalances that may be caused by contact with water. When they sense such an imbalance, they trip, shutting off the power.

There are a few different ways to get GFCI protection for receptacles. The first is to use a GFCI breaker in the service panel. This provides GFCI protection to the entire circuit, and can be a good option when all of the receptacles on that circuit require GFCI protection, such as a circuit dedicated to an outdoor deck or patio. But they're more expensive than GFCI receptacles, and they need to be reset at the panel when they trip.

The second option is to use GFCI receptacles where GFCI protection is needed. The nice thing about GFCI receptacles is they can be reset individually, and they can be wired to provide GFCI protection to all devices connected downstream on the same circuit, including regular receptacles. A single GFCI receptacle installed first in line on the circuit can provide the same whole-circuit protection as a GFCI breaker at a fraction of the cost.

It's worth noting that most receptacles inside and outside homes are nonlocking, with two slots to receive the blades and, in grounded versions, a round hole to receive the ground pin of standard plug caps. In most cases, these receptacles must be tamper resistant as a safeguard to protect children, both inside and outside the home.



A remedy for old outlets. Standard weather-resistant receptacles can get GFCI protection from GFCI devices—either breakers or receptacles—upstream.



GE THQL1115GFTP
15-amp GFCI breaker
\$50



Legrand 1597TRW
15-amp GFCI receptacle
\$24

COVERS WEATHERPROOF VS. IN-USE

All outdoor outlets need some kind of weatherproof cover. There are two main classes of these: weatherproof, and weatherproof while-in-use. Covers that are simply weatherproof keep water out only when there's nothing plugged into the receptacle and the cover is closed. Weatherproof while-in-use covers (commonly called "in-use covers") are able to close and keep water out even when an electrical cord is plugged into the receptacle.

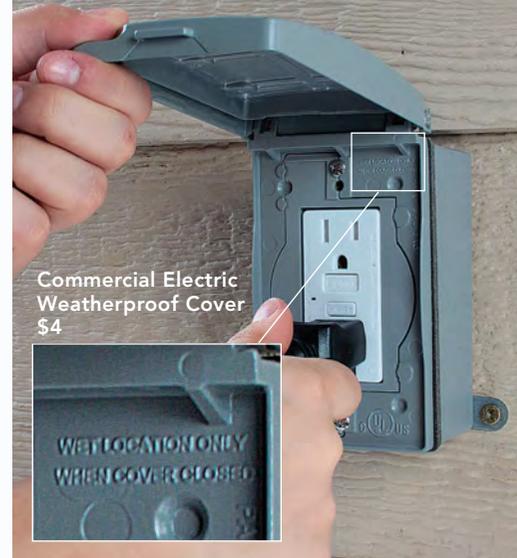
The type of cover you need depends on whether the location is considered "damp" or "wet." Everything outdoors falls into one of those categories. If you're unsure whether the location you're installing a receptacle in is wet or just damp, err on the side of wet. Anything that's good enough for a wet location is suitable for damp locations as well.

Damp locations are those that are exposed to moderate amounts of moisture—say from fog or morning dew—but are protected from the weather and aren't subject to beating rain or runoff, such as under the protection of a porch roof. In damp locations, a weatherproof cover is generally all that's required. These usually have little spring-loaded doors that snap tight over the receptacles when there's nothing plugged into them, but are open when the receptacle is in use.

Wet locations are places likely to get saturated with water or other liquids and typically have no protection from the weather, such as on decks, walkways, or pergolas. With one exception, receptacles in wet locations must have in-use covers. There are some boxes, like the Arlington IN BOX shown at the bottom of page 50, that include integral in-use covers. But the most common type is an in-use outlet box hood, also known as a bubble cover (photo above, left), and these covers must be labeled "Extra Duty."

As for the exception mentioned earlier: Receptacles in areas routinely subjected to high-pressure spray-washing (and thus considered "wet") are exempt from the Extra Duty in-use cover requirement. Here, a cover that's weatherproof when closed is permitted, so long as it's actually closed when spray-washing occurs.

In-use and standard weatherproof covers are available in both metallic and



Two levels of protection. Weatherproof while-in-use covers (left) can be closed even when something is plugged into them to protect outdoor outlets from precipitation, and are generally required in wet locations. Weatherproof covers that remain open when something is plugged into them (right) are mostly for damp areas.

nonmetallic versions, and either can be used with either metallic or nonmetallic boxes. All have hinged lids that should be installed so they open upward. Many in-use covers have removable inserts to make space for electrical cords when they're in use and keep critters out when they're not.

This should go without saying, but for flush-mount installations, the covers should sit flat on the surface, not bridge courses of siding or other irregularities. And while covers typically come with gaskets to help seal them to whatever they're attached to, they need backup (see below).

SEALING BOXES AND COVERS

Sealants are almost always needed to truly weatherproof outdoor receptacles. Most weatherproof boxes and covers note this in their instructions, which need to be followed for a code-compliant installation. Still, some instructions lack enough detail to do the job right. For surface-mounted boxes that don't come with explicit instructions to the contrary, cap all unused threaded hubs with closure plugs, and use nonhardening silicone to seal the joints around them. Use the same sealant around the top and sides of surface-mounted boxes where they meet the surface, but leave the bottoms unsealed so water that does get back there can drain out. Covers should also be installed with non-hardening silicone applied around the entire perimeter of the gasket to prevent water from wicking behind it through capillary action. The gaskets included with these covers can bridge only tiny irregularities.

Second line of defense. Even when installed on weatherproof boxes, a bead of nonhardening silicone is good insurance to back up the wafer-thin gaskets that come with weatherproof and in-use covers.

