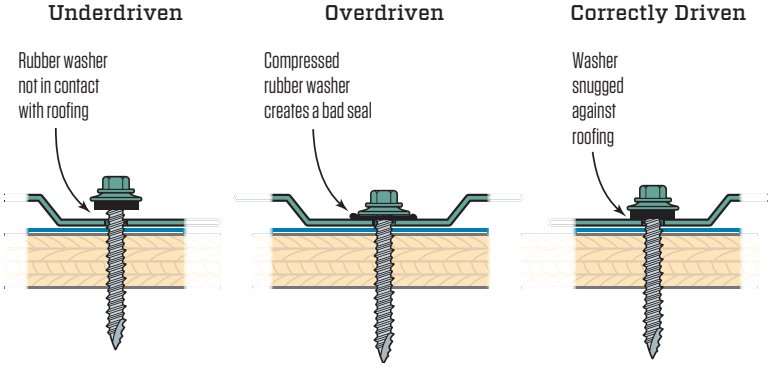
Q The new corrugated metal roofing on our client's garage leaks. The installer had driven the fasteners through the valleys and into the 2-by rafters. We've since been told that corrugated roofing should always be fastened through the ridges of the corrugation. Which method is correct?

A Rob Haddock, a metal-roof consultant and director of the Metal Roof Advisory Group, responds: The culture of fastening through the ridge (crest) or through the valley of the metal-roof profile seems to vary in the continental U.S. from one place to the next, from one contractor to the next, and even from one manufacturer to the next. Many years ago (before the advent of weather-sealing washers on fasteners), corrugated roofing was always fastened through the ridges using "lead head" nails. These were galvanized roofing nails with a lead washer under the head. As a nail was driven and its head came in contact with the roofing, the soft lead was supposed to conform to the surface of the roof to provide a seal. But these fasteners were notorious for leaking, which is why they were always driven through the high points of the roofing profile.

Today the fasteners of choice for corrugated roofing are gasketed hex-head screws with a metal and rubber washer below the head. As the screws are driven, the washer presses against the metal roofing to form a waterproof seal. If the screws are driven correctly, fastening through either the valleys or the ridges of the roofing is considered acceptable in this country. Valid arguments can be made for both preferences. If the fasteners on your roof were all properly driven, it is unlikely that they are the source of your leaks, regardless of whether they were driven through valleys or ridges.

No matter what fastener location your installer prefers, there are several factors to consider when fastening metal roofing to a building. Be sure to choose the right fastener—the right length as well as the right material—for your particular application. Roofing manufacturers often recommend certain fasteners and fastening schedules for their products according to the structural material of the roof. Each fastener must be driven straight into the metal roofing perpendicular to the plane of the roof to ensure that the washer seals evenly around the fastener hole. Also, fasteners should be driven using a properly adjusted torque-sensitive tool to avoid overdriving (see illustration, below). Applying too much torque when fastening through the ridges could crush or distort the profile of the roofing, and applying too much torque in the valleys could distort the washer to the point where it no would longer create an effective seal.

Fastening Metal Roofing



Q As a contractor, I often have to dig and pour concrete footings. But after long spells of dry weather, the soil at the bottom of the excavated holes can be super dry. How does the moisture content in the soil affect how bagged concrete cures?

A Bill Palmer Jr., an engineer and the editor-in-chief of Concrete Construction, a sister publication of *JLC*, responds: Concrete gains strength through a reaction called hydration, which means that water is consumed as it reacts with the mix and forms the crystalline structure that makes the concrete strong. If the concrete dries out before the hydration reaction is complete, it will not reach its full strength. This holds true for curing both at the top surface and at the bottom surface of the pour.

If concrete is poured into a hole with dry soil, the soil can pull the water out of the mix and for some distance

into the concrete (depending on how dry the soil is), the concrete will be weaker than intended. To prevent weakening the concrete, dampen any dry soil that will be in contact with the concrete. Dampening the soil can also help to reduce shrinkage cracks caused by water being drawn out of the mix.

Be aware that the type of soil can have a bearing on how much dampening you should do. For example, clay soil doesn't absorb much water, so it doesn't take much water to dampen it. Never pour concrete into a hole if there is standing water in it. Excess water increases the water-to-cement ratio in the concrete mix, which also reduces the strength of the concrete. Other important factors to consider with soil types are how much the soil will compact and settle with loads placed on top, and whether the soil will expand as it absorbs moisture, as with some clays. If you have doubts about the bearing capacity of your soils, be sure to check with an engineer.

Q Am I required to use a grounding screw when working with metal electrical boxes? And what about grounding when using plastic boxes?

A David Herres, a licensed electrician in Clarkesville, N.H., responds: Using a metal grounding screw is a convenient—and arguably the most reliable—method of grounding a metal wall box or light-fixture enclosure, but it isn't the only method. Certain metal raceways, such as the familiar electrical metallic tubing (EMT) that fastens to couplings and fittings by means of set screws (or compression fittings for outdoor work), also qualify as equipment-grounding conductors.

If a metal box is being used, best practice is to insert a green grounding screw into the threaded hole in the back of the box or enclosure. The equipment-grounding wires then connect to the screw, making the metal box part of the grounding system.

An alternative is to use a ground clip, which is an approved piece of hardware that slides onto the edge of a metal box and anchors the equipment-grounding conductor tightly against the metal. Conversely, the trunk slammers' old trick of folding back the bare ground wire so that it touches the inside of the Romex connector as the cable enters the box is not a reliable or an acceptable way to make a durable low-impedance grounding connection, and most electrical inspectors will flag it as a violation.

Plastic boxes cannot be grounded in the same way. But it's still necessary to bring the equipment-grounding conductor into the enclosure to ground devices such as switches and receptacles. Connect the bare or green wire directly to the green screw on the device. If another cable exits the box to feed downstream devices, connect a pigtail to the equipment-grounding conductors in both cables to attach to the grounding screw. The pigtail ensures that grounding continuity would be maintained even if the device were to be removed for some reason.