The first step when roughing in a ceiling can is marking out the location. For this shower light, the author first marked the centerline between the back wall and the showerhead **(1)**. Next, he marked the centerline of the width of the shower **(2)**. A slotted screwdriver removes the knockout for the switch leg **(3)**. After stripping back the outer jacket of the switch leg, the author feeds the cable into the box where a spring-loaded cable clamp secures it in place **(4)**.

Photos by Roe Osborn

Ceiling Can Rough-In

BY BEN GILES

In the January 2018 issue, I wrote "Rough-In Wiring," a feature about doing the preliminary work to install the electrical system in a home. Although that article covered the basics, there was not enough space for every single detail involved in the rough-in process. One thing I had to leave out was how to rough in a ceiling can.

Ceiling cans are the most ubiquitous permanent lighting fixtures in a house. These fixtures have a place for lighting in every room, from closets to kitchens. And with the wide variety of trim rings available to finish off the fixtures, they can serve myriad lighting duties, from ambient lighting to task and spot lighting.

THE RIGHT CAN FOR THE JOB

For every ceiling-can fixture I install, the first thing I need to determine is the type of can required for the location. The light for this project was being installed in a shower ceiling located directly below an unconditioned attic space. Because of the insulation that would be installed in the ceiling, I chose an IC (insulation contact) rated fixture.

I also chose a fixture outfitted with a gasket that blocks the flow of warm, moist air from the shower into the attic. From a design standpoint, the owners had specified a small, 4-inch-diameter fixture, which would provide plenty of light for the shower.

From an installation perspective, I wanted a fixture that was quick and easy to install. I also wanted a fixture that was adjustable in all directions, vertically as well as horizontally, and that I could lock in place after positioning it.

MARK THE LOCATION

Installation always starts with laying out the placement of the light. Specifications called for the fixture to be centered in one direction between the back wall of the shower and the shower head, and centered in the other direction on the width of the shower. I measured and marked the location of the can in both directions. Many electricians opt to install the fixture first and then make all the electrical connections, but I find it easier to make the connections before installing the box.

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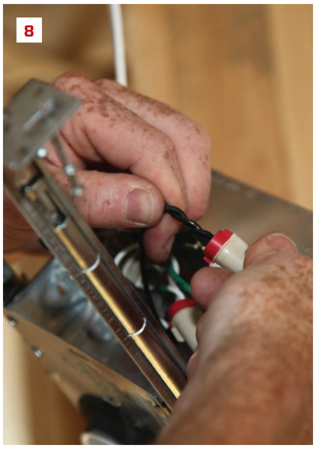

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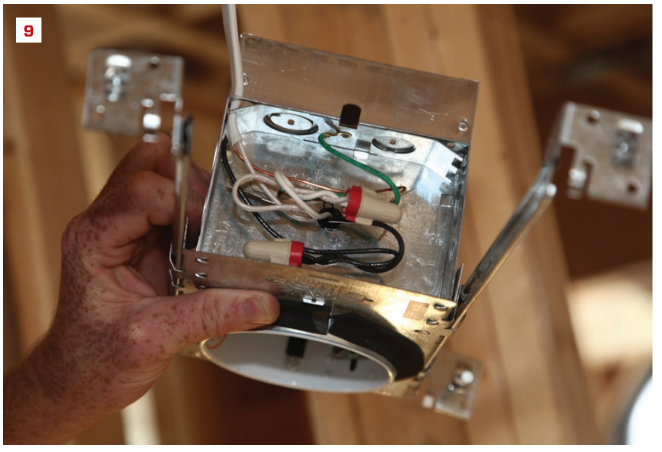


The author twists the green ground from the fixture with the bare conductor of the switch leg **(5)**. Next, he strips about 1/2 inch of insulation from the white and black conductors of the switch leg **(6)**, leaving the braided fixture wires longer than the solid switch-leg conductors **(7)**. After twisting the conductors with wire nuts **(8)**, he pushes the bundles into the box **(9)**.

HOOK UP THE CONDUCTORS

The crew had left a single cable (called a switch leg) leading from the switch for connecting the can, so the wiring would be straightforward. I stripped back the outer jacket of the cable about 8 inches, exposing the conductors.

To prep the can, I used a slotted screwdriver to remove a single knockout from the corner of the metal electrical box that was mounted on the side of the fixture. On this particular fixture, the corner knockouts were equipped with spring-loaded cable clamps. I fed the cable into the box, letting the jacketed part of the cable extend about an inch past the spring clamp.

The fixture came equipped with three wires inside the metal box: a white, a black, and a green (ground). As with most fixtures such as this, the factory-installed conductors were braided wire. The fixture conductors were already stripped and twisted with about 3/4 inch of bare wire exposed.

With the switch leg fed inside the fixture's electrical box, the first connection I made was the ground. The ground for this fixture was riveted to the metal housing, so no additional grounding screw was necessary. I simply lined up the end of the green fixture wire with the bare conductor from the switch leg and twisted the two together with the appropriate-size wire nut.

Next, I stripped back the insulation on the black and white conductors of the switch leg, removing about 1/2 inch of insulation from each of the conductors. Because the braided wire is more flexible, it tends to wrap around the solid conductor when they are twisted together. So I made the exposed solid conductor slightly shorter than the braided conductor so that the two ended at roughly the same point when twisted together with a wire nut.

To join the white and black switch-leg conductors to their fixture counterparts, I held them together with the shoulders of the insulation from both conductors lined up. I twisted a wire nut onto the ends, letting the braided conductor twist around the solid conductor. When that was tight, I continued turning the wire nut a couple

To install the ceiling can, the author lines it up on one of his centerline marks **(10)**. Metal tabs on the hanger bars set the can at the proper height **(11)**. He drives nails to attach the hanger bars to the framing **(12)**, aligns the can to his other mark, and locks the can to the hanger bar with a screw **(13)**. Finally, he pulls the slack out of the switch leg and staples the cable to the joist **(14)**.

of more turns, so that the insulated parts of the conductors twisted together as well. When all three connections have been made, I push the bundles into the box and snap on the cover, and I'm ready to fasten the fixture in place.

INSTALLING THE FIXTURE

This fixture came with bar hangers that adjust for joist spans of 12 inches to 24 inches. I began by setting the fixture between the joists and aligning it side-to-side on the mark that I'd made earlier. Then I extended the hanger bars out to span the distance between the joists.

The bar hangers have attachment flanges at the ends with double-headed nails all set and ready to drive. The flanges have metal tabs that hang down to help gauge the proper height for the fixture. The ceilings in this house were strapped with 1x2 furring, so I let the tabs extend down 3/4 inch **(11)**, and I drove in the nails on the ends of the hanger bars facing away from me.

Next, I drove the nails at the other end. For this part of the installation, I am working off a ladder, so rather than getting down and shifting positions to nail in the other side, I've gotten pretty good at hammering backwards.

After driving all four nails, I slid the fixture along the bar hangers until it lined up with my other layout mark. Then I tightened the screw on the hanger bar to lock the fixture in place.

SECURE THE CABLE

As when running cable during rough-in, I try to minimize the stress on the conductors. To secure the cable after installation, I pulled the slack out of the supply side. Then I drove a staple near the top of the joist close to the position of the box. This left a nice, relaxed loop of cable between the staple and the electrical box on the side of the fixture.

Ben Giles owns South Shore Electrical Contractors, in Wakefield, R.I.

Working Safely and Comfortably at Heights

BY ELIOT LOTHROP

While restoring old timber-framed buildings, my crew and I regularly work up high—at times, upwards of 75 feet off the ground—on tasks such as stripping existing roofs, replacing roof framing, and installing new decking. Over the years, our techniques for work in this environment have evolved. My goal for this article is to give a quick overview of the equipment we currently use to work vertically and on roofs. Having grown wary of using "compliance-in-a-can" solutions for fall protection, we turned to using nontraditional equipment (gleaned from arborists and rock climbers) to work safely and comfortably at heights.

ROCK CLIMBING–STYLE HARD HATS

Starting with our hard hats, we switched to using helmets made by Petzl about 10 years ago. On our jobsites, we require that hard hats be worn at all times. Working at heights, we can't afford to use uncomfortable hard hats that constantly fall off. The Petzl hard hat is comfortable to wear and comes with a chinstrap that keeps it securely on your head. They've become indispensable to us and have earned their keep several times over, preventing severe head injuries.

My crew and I use the Vertex Vent, Type 1, Class C model, which is ANSI certified. The Type 1 designation refers to its impact resistance to the top of the head, while the Class C denotes that it's not insulated for electrical shock—Petzl does make a model rated for electrical shock (Class E). It has slots to insert clip-on earmuffs and holes on the sides for mounting a flip-down visor. There is also a slot on the front to insert a headlamp; we use Petzl's PIXA headlamps.

FULL-BODY HARNESSES

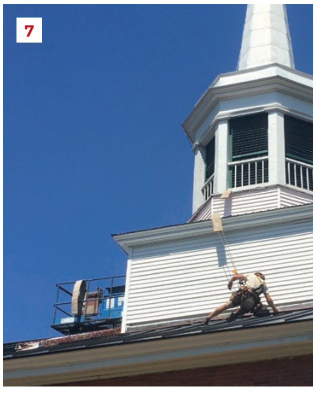
We used to use cheap full-body harnesses that were ill-fitting and uncomfortable. Another drawback was their lanyard attachment points were only on the back of the harnesses. These less-expensive harnesses were good only for fall-arrest protection and not for work positioning, which we found ourselves often trying to do.

To safely work on a roof slope or other location with poor footing where you might lean against your rope, the attachment point needs to be in front of you. Also, the harness's fit should be comfortable and padded against the legs. We prefer to use full-body harnesses by Petzl (though there are other construction-focused

A two-rope positioning system allows user to lean against his ropes and work with both hands free **(1)**. The Petzl hard hat comes with a chin strap **(2)** and is ANSI certified **(3)**. Higher-end full-body harnesses are more comfortable and safer. They also have padding against the legs and both front **(4)** and rear (dorsal) attachment points **(5)**.

Photos by Eliot Lothrop and Tim Healey

The photo above shows a roundup of the author's fall-arrest and work-positioning equipment: abrasion-resistant arborist rope (**a**); Protecta permanent ridge roof anchor with integral D-ring (**b**); DBI-Sala D-ring strap anchor (**c**); fall-arrest lanyard—Petzl ASAP mobile fall-arrester (**d**) clipped to a Petzl Absorbica energy-absorbing device (**e**); Petzl carabiners (**f**); Petzl RIG Compact self-braking descender for work-positioning (**g**); and Petzl Absorbica-I single lanyard with a compact, integrated energy absorber for clipping onto stationary points (**h**).



The author's crew are typically dropped off at their rope positions with their 65-foot Genie lift (its cage is seen here, peeking over the ridge) **(7)**. Pieces of old fire hose are used to protect the fall-arrest and work-positioning ropes from the edges of the metal roof **(8)**.

harnesses from companies like DBI Sala that are comfortable and may interface with tool pouches better).

I use Petzl's AVAO BOD fall-arrest, work-positioning, and suspension harness, which is CSA, ANSI, and NFPA certified. The AVAO harness has both a front and rear (dorsal) attachment point. It's designed to reduce pressure points during prolonged suspension and allows its user to hang from the dorsal attachment point for a longer time in case of a fall.

ROPES, ANCHORS, AND LANYARDS

For our lifelines, we use arborist ropes, which are abrasion resistant, strong, and lightweight. We typically anchor the ropes to the roof framing with the DBI-Sala D-ring strap anchors. OSHA requires that each anchor be able to support a weight of 5,000 pounds in case the anchor point is shock loaded. While the true capacity of the anchor might be hard to quantify, it needs to be substantial enough to really work and not just offer some false sense of security.

We employ a couple of different fall-arrest lanyard setups. For our rope work, we use Petzl's ASAP mobile fall-arresters. The ASAP moves smoothly, following you up and down the rope with little tending. But, if it senses a free fall or shock, it locks the rope (much like a car seatbelt). We clip the ASAP to a Petzl Absorbica energy-absorbing device, which we then clip on to the dorsal attachment point of our harness.

At stationary anchor points, such as clipping on to our Genie lift's cage when it's airborne, we use Petzl's Absorbica-I single lanyard with a compact, integrated energy absorber. This lanyard is longer than the one in the rope setup and allows for more freedom to move around while working. We clip it on to our front attachment point.

TWO-ROPE POSITIONING SYSTEM

We often employ a two-rope positioning system, which allows us to lean against our ropes and work with both hands free. In addition to the fall-arrest lifeline, we install a second, separate rope and anchor setup, along with a self-braking descender. We use Petzl's RIG Compact self-braking descenders, which allow you to ascend, descend, and lock yourself into a secure position. This piece of equipment was a game-changer for us.

If you are interested in using this gear, I recommend learning as much as possible before employing it in the field. Petzl has an excellent website with lots of informative videos to get you started. Always use the fall-arrest and work-positioning equipment as the manufacturer has intended—working at heights is no joke.

Eliot Lothrop operates Building Heritage, specializing in timber-frame restoration, in Huntington, Vt.

Safe Paint Removal

BY TOM O'BRIEN

I hate the RRP. There, I said it.

Count me among the thousands of remodelers who have griped about the difficulties of complying with the EPA's Renovation, Repair and Painting Rule since it was implemented in 2010.

I'm not just whining from a builder's point of view. When not swinging a hammer, I research and write on construction-related topics. I also live with my wife and son in a 1903 Queen Anne Victorian that we've been restoring since he was a baby, so the dangers of disturbing lead-based paint (LBP) are very real to me.

I've written many articles for *JLC* and other publications that explain the effects of lead poisoning on young children as well as on workers (see "Working Lead Safe," Jun/2016), and the requirements of the RRP Rule (see "Lead Safe Paint Removal," Mar/2011.) For research purposes, I've also sat through as many as 10 RRP classes over the years. And at the end of each one, I always felt like a survivor of a "Scared Straight" prison program.

Europe began outlawing LBP more than a century ago, but the U.S. didn't get around to it until 1978. In my opinion, it is a problem created and perpetuated by big industries (like galvanizing plants and coating manufacturers) and left for the little guy (building remodelers) to clean up or face the possibility of a $37,500 fine for each violation of the RRP protocol.

Nevertheless, the effects of lead poisoning are very real. I hope for the day when medical researchers achieve a breakthrough that enables the body to differentiate lead from nutrients such as calcium and magnesium. Until then, it's incumbent upon all of us who must disturb a painted surface in the course of our work to first do no harm.

Thankfully, technological solutions that enable us to strip paint without releasing dust or toxic fumes continue to improve. I was delighted to have the opportunity to try out a Speedheater Cobra, a new offering from the Swedish company that introduced low-temperature heat stripping to the U.S. more than a decade ago.

IR PAINT STRIPPING

Like its older brother, the Speedheater 1100 (see photo 1), the new Cobra uses infrared (IR) radiation to separate multiple layers of paint from the wood substrate. Compared with torches or heat guns, IR paint strippers operate at significantly lower temperatures (200°F to 400°F) that won't vaporize harmful chemicals such as

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The original Speedheater 1100 is particularly well suited for stripping paint from flat surfaces **(1)**. The new, compact Speedheater Cobra **(2)** is designed for smaller surfaces. The heating element does not get as hot as a torch or heat gun, but caution still applies. Electrical tape on the power cord and melted portions of the metal shroud clearly show the need to be careful when setting the tool aside during use.

Photos by Tom O'Brien

The Cobra directs concentrated infrared radiation over a small surface area, making it an excellent tool for window work **(3)**. The compact heating element proves especially effective at softening glazing putty **(4)** to the point where it can be easily peeled away from the window frame **(5)**. (Note: while not required on this job, aluminum foil can be used to shield historic glass.)

lead, or pose a fire hazard—if used as directed.

I bought an 1100 way back in 2004, and it quickly became my go-to for stripping paint from broad surfaces, such as clapboards and baseboards. But the 1100 is bulky, and not quite as effective at softening layers of old paint that have taken refuge within inside corners and the crevices of moldings.

The Cobra is smaller and lighter than the 1100 and features a compact, shrouded heating element that focuses the radiation on its intended target almost like a laser beam.

I tested this tool on flat surfaces, various molding profiles, and a few windows I was restoring at the time, all of which were heavily paint-encrusted. It was remarkably effective, but not until after I mastered the learning curve.

The manufacturer's instructions clearly state that one to three seconds heating time is all that's needed to prepare a typical painted surface for scraping. And they warn that "excessive heating can potentially mar the wood, release toxic fumes, and start a fire."

What worked for me was to hold the Cobra in one hand (fingertips grasping near the neck, as if it were a pencil) and a sharp, pull-type scraper in the other. I'd hover the face of the heating element about an inch over the doomed paint until it began bubbling and smoking, then slide the heater to the next section of paint and scrape away the debris. With practice, I was able to keep the heater and scraper moving across the surface in a fluid motion.

When I reached the end of the line, I learned the hard way that it was crucial to have planned for a safe, fireproof, parking spot for the tool. One time I set it down too close to the 6-mil poly I was using for ground cover; another time I held it off to my side, heating element facing the ground, while I momentarily finished scraping a corner, and inadvertently melted the insulation on the power cord.

On flat surfaces, the Cobra proved adequate but slower than the 1100 (because of its much smaller heating element). It worked well for stripping paint from intricate, profiled surfaces, such as moldings, spindles, and balusters (as long as the scraper blade was a good match for the profile), but it excelled at restoring window sashes. The heating element was perfectly sized for stripping the frames, and it softened rock-hard glazing putty better than anything I've ever tried—I found that after two careful passes of heat over the surface, the putty came off as easily as if it were DAP right out of the can.

Tom O'Brien is a freelance writer and a restoration carpenter in New Milford, Conn.