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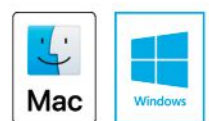
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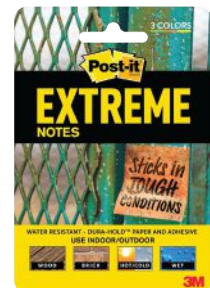
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On the cover: Aron Bach, lead carpenter for Mike Patterson Builders and Remodelers, in Gaithersburg, Md., sets out a jacking post for raising an existing roof to create a roof for a shed dormer. See the story on p. 25. Photo by Mike Patterson.

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THE JOURNAL OF LIGHT CONSTRUCTION (ISSN 1056-828X), Volume 38, Number 6, is published monthly by Hanley Wood, 1152 15th St. NW, Suite 750, Washington, DC 20005. Annual subscription rate for qualified readers in the construction trades: \$39.95; nonqualified annual subscription rate: \$59.95. Frequency of all magazines subject to change without notice. Double issues may be published, which count as 2 issues. Publisher reserves the right to determine recipient qualification. Copyright 2020 by Hanley Wood. All rights reserved. Canada Post Registration #40612608/G.S.T. number: R-120931738. Canadian return address: IMEX, PO Box 25542, London, ON N6C 6B2. Periodicals postage paid at Washington, DC, and at additional mailing offices. POSTMASTER: Send address changes to JLC, Box 3530 Northbrook IL 60065-3530.



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BUILDER'S ADAPTIVE SPIRIT BREEDS HOMEBUILDING SUCCESS



Bob Koplos has always been active and energetic, but after he was hit by an out-of-control car in front of his home, he focused that energy into deliberate action: starting his own business, Steel Root Builders, in Asheville, North Carolina.

"The first thing I did was wiggle my toes," Bob said about the moments after the car struck him. "My leg was broken, but I was actually kind of excited that I wasn't paralyzed."

"Being a builder means I'm always on the go. There's an ever-changing aspect to the job, so you have to adapt to creating at any given moment in time."

Bob Koplos, Owner - Steel Root Builders

A Texas native, Bob journeyed to North Carolina to attend Warren Wilson College, where he deepened his woodworking craftsmanship.

"Being a builder means I'm always on the go," Bob said. "There's an ever-changing aspect to the job, so you have to adapt to creating at any given moment in time."

After school, he joined a green construction crew in Asheville. The accident happened during the time he worked with that crew, and he moved into project management while healing.

Over the next few years, Bob realized he needed more than working for someone else could offer. He sought the opportunity to grow his business management skills, while finding more space to create in his own way. His company, Steel Root Builders, now serves the greater Asheville area and specializes in modern, energy-efficient homes.

The mountainous landscape offers additional challenges for homebuilding, whether on a steep slope or in a heavily wooded area.

"AdvanTech® subflooring helps us ensure that quality and durability are maintained throughout the process," Bob said about building custom homes on rugged terrain. "I want to keep the tried-and-true elements of the build, like a good subfloor assembly, in place, so we can adapt the rest of our process around every unique project and

deliver a product that is durable and beautiful and lasts a long time."

From fine art to craft beer to custom homes, Asheville is a maker's town. Surrounded by mountains, Bob says the natural beauty of the landscape is both inspiring and motivating for creativity. His injury helped him channel that inspiration into a resilient spirit and a new business venture.

"The accident helped me create a work ethic and desire to get the most out of what I have in front of me every single day."

Hear the rest of Bob's story at [AdvanTechAGame.com](https://www.AdvanTechAGame.com).



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Chief Editor, JLC Group Clayton DeKorne, cdekorne@hanleywood.com
Executive Editor, JLC Group Andrew Wormer, awormer@hanleywood.com
Senior Design Director Tina Tabibi, ttabibi@hanleywood.com
Managing Editor Laurie Elden, lelden@hanleywood.com
Senior Editors Ted Cushman, tcushman@hanleywood.com;
Tim Healey, thealey@hanleywood.com;
Roe Osborn, rosborn@hanleywood.com
Assistant Editor, Products Symone Garvett, sgarvett@hanleywood.com
Freelance Designer Melissa Krochmal, mkrochmal@hanleywood.com
Contributing Editors Mark Clement, David Frane, Dave Holbrook,
Tom Meehan, Matt Risinger, Emanuel Silva, Gary Striegler, Tim Uhler
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Editorial & Advertising Offices:
The Journal of Light Construction,
Hanley Wood LLC
1152 15th St. NW, Suite 750
Washington, DC 20005
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CONTACT INFORMATION

jlconline.com; 202.452.0800
JLC
Hanley Wood LLC
1152 15th St. NW, Suite 750
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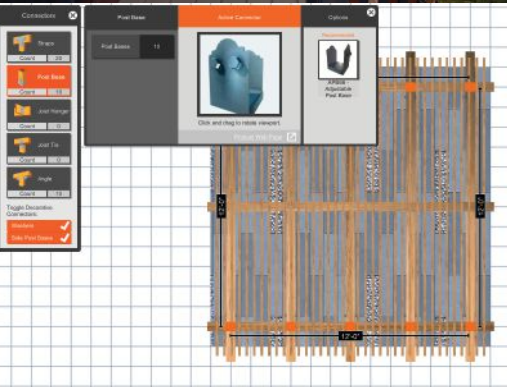
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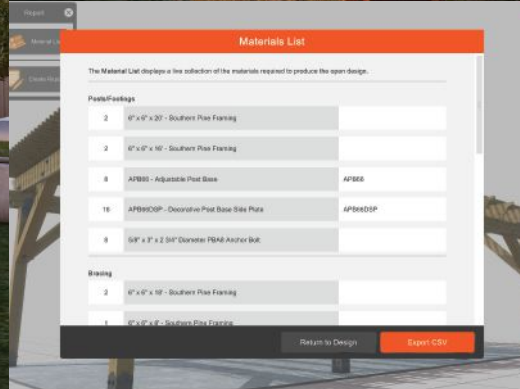
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Dan Colunio

Vice President, Sales, Remodeling &
Distribution Groups
617.304.7297
dcolunio@hanleywood.com

EAST / SOUTH

Paul Pettersen

Strategic Account Director
516.252.8020
ppettersen@hanleywood.com

MIDWEST / SOUTH CENTRAL

Kay Ross-Baker

Strategic Account Manager
773.824.2576
krossbaker@hanleywood.com

WEST COAST

Carol Weinman

Senior Strategic Account Director
831.373.6125
cweinman@hanleywood.com

CANADA

John Magner

York Media Services
416.598.0101
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Q I need to pour a 4-inch-thick concrete patio slab that's 15 feet square. Can I mix and pour enough concrete fast enough with my electric mixer to do the job before the concrete hardens?

A John Carroll, a mason and a builder from Durham, N.C., responds: A 15-foot-by-15-foot slab would take close to 3 cubic yards of concrete. That's about the most I'd ever want to mix on site. So if at all possible, I'd order the concrete from a ready-mix supplier (see "Mixing Your Own Concrete," Dec/19).

Keep in mind that concrete weighs 2 tons per yard and that your working time is limited. As soon as the dry ingredients are mixed with water, they begin the unrelenting and irreversible hardening process. If that process gets away from you, the pour can become a real nightmare.

On a recent project, I used my mixer to mix up one cubic yard, which took eight mixer batches over about an hour and a half. As I mixed each batch, I dumped the concrete in a wheelbarrow. Then two other experienced masons took it from there, rolling the wheelbarrow to the form,

shoveling the concrete into buckets, lifting the buckets up onto a scaffold, and then pouring the concrete into a form. So, to mix 3 cubic yards on site, count on spending four to six hours just mixing the concrete. You'll need to have two other experienced workers to place and finish the concrete while you mix.

If you can't line up extra help, I'd recommend dividing the slab into four 7½-foot-by-7½-foot sections and pouring each section separately. Before you begin, make sure that you have a well-compacted, drainable base for the slab (see Pouring a Concrete Patio, below left). Start by compacting the existing soil. Then place and compact a 4-inch layer of gravel. A mechanical compactor is ideal, but a hand-held compactor also works. If you have thoroughly compacted the base, no reinforcement should be needed for the concrete, as long as no one plans on driving a vehicle over the slab.

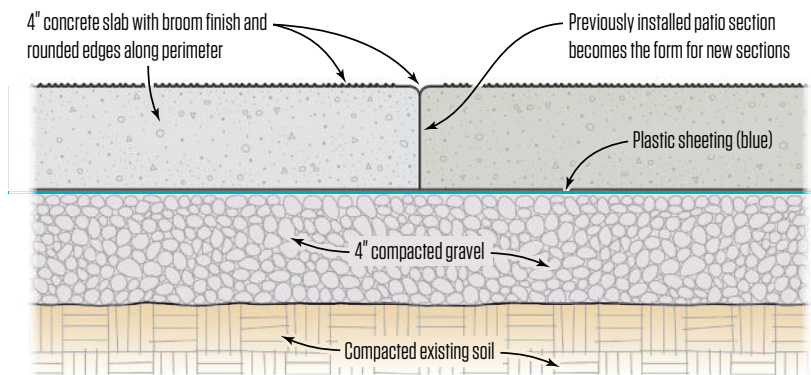
Start by forming the perimeter of the entire slab. The forms can be minimal—staked 2-bys will work fine. Next, cover the base inside the perimeter forms with 6-mil plastic sheeting to prevent water from draining out of the wet concrete, which gives you more time to place and finish the concrete.

Then use a long length of 2-by to divide the slab area into two rectangles, making sure to place the 2-by so that the interior of one section measures 15 feet by 7½ feet. Use a shorter length to divide that section to form a 7½-foot square. Now mix and pour the square and let it cure for three days. When that section has cured, remove the short form and pour the adjacent section up against the first.

After the second section cures, you should need to form only one side of the third section, using the adjacent finished section as a "form." For a slab this small, expansion joints should not be needed between the sections. I'd finish the perimeter of each section with an edging tool to round over the edges and to create a more professional look.

I would also give the concrete a "broom finish," applied by literally running a coarse broom over the surface while the concrete is still fairly wet. The broom finish adds texture to the surface to create traction for foot traffic. Leaving a slick finish is definitely not a good idea for an outside application. Not only does it increase the likelihood that people will slip and fall, it also creates a thin skin of fines that tend to flake off when the slab is subjected to freezing temperatures.

Pouring a Concrete Patio



To support the concrete patio, the existing soil is compacted along with a 4-inch layer of gravel. Plastic sheeting over the gravel prevents water from draining into the base layers. Forming and pouring smaller sections eliminates the need for control joints.

Illustration by Tim Healey

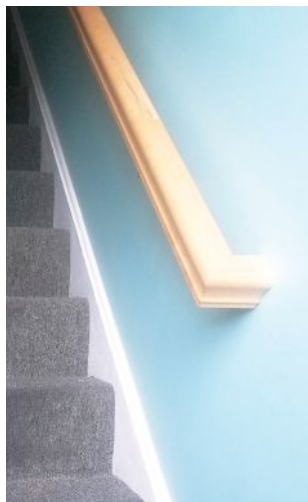
Do wall-mounted handrails need returns?

A Victor Staley, a building official in Brewster, Mass., responds: The short answer is yes, but let's first take a look at what the code requires for basic wall-mounted interior handrails. The Handrails section, R311.7.8, of the 2018 IRC requires a handrail on at least one side of any stairway with four or more risers. The handrail must be between 34 and 38 inches measured vertically from the nosing of the stairs—that is, the sloped plane of the stairs—and must be a minimum of 1½ inches from the wall. There are also specific regulations for the graspability of the handrail.

Reading on in the code, we come to Section R311.7.8.4, Continuity, which relates more specifically to your question: “Handrail ends shall be returned or shall terminate in newel posts or safety terminals.” The term “safety terminal” is a catch-all phrase and does not indicate a specific handrail design or component.

My interpretation of this section is that both the top and bottom ends of a handrail must be constructed so that clothing, handbags, and the like are less likely to snag on the ends of the railing when a person walks up or down the stairs. A handrail return is the easiest

and most common way of creating a so-called “safety terminal.” Most returns I see are made by turning the railing 90 degrees and making it square to the wall. On rare occasions, I've also seen designers or builders make handrail returns greater than 90 degrees as a decorative element (see photos, below).



Photos by Roe Osborn

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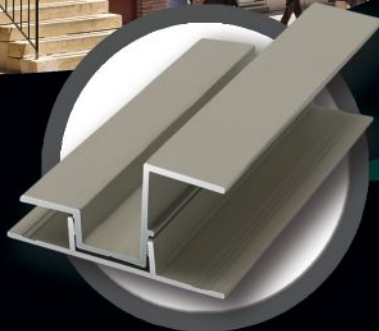
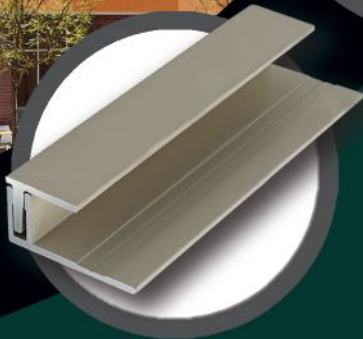
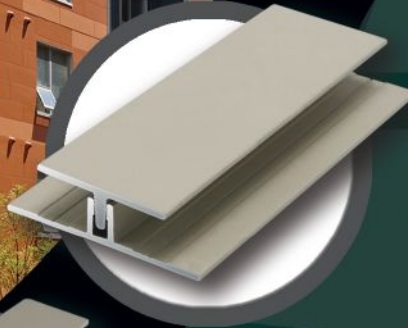
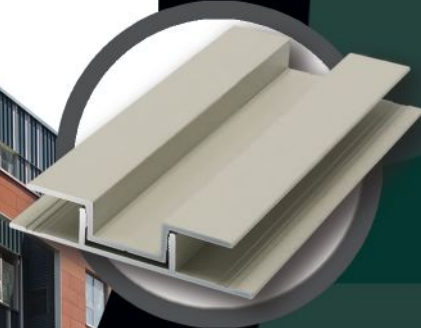


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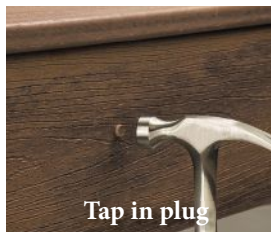
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Transoms for Interior Doors

BY GARY STRIEGLER

Nine-foot ceilings are a common upgrade in the new custom homes we build; in fact, they are rapidly overtaking 8-foot ceilings as the standard. But while ceiling heights are growing, the standard height for doors hasn't changed—6'-8" doors have been the standard for ages. I have tried using 8-foot doors with 9-foot ceilings a few times, but I've found that when an 8-foot door is trimmed with a nice 3 1/2- to 4-inch-wide casing and there's a decent-size crown molding above on the ceiling, the visual proportions don't work very well. Seven-foot doors look great with 9-foot ceilings, but they are never a stock item and usually cost more than an 8-foot door.

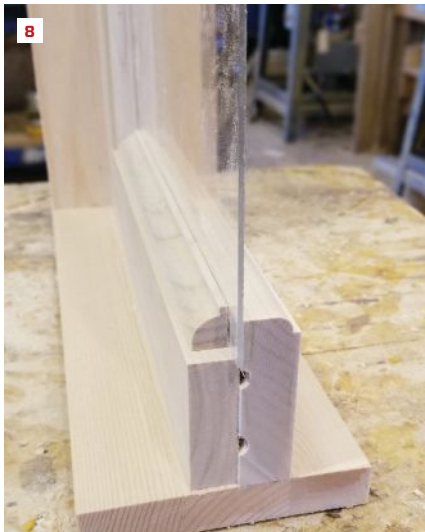
Transom frame and jamb. There are usually only a few highly visible doors in the public spaces of a house, and transoms are a great way to make those 6'-8" doors look better with tall ceilings. To make room for transoms in new construction, I make sure that we frame the headers directly below the top wall plates. On remodeling jobs, the header can be removed if the wall isn't load bearing. For load-bearing walls, we simply remove the drywall from one side of the wall and move the header up under the top plate. The goal is to have 10 to 12 inches of space above the door.

To make the transom jamb, I build a box out of door-jamb material to the exact width of the door below. I make the box 1/2 inch



Nail together pieces of jamb material for the transom jamb (1). Install the transom jamb about 1/4 inch above the door jamb (2). After shimming the jamb square (3), secure the sides (4) and case the entire door and transom (5).

Photos by Gary Striegler



For a traditional-looking glass transom (6), the author mocked up several options. The simplest glass option captures a glass panel between two strips of panel molding (7). The second option looks more like a window sash in the transom (8). The solid panel option can be built and installed before the box goes in (9).

shorter than the opening to ease installation. I make the top and bottom full width and nail them to the vertical legs (1).

To install the transom jamb, I align it with the door jamb below. After spacing the box about 1/4 inch above the header of the door jamb, I nail it in place (2). I set a square in the corner of the transom jamb (3) and shim the jamb square in the opening (4).

Then I just let the door casing extend up to include the transom (5).

Glass transom options. Glass transoms let light pass between rooms even with the door closed (6). A simple way to make a glass transom is with panel molding laid flat on the jamb as a glass stop (7). To save time, I cut four pieces of molding to the height and four more to the width measurements.

With a gauge block, I locate the first set of panel molding 1/8 inch back from the jamb centerline (to accommodate 1/4-inch-thick glass). I attach the molding to the jamb with brads. I leave the second set of molding loose for the painters to prefinish, making sure that they finish the back edges that can be seen after the glass is installed. After the painters finish, the glass company sets the glass on rubber setting blocks with a dab of silicone to keep the glass from rattling. We then nail in the second set of stops.

Another glass transom option has the more traditional look of a window sash above the door (8). Instead of using panel molding, I make a frame out of 2-inch-wide 1-by material. I rout a profile around the inside edge of the frame with a 3/8-inch radius bit set deep enough to leave a shoulder. The rounded corners can be cleaned up with a sharp chisel and sandpaper. If possible, we nail this frame in place before installing the transom box.

Next, I build a second frame out of 1 5/8-inch-wide 1-by material and nail it back-to-back to the first frame. The glass then sits inside this frame, held in place by a 3/8-inch quarter-round stop that I make using the same router bit. I precut the trim and make sure everything is prepainted. Because I am working with much smaller trim, I install the stop with headless pins. The side of the transom with the stop looks a little better, so I face it toward the most visible side.

For a solid panel instead of glass, I sandwich a 1/4-inch plywood or MDF panel between two 2-inch frames back-to-back (9). Again, I assemble and install the frames in the box before the box is installed. I finish the detail with panel molding installed inside the frame on both sides.

Transom without the jamb. To dress up a door, such as an entry closet door, that doesn't call for the full transom treatment (10), I use a detail that doesn't need a separate jamb so there is no need to raise the header. My strategy varies depending on the size of the door trim I'm using. If the inside edge of the trim is 5/16 inch or wider, I run the casing trim as if I had an 8-foot door, installing the casing directly over the drywall.

If I'm lucky enough to have smooth drywall, I only have to add a thin piece of trim at



Doors that are less visible don't need the full transom treatment (10). After extending the door trim to include the transom area, the crew member removes the drywall and installs a plywood panel (11). A molding strip goes between the door and the transom area (12).



To finish off the panel, the crew member pre-assembles a decorative frame of panel molding, gluing and pinning the corners (13). Using a gauge block to space the panel molding frame away from the door trim, the crew member attaches the frame to the transom panel (14). The entire door assembly is then ready for paint.

the door jamb header between the casing legs. If the drywall has a texture to it, I fit a piece of 1/4-inch plywood inside the casing that extends down to the door jamb header (11). The thin piece of trim then covers the bottom edge of the plywood (12).

If the door casing trim has a very thin inside edge, I use a multi-tool to cut out a section of drywall above the door. I make the edges of the cut fall beyond the inside edges of the extra tall casing trim. I then replace the drywall with 1/2-inch MDF or plywood. When I install the casing, the inside edge lands on the plywood.

With either strategy, I add a picture frame of panel molding to finish the detail. I size the picture frame to leave a 2-inch reveal to

the inside edge of the casing trim. I assemble each frame on the workbench (13) and install it with a headless pinner (14). If I am using this treatment on multiple doors, I make a 2-inch gauge block to speed up the installation.

The extra work and marginal cost of these treatments on high-visibility doors is well worth the result. My clients are always happy to have invested a little bit to dress up their doors.

Gary Striegler owns Craftsman Builders (craftsmanbuildersnwa.com), in Fayetteville, Ark., and teaches workshops at the Marc Adams School of Woodworking. Follow him on Instagram @craftsmanbuilders.

BY BRIAN ALTMANN

The Ideal Job Scope (and How It Could Save Your Business)

My company no longer gives “estimates” to potential customers; instead, we provide “Comprehensive Project Evaluations,” or CPEs—for a fee. A project’s CPE is composed of three parts: the design, a job scope, and a cost analysis (three components I believe every homeowner needs in order to properly conduct business with a remodeling company). The CPE is the key to our business, and the key to an effective CPE is a well-written job scope.

For us, the job scope is a precious document that clearly defines precisely what the consumer is purchasing. Leaving no stone unturned, this line-by-line summary outlines the step-by-step components of all work to be completed, as well as expressing *what is not included and what is to remain untouched*. It is my best friend in business; it is the crown jewel of all our contracts.

In this article, I’ll review how to compose a great job scope, which I hope will help you earn more, eliminate headaches, and get paid for everything.

BUILDING VALUE DURING THE SALE

In my *JLC* article, “Charging for the Estimate” (Jul/15), I outlined the importance of being paid for estimating, as well as “building value” with potential customers during the sale. I noted that having buy-in from the clients upfront has allowed us to determine the precise cost of a project. Acting more in the role of the customer’s

The job scope is a precious document that clearly defines precisely what the consumer is purchasing. Leaving no stone unturned, this line-by-line summary outlines the step-by-step components of all work to be completed, as well as expressing *what is not included and what is to remain untouched*.

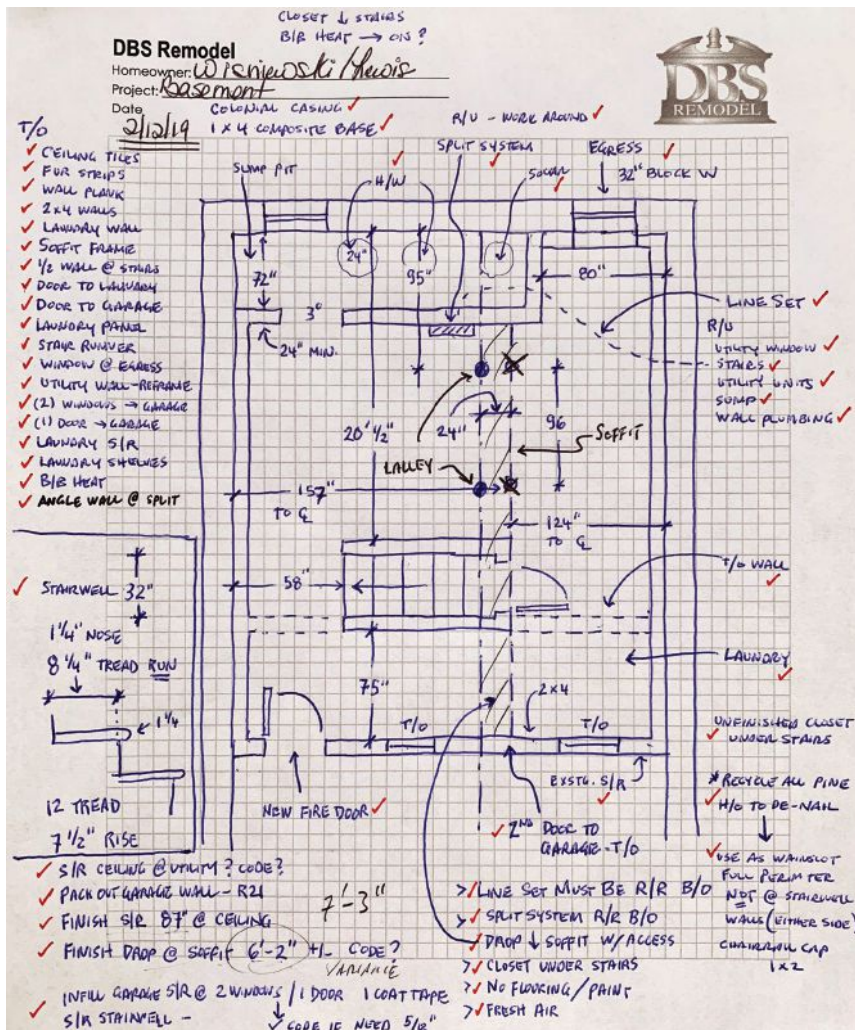
consultant, we listen to their needs and educate them about the realities of remodeling over a series of methodical interviews. We are able to walk them through the process of how we would accomplish their project, step by step and in person, illustrating to them that we are professional, communicate well, and will be a reliable ally. This builds trust, and in turn, builds value.

It’s expensive to be in the remodeling business today. With more regulations, required employee training and certification, and the labor shortage (we’re going to have to compensate our employees more to keep them on staff), it’s certainly not going to get cheaper. We therefore have to be precise on how we approach pursuing new work in order to meet the margins we need to keep our business vital and on-going. So, when we break the news to prospective clients that their new kitchen will cost \$75K rather than the \$50K figure they had in mind, we have to use every opportunity we can to build value with that client. We need to be able to sell the job at the higher figure, whether we like it or not.

Our first appointment with potential clients is free and we use it to prequalify them to make sure their project is a good fit for our company. If we like them and they us, we enter into an alliance to act as their consultant to develop a CPE for a fee (a CPE can range from \$200 for a deck or half bath to \$4,000 for an addition). It may take multiple meetings and rough drafts to hone a well-defined job scope, depending on the complexity of a job. In follow-up meetings, we get to know the clients, learning their concerns, fears, and wants. As we progress through the interview phase and have a better handle on their project, we explain how we plan to accomplish the job. We speak—and write—in detail, using layman’s terms and reviewing the scope with them at a comfortable pace.

For instance, if we are remodeling a bathroom, we don’t just say that we’re going to drywall and paint. We write in the job scope that we are installing moisture-resistant drywall; fastening all drywall with screws; taping all seams and applying three coats of compound; feathering new drywall into existing as required; wiping down all drywall prior to painting; and applying two coats of Benjamin Moore Regal Select with an eggshell finish. Being specific builds value. Or, if the client has a particular pain point, such as a child with asthma, we write in the scope’s home-protection-and-care section that we will run a BuildClean air scrubber with a HEPA filter ducted to the outside that will remove the bulk of the dust particulates during the remodel. Clients will often note that “the other guys didn’t tell us this.” The idea is to set ourselves apart from our competition. Being cognizant of the clients’ pain points and having a plan to deal with them helps us to build value and sell the job at the number we need.

Being courteous, polite, and thoughtful—for example, by showing up when we say we will, by thanking clients for inviting us into their home, and by confirming appointments 24 hours ahead—also builds value. If we’re not doing those things, we cannot sell the more profitable \$75K number.



The author takes quality jobsite notes, jotting down what is not included, what to tear out, any perceived difficulties, and general site conditions. Here, for a recent finish basement remodel, he checked off the items with red check marks as he brought them into his job scope and estimating program (applying hours and quantities to do each task).

SEVEN STEPS FOR CREATING A FLAWLESS JOB SCOPE

The first “step” is not a step per se, but a nod towards creating a mindset of believing in the impact this will have on your business.

Step 1. Drink the Kool-Aid. You need to pride yourself on exceptional job scoping; “drink the Kool-Aid,” as they say.

I’ve given a number talks at JLC Live and the Remodeling Show on how to build value during the sale. In them, I’ve tried to show how creating laser-sharp job scopes could be the most valuable weapon you

own in business. Being thorough and writing with clarity eliminates disputes and allows you to get paid (I think of myself as a lawyer for the client as well as for my company when I’m building a job scope). And, if we follow the scope’s “script” and fulfill every obligation with an acceptable level of craftsmanship while executing a job, there is no excuse for somebody not to pay you. Many homeowners want things for free, but an iron-clad job scope will help prevent clients from pushing you around and assuming things were included that weren’t.

Also, effective job scoping doesn’t allow homeowners to play dumb or use ambiguously written language against us. For example, I once wrote in one of my scopes that “the owner was going to do all the painting in the bathroom.” When it came time to paint the bathroom, the client asked, “When are you painting the bathroom?” “I’m not painting the bathroom,” I replied. “But I thought the owner is painting the bathroom. You’re the owner of the company, right?” he asked. “Really?” I responded. “That’s what you thought? Honestly?!” When he said, “Yeah ... it says ‘owner,’” I was stuck. “Well, OK ... I guess I’m painting tomorrow,” I said, but thought to myself, I have to remember this one!

We are all going to have our battle wounds, but a mistake is only a mistake if you don’t learn from it. Say to yourself, “OK, I get it. The next scope will be a little bit better.” We now write “homeowner” rather than “owner” in the job scope.

Another benefit of our approach is that it creates independence in the field for our team. We give our lead carpenters a bound book that contains the contract, the job scope, all the drawings, and any special-order items—it’s their jobsite “Bible.” We’ve found that if we give our leads well-thought-out job scopes, it reduces the number of calls into the office

with questions (my phone hardly rings anymore with questions from the field) and thwarts clients from trying to influence our crew members with cross communication.

Step 2. Take detailed job notes. The second step is to take quality notes while walking through the entire work area. During the interview process with the clients, note what is not included and what is to remain untouched, what to tear out, any perceived difficulties, and site conditions (see image of job notes, above left). These notes are

Example of DBS Job Scope

- Protect all finished floors during construction
- Access home through side door as per homeowners request
- Remove and reset the following existing items
 - Existing water closet- Install new wax seal @ re-install
 - Bath vanity and top- Unhook and reconnect plumbing
- All door jambs and casing to remain untouched
- Tear out the following existing items
 - Floor tile / grout including thinset below
 - All bath base trim
- Install *Ditra* premium uncoupling waterproof membrane over sub floor
 - Fasten to existing sub floor w/ modified thinset
- Ceramic tile floor (min. 8" x 8") over *Ditra*
 - \$325.00 tile purchase allowance (includes tax)
 - Adhere tile w/ premium *Superflex* unmodified thinset
 - Grout all joints w/ *Mapei Opticolor* epoxy grout
 - Install tile on diagonal- Borders or accent tiles cut in *not* included
 - Remove/ reset existing vanity to tile underneath
- Install marble saddle under bath door- \$40.00 saddle purchase allowance
- Install new primed pine 3 1/2" colonial base trim @ bath perimeter
 - Paint new trim w/ 2 coats *California Elements* premium latex- semi gloss
 - Caulk new base trim to walls W/ GE white silicone- wipe clean
- The following items are **not included** in this project
 - Sub floor repairs
 - Wall painting or repairs to existing sheetrock
 - New shutoff valves @ vanity sink
- Remove all DBS generated debris from site on daily basis
- Provide client w/ workers comp and liability certificates

A precise job scope is written clearly and in layman's terms. Here, a portion of a job scope for a bath remodel shows the author's simple but effective layout, or "the art of indentation." Noting what is not included is as important as noting what is included.

the head start of our job scope, and we use them to build it and the cost analysis later on. We are going to review the notes again with clients, and they may change their minds on certain items, but that's OK.

Step 3. Take photos. It may sound overly simplistic, but take lots of pictures of the existing conditions when you're there. A large portion of our work is kitchen and bathroom remodels and we do 40 to 60 projects a year. We also have anywhere from 20 to 25 active CPEs any given month that we are trying to move to the next level (with the hope of closing on six to eight contracts per month). So, given this volume of work, we know that we're more than likely going to miss some details during our walk-through meetings. Having lots of photographs, taken from multiple angles, goes a long way toward filling in gaps in information.

Step 4. Interview with scope development sheet. To prompt productive conversation, we also bring along a scope development sheet when we interview the clients. It contains a broad list of talking points, everything from site protection and portable toilets to painting and lighting fixtures. Having the bullet-pointed list at our fingertips helps tease out what we need to know from the client and prevents us from forgetting something. These "cheat" sheets are specific to each project type, so if we are discussing a tile job

for a bathroom, we ask questions like: What is the purchase cost of the tile? Are we setting the tile over *Ditra*? Are we using Grout Once sealer?

When reviewing site conditions, we ask if our workers have bathroom privileges during the project. It's OK if clients say "no"; we just need to know because it costs \$168 per month to rent a portable toilet. If it's a four-month job and they say "yes," but renege on the verbal commitment, that's going to cost us about \$675 we haven't planned for. So, there's some profit slip-page right out of the gate. We note whether we can or cannot use the homeowner's bathroom in the job scope.

Step 5. Compose rough draft. We typically start composing a rough draft by copying and pasting a similar job into our file, though we won't copy a job or information from a job older than six months (to me, anything prior to that is a relic). If we do copy and paste, we are careful not to forget to change the client's name or delete items unique to that project, such as a pet door flap in a kitchen door, especially if the clients do not have a pet. We review all photos during scope building, inserting pertinent project photos into the rough draft and listing project objectives and any pain points the homeowners have brought up that we plan to address. We check off all our job notes as we bring them into the scope (see image of job notes, page 19). And, remembering that the clients do not do this every day (and we do), we organize the job scope chronologically in

a method that they can understand, using what we refer to in-house as "the art of indentation" (see example, left).

Step 6. Review rough draft with client, final edits. We review all job scopes with clients, in person, line by line, telling them that we can still change whatever needs to be changed. For example, when a client says, "Well, I was talking to my friend, and we decided we want a 24x24 double niche in the shower rather than a 12x12 niche," we can say, "OK, no problem," and mean it. The process of reviewing the job scope builds trust. We are sharing things with the homeowner that no other remodeling firm is and we are getting paid to do so. We can afford to be focused and patient, which is not easy to do when you are not being compensated, especially when you are not sure that the people you are talking to will ever even call you back.

We mark all changes in green text so the next time we look at the text, we review just the things that were changed and don't cover old ground.

Step 7: Prep for final presentation. Our final presentation includes the design drawings, job scope, and cost evaluation placed in a DBS Remodel presentation folder. If we are working with a husband and wife team, they each get a copy. The presentation is clean and easy to follow, not dense like an architectural plan. It should



The final presentation includes the design drawings, job scope, and cost evaluation placed in a DBS Remodel presentation folder. The front page of the job scope lists the project objectives, home care/protection requirements, and “before” photos, which here contrast with printed outputs of rendered “finish” illustrations. VR (virtual reality) is also an option for the presentation, if requested.

be relatable to them with nothing scary and no fine print. As I am closing the deal, we review the amended job scope one last time. Any changes after this will be executed through a change order.

I never include the investment figure on the scope document. Ultimately, everyone goes to the last page looking for it. I tell clients it’s not there because I want them to focus on understanding what they are purchasing first. When all questions have been answered, and they understand precisely what they’re buying, I unveil the projected cost and ask them for their business.

Price conditioning. Throughout the scope-building process, we present a project cost range to the clients, which becomes more refined as we delve deeper into the

job. In general, prospective customers do not have a good grasp of remodeling costs, and we need to price condition them. We have to tell prospective customers the cost range over and over again throughout the process because it’s such a shock to them. For instance, initially I may tell a client that the cost of their kitchen remodel may range from \$100K on the high side to \$60K on the low side, but that I won’t know the exact cost until we work through the project details (it’s sometimes helpful to provide a Cost Vs. Value report (remodeling.hw.net) for a similar project to act as a third-party source for verifying this range). If we haven’t tiptoed into the cost investment of this project with them, we’ve done a disservice to our clients and to ourselves. So, I’m estimating in tandem with

building the scope, but presenting the costs in an ever-narrowing range until the end when I present a lump-sum projected cost amount to them.

The job scope is where the money is. It’s going to protect you from a client being naïve or playing dumb (potentially money out of your pocket). It allows you to charge more because you’ve built a more premium picture of their project in their heads. And it creates independence in the field for your team, which adds up to real savings.

Brian Altmann, CAPS, is president of DBS Remodel, a design-build residential remodeling company based in Poughkeepsie, N.Y. He is also a private consultant for other remodeling companies related to business advice.

BY TED CUSHMAN

Makeup Air for Kitchen Range Hoods

Kitchen ranges are a significant source of indoor air pollution. Gas ranges produce oxides of nitrogen, or NO_x, and if they don't combust cleanly, they can produce carbon monoxide too. Both gas and conventional electric ranges interact with smoke, spatter, fumes, and vapors from cooking to produce clouds of small particles that are suspected of having health effects.

The point of kitchen exhaust hoods is to capture those combustion gases, vapors, and particles (along with odors) and send them safely out of the house. But kitchen exhausts—particularly the large units associated with commercial ranges—come with their own set of problems. In particular, they can backdraft other appliances in the house, such as natural-draft heating equipment and water heaters.

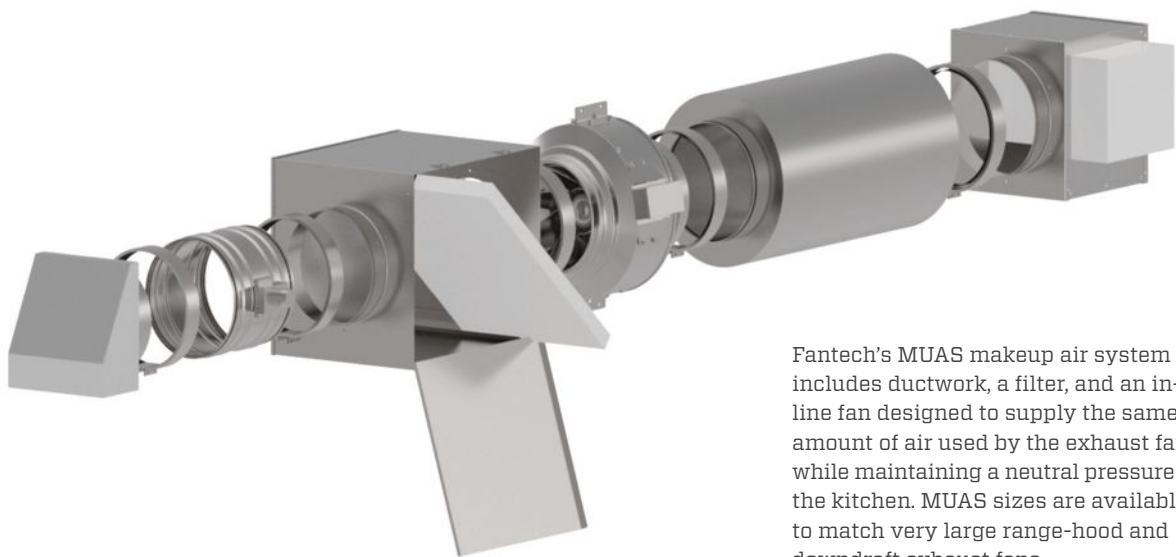
In 2009, the International Residential Code (IRC) was amended to require makeup air to be provided for any kitchen exhaust fan that exceeds 400 cubic feet per minute (cfm) in capacity. That requirement stayed in the code through the 2012 and 2015 editions. Then, in 2018, the code was amended again to limit the application of that makeup air requirement. The new language requires makeup air only if the house also has atmospherically vented combustion equipment that could be backdrafted, such as a naturally vented water heater or a natural-draft furnace. An all-electric house or a

house with only sealed combustion equipment would be exempt from the makeup air requirement. Here's the language:

"Where one or more gas, liquid, or fuel-burning appliance that is neither direct-vent nor uses a mechanical draft venting system is located within a dwelling unit's air barrier, each exhaust system capable of exhausting in excess of 400 cubic feet per minute shall be mechanically or passively provided with makeup air at a rate approximately equal to the exhaust air rate. Such makeup air systems shall be equipped with not fewer than one damper complying with Section M1503.6.2."

Interestingly enough, the IRC has never required kitchen range hoods themselves. The provisions for makeup air are required when a high-capacity exhaust fan is installed, but there is no rule in the model code actually requiring any type of range hood.

That's not to say, however, that a state or local code can't require an exhaust fan, and some do. Oregon's code, for example, provides, "Domestic kitchen cooking appliances shall be equipped with ducted range hoods or down-draft exhaust systems." But Oregon requires only a small fan capacity: 150 cfm intermittent. Washington, by comparison, stipulates, "Exhaust shall be provided in each kitchen, bathroom, water closet, laundry area, indoor swimming pool, spa, and other room where water vapor or cooking odor is produced."



Fantech's MUAS makeup air system includes ductwork, a filter, and an in-line fan designed to supply the same amount of air used by the exhaust fan while maintaining a neutral pressure in the kitchen. MUAS sizes are available to match very large range-hood and downdraft exhaust fans.



Broan's makeup air damper opens or closes in response to the control on the range hood fan, allowing passive entry of makeup air for the exhaust fan.

There is no mention of range hoods, and the required ventilation rate, again, is low: 25 cfm continuous, or 100 cfm intermittent.

In any case, large commercial-style gas ranges typically are installed with powerful range hoods and for good reason: Nobody using a big range would want to be without the ability to capture and exhaust smoke, heat, steam, and cooking odors. Once a range hood capable of 600 cfm, 800 cfm, or 1,200 cfm is in place, backdrafting of pressure-sensitive equipment is a risk.

There are other reasons besides backdrafting to consider the need for makeup air. In tight houses, exhaust fans are fighting against room pressures to move air. If there aren't enough leaks in the building envelope to supply makeup air, the fan may not effectively exhaust the kitchen air. In that case, the primary purpose of the fan is frustrated.

There are two kinds of solutions to providing makeup air: active and passive. Typical of the passive solution is the Broan Automatic Makeup Air Damper (see photo, above). The damper comes in three sizes (6 inches, 8 inches, and 10 inches). The idea is for the damper to open any time the exhaust fan is depressurizing the space. Broan offers a variety of control strategies for operating the damper: a "LinkLogic" connection that sends control signals over power wiring, a direct-wired connection that communicates with the exhaust device through low-voltage wiring, and a Universal model that controls the damper by means of a pressure sensor at the exhaust device, connected to the damper via low-voltage wiring.

The Broan solution requires a pressure difference to move air through the makeup air duct. An alternative to this strategy is the Fantech Makeup Air System, or "MUAS" (see photo, facing page). The MUAS incorporates an in-line intake fan to the air supply duct, calibrated to match the kitchen exhaust fan. Like the Broan damper, the Fantech equipment comes in a range of sizes to match various exhaust fan capacities: the MUAS 750, the MUAS 1200, the MUAS 1600, and the MUAS 2000 (the number corresponds to the maximum cfm of the fan). Controls enable the installer to set up the system to operate at a neutral air pressure, a slight positive pressure, or a slight negative pressure. The system responds to the speed of the exhaust fan and ramps the MUAS fan up or down to match the exhaust airflows.

In cold climates, in-drawn air can cause discomfort during winter. To compensate for this, Fantech offers an optional MUAH air heater that tempers the incoming air using electric resistance heat.

Range-hood manufacturers have responded to the code in another way: They've simply provided the market with more hoods whose maximum exhaust airflow is under 400 cfm. The market is now full of range hoods whose maximum airflow is rated at 390 cfm. For most kitchen ranges, that's more than sufficient to get the job done.

So for builders who want to avoid problems, there's a pretty simple pathway: In new construction, stick to ranges that will work well with less than 400 cfm of exhaust; stick to all electric or all sealed-combustion heating and hot-water equipment; and, to minimize the need for kitchen exhaust, consider installing electric convection ovens and electric induction ranges. That combination should give you simple code compliance without makeup air, and reasonably effective performance across the board. The wrinkle, of course, is fireplaces: If you have a fireplace in a house with a powerful range hood, you probably want to include makeup air in your kitchen design.

Remodels, however, are another matter. In many cases, a new kitchen with new cooking and venting equipment is built in a house with existing naturally vented heating equipment, such as a natural-draft water heater. The new range hood could push the water heater into a backdrafting situation. And as the old adage says, "If you don't test, you don't know."

Gary Boyer is a project manager for Edge Energy in the Washington, D.C., suburbs. In his work verifying builder code compliance, Boyer says, it has been at least seven years since he's seen a naturally vented water heater in a new build. On the other hand, he says that in his combustion testing work, it's not uncommon to find a new range hood threatening to backdraft an existing water heater in a remodeling situation. You could handle that problem by installing makeup air for the kitchen. But Boyer says the common solution is to replace the water heater with a direct-vent model.

Ted Cushman is a senior editor at JLC.



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FRAMING



Raising a Shed-Dormer Roof

Lift up and use the existing roof instead of throwing it away

BY MIKE PATTERSON

Recently, my company was asked to build a shed dormer in the rear part of an attic to create a pair of bedrooms and to make the attic space more usable. Removing the old roof and framing the dormer was doable, but as a small company that rarely uses framing subcontractors, we had a couple of concerns.

HATCHING A PLAN

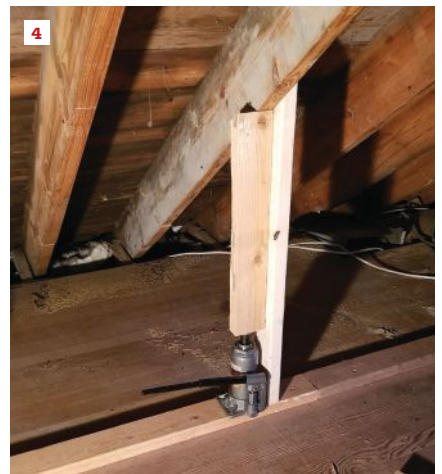
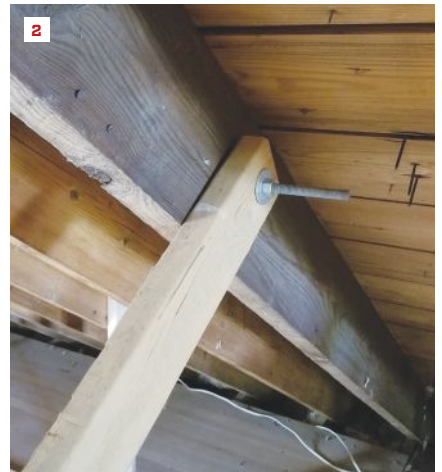
The primary consideration was how quickly we could get the existing roof demolished and the new one dried in. We'd be working in August, and here in the Maryland suburbs of Washington, D.C., thunderstorms are almost daily events. I wanted to have the house open to the weather as little as possible, and without a large

framing crew, we would run a high risk of exposing the interior of the house to rain. Our solution—hinging up the existing roof—would allow us to keep a mostly weathertight roof over the house at all times. To cover open areas during construction, we planned to supplement with tarps that we could deploy quickly.

A secondary, but still important, consideration was cost. Raising the existing roof to the new pitch would save us more than \$1,000 in framing material compared with building the dormer from scratch. As an added benefit, we would keep all the old—but perfectly good—material out of the landfill. The engineer we consulted was on board with using the existing 2x8 roof framing. So we just needed to figure out how we were going to get it done.

Photos by Mike Patterson; Illustrations by Mike Patterson, adapted by JLC

RAISING A SHED-DORMER ROOF



To prepare for lifting the roof, the crew set up a line of vertical 2x10s near the ridge to support it (1). They also bolted 2x4 support posts to the rafters; the opposite ends of the 2x4s would come to rest against stops nailed to the floor as the roof went up (2). To allow the roof to hinge at the ridge, the crew attached metal twist straps to every other rafter (3). The straps went through holes in the roof and attached to the opposite roof. The crew also set up hydraulic jacks with lifting posts on the low part of the roof (4).

AT THE DRAWING BOARD

Our first task was to create an accurate drawing of the existing site conditions, such as the existing roof pitch, the amount of sag in the attic floor, overall dimensions, and so on. I've gotten comfortable with SketchUp, having used the program for more than 10 years now. Using SketchUp in conjunction with accurate measuring and line lasers, I was able to generate an accurate 3D model from which we could pull critical measurements.

Once I drew it in SketchUp, I could easily see how the geometry of the roof would change as we lifted it (see *Geometry of Raising a Roof*, facing page). We could also determine where to bolt the lifting posts and where on the floor to place the positive stops,

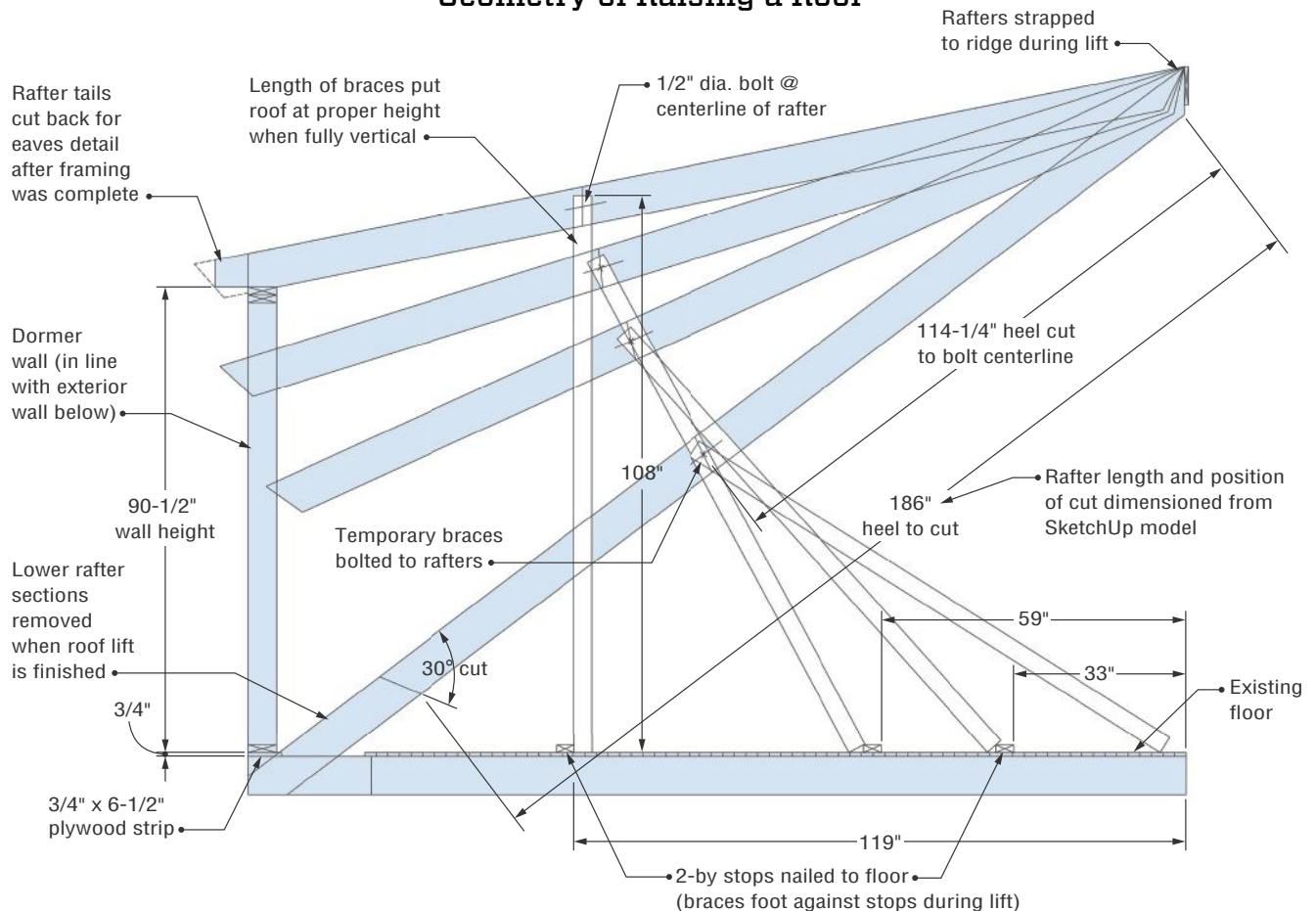
which, when the lifting posts were snugged up to them, would tell us that things were where they needed to be.

PREPPING FOR THE LIFT

Inside the house, we installed vertical 2x10 supports, set back about 18 inches from the ridge, at every other rafter on the side of the roof opposite the future dormer (1). These supports would keep the ridge from sagging or shifting once we cut and raised the rear part of the roof. The small cantilever between the support and the ridge was acceptable, and it would keep the supports out of our way as we worked on the ridge and in the attic.

Outside, we set up a cut station on the ground and precut all the

Geometry of Raising a Roof



The author used SketchUp to plot the rotation of the roof from the existing pitch up to the pitch of the dormer roof. The program helped determine where the rafters needed to be cut. It also gave the crew the length and position of the temporary 2x4 braces, along with the locations of the floor stops to foot the braces as the roof hinged into position. When the braces were tight against the final stop, the dormer roof was at the proper height.

pieces we'd need for the dormer walls based on the measurements from our drawings. These parts included studs, jacks, and sills (we made headers from the support materials when they were removed later). We stacked and labeled all of the pieces so they were ready to be lifted up to the attic as soon as we needed them.

We bolted support studs to the rafters every 4 feet **(2)**, so that when the roof was at the proper height, the 2x4 bracing would be hard against a 2x4 stop nailed to the floor. Thinking that we'd need to pause and reposition a few times as the roof went up, we also installed intermediate stops that would hold the bracing in place while we shifted everything between lifts.

To ensure that the connection at the ridge board would act as

a hinge, and to keep the rafters from shifting, we attached metal twist straps at every other rafter at the ridge **(3)**. We fed the straps through holes drilled through the roof, nailing the straps to the rafters inside, and face-nailing them into the roof from above.

I looked at the weather forecast and saw that we had a couple of dry days with light winds predicted. So on the day before the lift, our final task was to cut both the rafters and the sheathing. From the ridge, we measured down the underside of the rafters an equal distance at both ends and then snapped a line to mark the start of our rafter cuts. We cut the rafters with a reciprocating saw at a 30-degree angle so that the cuts wouldn't bind once the lifting began. Also if anything slipped, the roof would be supported as it came down. We

RAISING A SHED-DORMER ROOF



The crew cut the rafters at an angle to eliminate binding as they lifted the roof (5). Initially, they used T-shaped lifting posts between the jacks and the rafters (6). When the jacks had reached the maximum distance that the crew could lift in one shot, temporary supports held the roof while the jacks were placed on 2-by-4 scraps for the next lifting stage (7).



The author devised movable “jacking boxes” to hold the posts as the jacking progressed (8). After each lifting cycle, the crew installed temporary supports until the jacks could be reset (9). Instead of cutting new support posts for every lift cycle, they stacked cribbing made from 2-by-4 scraps under the jacks (10).



As the roof went up, the vertical supports footed against stops nailed to the dormer floor (11). The crew continued the lift in increments according to the lifting height of the jacks (12). When the supports were plumb and in contact with the outermost stop, the roof was at the proper height (13).

positioned the cuts so that once the roof was tilted up, we'd have about 10 inches overhanging the dormer wall. We would string the rafters and cut them off after the roof was raised into position. From inside, we projected a laser line of each perimeter line of the dormer onto the underside of the sheathing. After poking nails through to the exterior at the four corners, we snapped chalk lines between the nails for our cut lines. Using a demolition blade in a wormdrive saw, we were able to cut through the asphalt shingles and 1-by board sheathing in a single pass.

THE LIFT

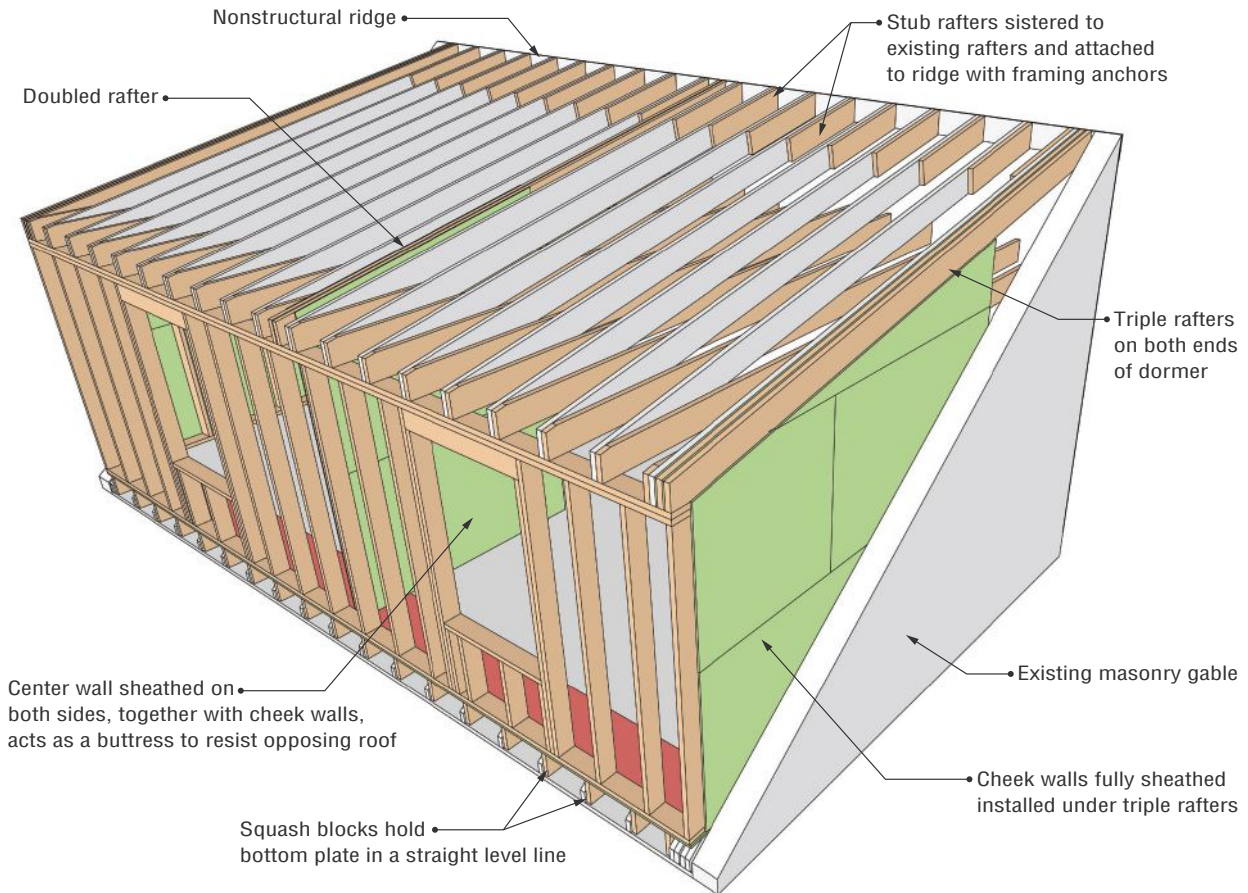
My initial plan was to gather 10 or so people with strong backs and lift the roof until the 2-by supports were vertical. As a backup, we set up five 4-ton hydraulic jacks with lifting posts positioned down low on the roof (4). On the lift day, we positioned all of the assembled strong backs under the rafters and gave the order to "Heave ho!" The roof didn't budge. We tried several more times but with no success. Disappointed to discover that the roof was much heavier than we expected, we shifted to plan B: using jacks to raise the roof (5).

We'd positioned the five jacks on top of the outermost 2-by stops to help distribute the load (6). To address the problem of lifting straight up against the angle of the rafters, we made T-section lifting posts. One part of the T went between the underside of the rafter and the jack, and the other part of the T screwed to the first part as well as to the side of the rafter.

We pumped the jacks, and the roof rose easily, but slowly. When we reached the maximum jack height (about 7 inches), we braced the roof and reset the jacks (7). After a few lifting cycles, fastening and unfastening the jacking posts became bothersome, and the ends of the posts started to split. I devised "jacking boxes," which straddled the rafters with slots to capture the ends of simple 2x4 posts (8). The boxes screwed to the rafters and could be repositioned easily. Now that we were no longer concerned with the angle of the post or fastening to the rafter itself, the lift progressed quickly and easily (9).

To avoid having to cut new jack posts after every lift, we stacked 2-by scraps under

Shed Dormer Framing



The crew framed the dormer using SketchUp to work out the details. Cheek walls at the ends of the dormer and a wall in the center of the dormer act as buttress walls. With continuous sheathing, they resist the thrust of the opposing roof, preventing the ridge from sagging, and eliminating the need for a structural ridge. At the ridge, stub rafters cut to the dormer roof pitch were sistered to the existing rafters. Framing anchors were used throughout to achieve the engineered specifications.

the jacks as cribbing as the roof went up (10). With the jacking boxes and the cribbing, we used the same length posts through several lift cycles.

We lifted in increments (11), and when the braces bolted to the rafters footed against each set of the stops nailed to the floor, we adjusted the jacking boxes for a better lift angle (12). When the braces finally contacted the outermost stop, the roof was at the correct height (13). After checking the new roof pitch against my SketchUp calculations to verify that the lift was essentially done, we braced the end rafters at the exact height and string-lined the rest of the rafters, shimming under the jack posts until the bottoms of the rafters were perfectly in line.

FRAMING THE DORMER

With the dormer roof raised and supported, we cut away the part of the original roof that was still in place, leaving the exposed ends of the floor joists (14). To correct a slight dip in the floor, we established a benchmark height with a laser level and nailed 2x6 squash blocks to the sides of the existing floor joists. The line of blocks was exactly level, and we installed the 2x6 bottom plate for the new wall directly on top of them.

We projected a laser line onto the rafters at the height of the new dormer wall, which gave us the locations for the horizontal seat cuts. Aligning the laser with the outside plane of the wall, we projected a line onto the rafters for the vertical cuts of the birdsmouths.



After raising the roof into position, the crew removed the bottom sections of the existing rafters (14). Using a laser level, they laid out and cut the birdsmouths for the dormer wall (15). The crew installed squash blocks along the floor joists to support the plate for the dormer wall (16). They also built and raised cheek walls at the ends of the dormer.

We then cut the birdsmouths in place (15) and nailed the top plates to them. Next, we filled in the wall framing that we'd pre-cut, and we sheathed the wall's exterior.

At each end of the dormer, we tripled the rafters per the engineer's specs, and removed the support posts and the floor stops (see Shed Dormer Framing, facing page). The engineer called for the cheek walls to have continuous sheathing from the top to the bottom plates. Building the walls in the dormer space and tilting them into place was an easy way to get sheathing between the outside face of the cheek walls and the remaining rafters inside the masonry gables. In the center of the dormer, we installed a double rafter with a wall below sheathed on both sides with 1/2-inch plywood. The center wall and cheek walls act as buttress walls to resist thrust from the front roof and to eliminate the need for a structural ridge.

To account for any differences in floor height, we framed the cheek walls slightly short. When we tilted them up, we shimmed them tight to the underside of the triple rafters and fastened them to the floor (16). To join the cheek walls to the rafters, we installed engineer-specified clips.

Next, we installed 36-inch-long stub rafters at the ridge, cut to the pitch of the dormer roof and sistered to the existing rafters. We left the tension straps in place; they were later cut off flush with the roof sheathing. The engineer specified framing anchors on both sides of each sistered rafter. With the framing complete, we could then remove the roof props.

After setting up staging, we peeled back the shingles at the eaves of the dormer roof, snapped a chalk line, and made new cuts for the fascia and soffit. The roofers stripped off the old shingles and renailed the 1x6 sheathing in areas where it had become loose—either due to age or from the jacking process.

The interior of the house was never directly open to the weather. The savings in labor were modest, but real, and a few tons of material stayed out of the landfill.

Mike Patterson, owner of Mike Patterson Builders and Remodelers in Gaithersburg, Md., is a frequent presenter at JLC Live and the Remodelers Show.

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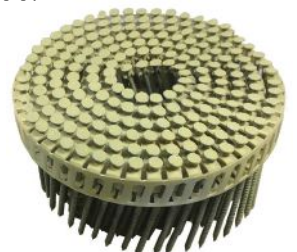


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REMODELING



Jobsite Protection for Remodels

Wall off the job, protect surfaces, and create negative pressure

BY DOUG HORGAN AND TOM JOHNSTON

When we're planning for a remodeling job, one of the top checklist items is jobsite protection. The first rule is to do no harm. We don't want to damage any existing finishes or contaminate the homeowner's living space. So we plan in advance to control dust and protect surface finishes.

There are four main steps to dust control on the job:

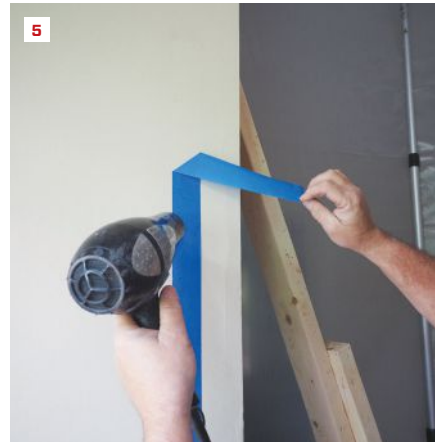
- Create effective dust barriers around the work area.
- Set up negative air pressure with exhaust fans whenever practical. Where that's not practical, filter the air.
- Block off or filter HVAC ductwork.
- Minimize dust within the work space using wet methods, vacuum collection, and so on.

DUST BARRIERS

There are three standard ways to build dust walls: For long-term or high-strength walls, constructed wood frames covered with plastic or sheet goods are the most durable. We seal the perimeter with tape or sill sealer foam. For short-term use, pole-type systems (such as ZipWall) are easy and inexpensive. And simply taping plastic to ceiling and walls can work for the short term, if there is no wind load.

When possible, set up dust enclosures where they won't need to be moved for the duration of the project, including painting and floor finishing.

Here's a tip: Install furnace filters in the dust wall to allow



Constructed wood walls (1, 2) are the most durable way to block off an area, but aluminum or steel pole systems (3, 4) are quicker. Plastic should be taped to walls and ceilings, but stay away from finishes that could be damaged when you are removing the tape. A hair dryer (5) can soften adhesive to help prevent damage when tape is removed.

wind to blow in and out without carrying too much dust through. This helps keep wind pressure or door slams from blowing the wall down.

Once the dust wall is in place, you need a way in or out of the work space. One solution is to use an actual hinged door (such as an interior door being demoed from the project area, a sheet of plywood on hinges, or a \$50 home-center screen door with plastic stapled to it).

Another common method to provide access is to install a double-zipper door with self-sticking zippers (some brands come with metal hooks to hold the flap of plastic out of the way when the door is opened). And finally, overlapped plastic sheeting works well: Cut a vertical slit in the dust-wall plastic, then tape a 3- to 4-foot-wide piece to cover the hole. This method is inexpensive and convenient, and, with negative air pressure, will keep dust

in the work area. (It's even endorsed by the EPA Lead Renovation, Repair and Painting training.)

NEGATIVE AIR PRESSURE

Once the dust walls are set up, we need to create negative air pressure in the work area. The basic idea is to blow air out of the work area so the work area is under lower pressure than the rest of the house. All dust walls have small holes. If the work area is negative and the house is positive, air has to move from the house into the work area through those small holes. Dust can't move into the house if all the air is moving out of the house.

It's easy to tell if the work area is under negative pressure: The plastic will be sucking into the work space. If the plastic is blowing outward, the wind is stronger than the exhaust fan, and dust will escape. To fix this, either seal more holes or use a more powerful fan.



A wood screen door or demoed interior door (6) makes a good dust containment door. Other options include zipper systems (7) and commercial doors (8), which tend to be expensive. Tape furnace filters to holes in the plastic (9) to control dust while relieving air pressure from wind.

FAN CHOICES

For less than \$25, a box or window fan works for a small area (one or maybe two rooms). It won't work for a larger space, like an entire condo—it's not strong enough. Use cardboard, foam board, or plywood to fill in around the fan in the window. A furnace filter can help keep the fan clean and running well.

A restoration "carpet dryer" fan, priced at around \$200, can be installed with ductwork on the inlet or the outlet side. These units are available for rent. Use a filter to protect the motor from dust.

A woodworking dust extractor (priced under \$200) can be placed outdoors with a 4-inch flexible drain pipe used as a duct into the interior room work space.

There are many situations (such as homes on small lots, townhouses, and condos) where blowing dust out of the window is a bad idea. For those cases, I suggest using an air filtration device (also called a negative air machine or a powered air scrubber). These cost \$500 to \$1,500 and are available for rent. They're designed to move large amounts of air while filtering it; most units are equipped with HEPA filters.

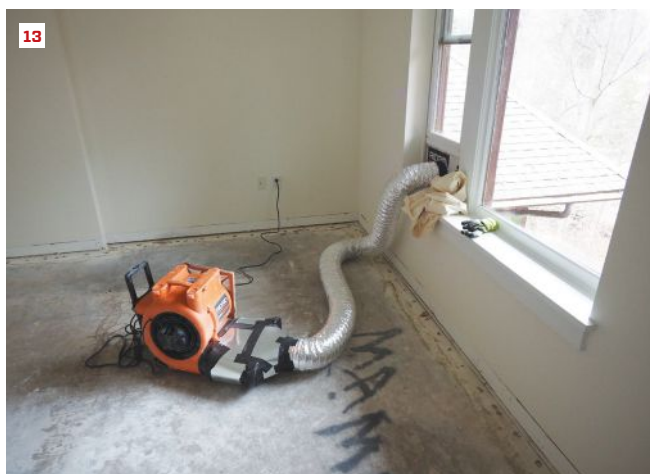
HVAC DUST PROTECTION

Keeping dust out of heating and cooling system ductwork is a top priority. To that end, I advise keeping the system fan turned off as much as possible, consistent with owner comfort—and definitely keeping it off during the dustiest operations. Block off all supply and return ducts in work areas.

Use filters on returns to reduce dust entry. Middle-level pleated-media filters are the best choice; the finest filters clog too quickly, and the cheapest don't catch much. But any filter is better than none and will do in a pinch. Filters don't need to fit the duct opening exactly; tape the filter to the wall over the entire return grille. Consider using an inexpensive pre-filter material in addition so the expensive filter will last longer.

Vacuum or clean the outside of the filter daily to extend its life. Be sure to turn the system fan off before vacuuming! Check the main system filter regularly and clean or change it as needed. Vacuum all accessible ducts after demolition is complete and at the end of the job. Consider a duct cleaning service. After work is complete, verify that the central air conditioner coil area is clean; dust on coils and

JOBSITE PROTECTION FOR REMODELS



Fan choices range from a cheap box fan in the window (10, 11) to carpet dryer fans (12, 13) and dust extractor fans (14). At the top end are air filter systems (15) that come equipped with HEPA filtration. The author recommends the filter systems for situations where blowing dust out of the window would create a nuisance for neighbors.



The author advises taping over HVAC supply registers (16) and taping filters over return registers (17). For protecting wood floors, he advises starting with a base layer of tacky felt (18) and adding an impact-resistant layer of durable sheet goods over the top of that (19).

heat exchangers causes inefficiencies, clogged condensate lines, and unhealthy biological growth.

REDUCING DUST

Of course, if you can reduce the amount of dust you create, you reduce your need to exhaust it or filter it. Using a small amount of water during demo can drastically reduce dust. For smaller jobs, a hand-held spray bottle works fine. For larger jobs, pump-up garden sprayers may make sense. For exterior work, a hose with a good spray nozzle is ideal.

Lightly mist the work area before starting demolition. This alone traps huge amounts of dust. Misting as you go along also helps. For example, if you pop off a piece of window trim, spray a few pumps into the dusty area behind the jamb. Lightly misting before sweeping also knocks down tons of dust.

Be careful, though, about slip hazards when wetting floors. Masonite floor protection isn't too slippery when wet, but plastic is.

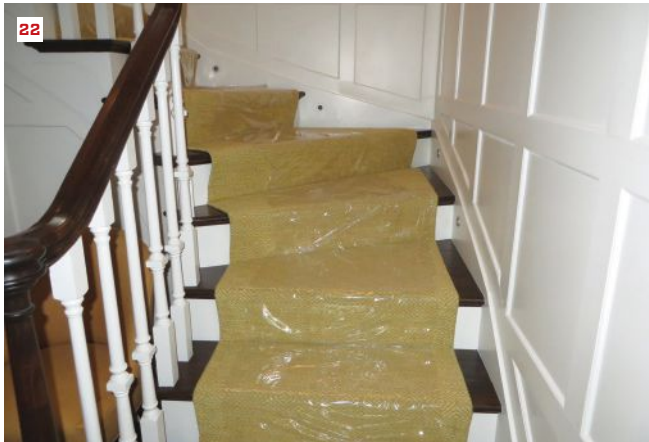
PROTECTING SURFACES

The homes we work in commonly have valuable and vulnerable surfaces such as hardwood, carpet, and tile. Here are some tips on protecting those surfaces while you work.

Again, the first rule is to do no harm. Avoid using adhesives on surfaces that are hard to repair. Don't tape to wallpaper, faux finishes, cabinets, or hardwood floors. Tape to shoe molding or painted baseboard rather than to hardwood floors. Tape to trim or painted ceilings rather than to faux-finished walls or wallpaper.

To remove tape, pull slowly and at an angle, parallel to the surface (instead of pulling straight out away from the surface). Use a hair dryer (not a heat gun) to warm up the adhesive.

Hardwood floors. For hardwood floor protection, our standard is two layers: one soft layer sealed against dust, and a second, strong layer for impact protection and easy cleaning. For newly-finished hardwood, a typical base layer is unfaced tacky felt; for most floors, we use tacky felt with a plastic facer.



The author advises using adhesive roll plastic to protect carpets (20). Whole rooms can be protected with a sheet of 2-mil or thicker poly (21). Carpeted stairs can be covered with adhesive plastic (22, 23).

An example of unfaced tacky felt is Surface Pro from KS International (dropcloth.com). It is not liquid-proof and allows the floor beneath to cure. It should not be covered with airtight materials during the curing phase. An example of tacky felt with a plastic facer is Econo Runner from Protective Products (protectiveproducts.com). It has a plastic top surface that blocks liquids.

Other base layers are less protective, more expensive, or more slippery. Paper layers are not protective enough, even when fully taped. Engineered floor underlayment (felt with a plastic top), found at home centers, is protective but slippery and expensive; we use this only if we don't have time to get tacky felt with a plastic facer.

Taped sheet goods provide physical protection. Hardboard, 1/8-inch structural board such as ThermoPly, or cardboard such as Ram Board or Flexboard (from Protective Products) are good options.

Hardboard is the most durable and easy to clean of these choices; the painted version is less slippery. Eighth-inch structural board is

easy to fold for stairs, jambs, and the like. Cardboard is less expensive and easy to install, but it is not nearly as protective and is hard to clean. Only cardboard should be used on newly finished floors, because it allows curing to take place.

Carpets. For protecting carpets, we use Carpet Protection adhesive roll plastic, supplied by Protective Products; other products we've used have left residue on the carpet, so be careful to use a proven product. In any case, the plastic must be removed and replaced, or it can become very sticky and hard to remove. It has a limited life in service—usually less than two weeks.

Tacky felt products work well, even on carpet. Plastic sheeting (2-mil or thicker) can be used to cover an entire room. Canvas tarps are acceptable for short-term use, but they can be a trip hazard, so exercise caution.

Tile. For protecting tile, we use adhesive or other roll material. Blue "Floor Protection" adhesive plastic works well to stop spills



and dirt but offers no physical protection against bumps. Add a hard layer for impact protection.

Stair protection. For carpeted stairs, drop cloths are a trip hazard and shouldn't be used. Carpet Protection adhesive plastic works well. A 24-inch strip is usually easier to install than a complete 36-inch cover. Use the special "stair" roll with reverse adhesive winding. Tacky felt products also work well. Use wood strips nailed to the risers with 18-gauge nails to hold roll materials.

To protect hardwood stair treads, hardboard or plywood tread covers can be tacked with 18-gauge or smaller nails; holes are usually not visible later. Tread covers can be built with a cleat at the back and attached to risers, or with cleats at the sides attached to skirts, if holes in treads are unacceptable. Use tacky felt below for dust protection.

Tacky felt products without a hard cover are a good medium-term option; use strips tacked with 18-gauge nails to hold the

roll material in place. Other roll protection is fine if you can tape it to the skirtboards or risers.

Hardwood stairs can be protected using hardboard or plywood tread covers (24), secured to skirtboards using cleats. For stair railings, the author recommends wrapping the railing in sill sealer and tape (25). Foam board works well for protecting walls (26).

You can add a plastic layer on top of or under sheet goods. Plastic doesn't prevent physical damage, but it does control dust and liquids.

Sill sealer or other flexible foam is good for wrapping railings and fixtures. Tacky felt is also good and can be cut on the roll with a miter saw into narrower widths. Cardboard and old carpet being demoed out (fuzzy side to the railing) are less expensive options that also protect well.

For covering walls, foam board, roll foam sheet, cardboard, fanfold, or corrugated plastic sheet are good. Even 6-mil plastic is fairly protective.

Doug Horgan is vice president of best practices at BOWA, a design/build remodeling company in McLean and Middleburg, Va. Tom Johnston is a senior project manager at BOWA.



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Concrete seems about as straightforward and rugged as any material on site. But the fact is, if you make certain common mistakes during placement, you can end up with a weak finished product. Here are some essential guidelines that will guarantee good work.

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WALL SYSTEMS



Evolution of a High-Performance Wall Driven by practicality, the “Awesome Wall” emerges

BY MICHAEL ANSCHEL

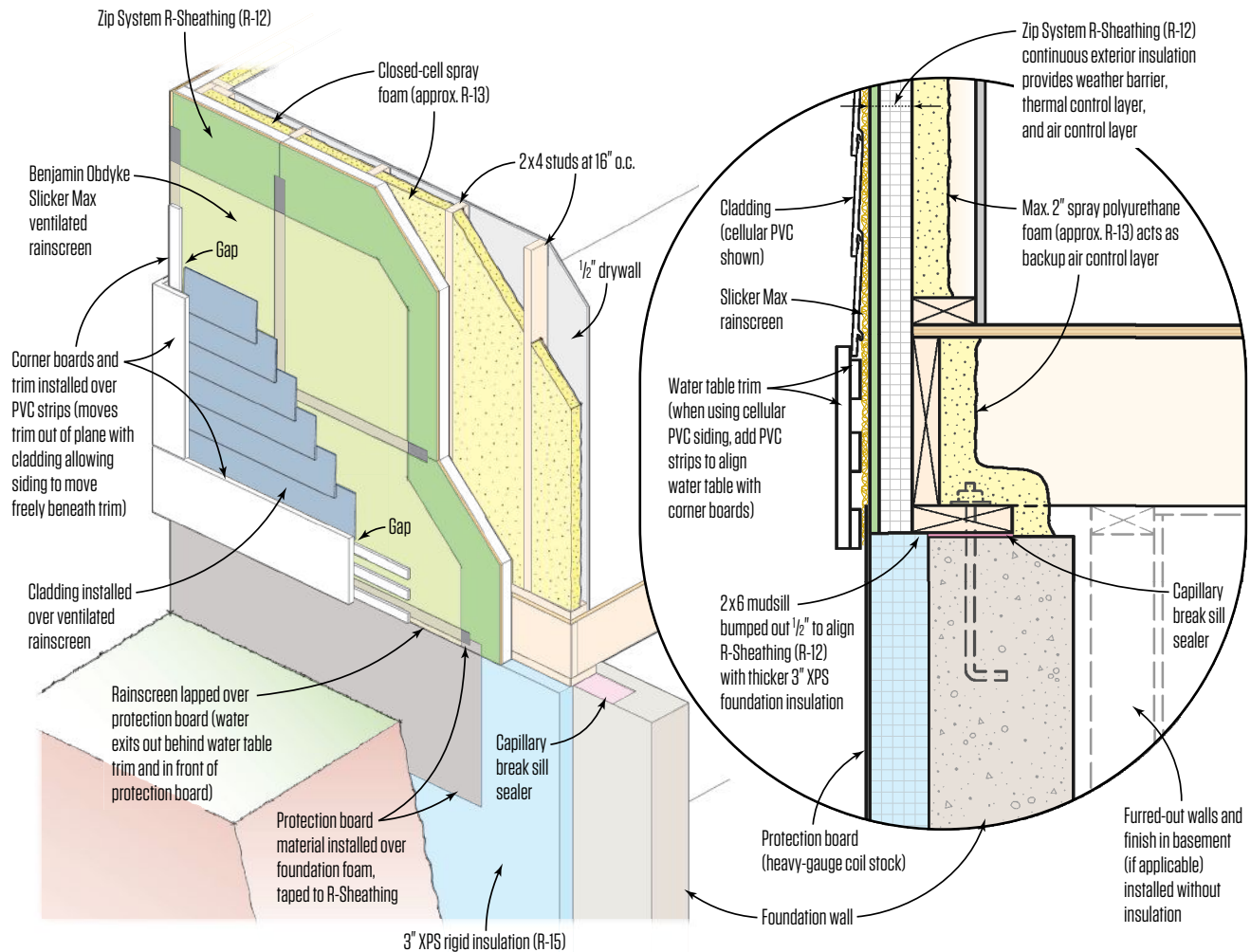
JLC readers may be aware of the “Perfect Wall”—a wall design by building-scientist Dr. Joe Lstiburek of Building Science Corporation that, in a phrase, “keeps the outside out and the inside in.” All the control layers for water, air, vapor, and thermal energy are placed outside the structure. That means there is no insulation in the stud cavities; all insulation is continuous on the exterior. This helps protect the structure from the destructive forces of water (the most important in Joe’s hierarchy of control layers) and keeps the dew point outside of the wall cavity so there’s no risk of condensation.

The idea that the insulation could be in the wrong place for both thermal performance and moisture management pushed me to

rethink how I was building in my region. I’m in Minneapolis, and while I like the idea of driving the dew point completely outside the structure, in climate zone 6 we would need at least 4 inches of polyisocyanurate (polyiso) or 5 inches of extruded polystyrene (XPS) continuous insulation. That can be done, but not easily.

My company has done a number of two-layer foam build-ups on roofs. Taking 2x4s and screwing them through layers of foam is expensive, and getting it to plane out flat is challenging and time consuming to do well. Plus there aren’t a lot of skilled carpenters entering the workforce, so we have to rely on available labor. Perfect Wall may be “perfect” from a performance standpoint, but it’s not practical to build in a cold climate, and it remains inaccessible

Awesome Wall



“Awesome Wall” is design-builder Michael Ansel’s take on the “Perfect Wall.” The primary design goal was to create a wall system that performs as close as possible to the Perfect Wall, but is optimized for simplicity of installation so there are as few places as possible to introduce potential failures.

for most builders and remodelers. The engineer part of my brain began searching for a simpler solution.

REDEFINING PERFORMANCE

The advent of Zip System R-sheathing—structural OSB with an integral weather barrier married to polyiso foam—provided a path towards a simpler high-performance wall. The R-12 panel provides enough continuous exterior insulation to eliminate the interior vapor retarder, which would otherwise be required in climate zone 6. It doesn’t restrict our ability to design cool shapes and doesn’t require retraining crews to build in a substantially

different fashion. Carpenters still sheet their framing with a nail gun (granted, it needs to be a large one that can shoot 5-inch nails), which means the wall goes together nearly as fast as uninsulated Zip System sheathing. When we extend our sill plates out 1/2 inch, the surface of the drainage plane aligns perfectly with 3 inches of exterior foundation insulation. (Yes, below-grade walls also want the insulation on the exterior.) It gets better: Windows are installed just like they would be in a normal wall. No bucks, no “innie vs. outie” debate, no complex multi-step tape and liquid flashing details. It accomplishes much of what the Perfect Wall sets out to do with regard to aligning control layers,



Continuous exterior insulation protects against thermal bridging at studs (1). Bumping the sill plate out allows thick foundation insulation to align with the wall's face, simplifying drainage, air-sealing, and exterior finishes (2). These clad vinyl-frame windows (3, 4) have an integral flange that allows for standard installation: no need for window bucks or elaborate flashing.

which is what we're really chasing when it comes to both thermal performance and general resilience.

NO MATERIAL (AND NO WORKER) IS PERFECT

Zip R-12 sheathing certainly qualifies as simple from an installation standpoint, but it's not perfect: The geometry of the material is complex, which means you cannot rely solely on taping the outside face to ensure a continuous air barrier. The corners require cutting back the foam so none is exposed, then aligning it with another panel, which is definitely not a perfect connection. When fastening the panels to framing, you get a little compression of the insulation, particularly at edges. Field-cut panels don't match up perfectly. We can address everything on the surface, using tape and liquid flash-

ing, but it's a 2D solution that doesn't address all edge-to-edge connections, particularly those at the top and the bottom of the wall.

Every product has its limitations. Knowing what they are is crucial. We need to be building things that are hard to screw up. If someone proposes a wall system or home design that relies on near-perfect detailing or requires angelic occupants who pay attention to RH sensors, I'm not interested. It is simply not realistic.

We hire great carpenters and work with good subs, but everyone has bad days. Myself included. We're in Minnesota where it's cold a lot of the time. By 3 p.m., we're tired and worn down by the cold, and while we can have the good intention to do it "perfect," there are times when "good enough, let's button it up and get out of here" is the reality. We must have systems that allow for imperfections



and mistakes. If we pitch a solution to our industry and we say, “Don’t screw it up,” then I have to ask myself as a builder, “Who is going to take a chance with that?” We’re a risk-averse industry; failure is costly, and convincing consumers to pay for high-quality construction is already a challenge.

Wall performance has to account for installation. Yes, we want high thermal performance, but we need walls to be super durable. If an efficient, durable wall doesn’t require a significant change in process, is not overly complicated, uses readily available materials, is hard to screw up, and is unlikely to fail, then we’re onto something awesome.

FAIL-SAFE SYSTEMS

R-12 exterior insulation by itself didn’t cut it, and I needed to add cavity insulation. But taking a note from Perfect Wall, I had to be careful that I didn’t pull the dew point back inside the house too far, where condensation could form at the framing. What is the magic number for cavity-wall R-value? Joe Lstiburek advised me to “split the difference, but stay under R-14.” Code allows more R-value in the cavity, but the consensus in the building-science community is that code allows for a risky wall in climate zones 6 and above (see “Avoiding Wet Walls,” Apr/17). Ideally, Joe wanted me to match the value of the foam on the outside of the framing with the insulation in the cavity, so we went with 2 inches of closed-cell spray foam. The spray foam gave us the R-value we need (R-13) and gave us our complete air seal. This solved two problems with one move.

It turns out, we also solved a third: When you install R-12 panels, you need to hit the studs, but occasionally you don’t; you get a “shiner” here and there. The problem with shiners is that you now have a piece of metal that’s super conductive, and in winter, condensation can form on these exposed nails. If you use air-permeable cavity insulation, you need to remove shiners and seal over the resulting hole. With spray foam, there’s no need to remove them.

Continuous rainscreen. For a ventilated rainscreen, we used Benjamin Obdyke’s Slicker. By installing it over the entire wall, wrapping around corners, and lapping

To avoid the risk of condensation in a cold-climate wall assembly, the R-value of cavity insulation ideally should match the R-value of continuous exterior insulation. The author achieved this balance using Zip System R-12 sheathing (5) with 2 inches of spray polyurethane foam in wall cavities (6). Adding the rest of the assembly components yields a total effective wall value of around R-28.

over the foundation insulation, we get omni-directional drying and drainage with an infinitely lower chance of failure than with a rainscreen created with strapping. It installs quickly and provides a consistent nailing base. Strapping is time consuming, requires skill, and confines the drying and drainage to vertical sections.

Cladding is an aesthetic choice. On the project shown in the photos in this article, we used Celect cellular PVC siding, but the wall system works for most siding types. Code specifies the length and spacing of fasteners for siding that weighs less than three psf (this includes most fiber-cement lap siding) nailed into 7/16-inch structural sheathing “where no stud penetration is required” (2015 IRC, Table R703.3.2). Siding can hang off the Zip-R; no need for strapping nailed to studs. We did apply PVC strips to pad out the trim, allowing the siding to move freely beneath the trim. This way we avoid caulk joints, which have a poor performance life and cause more problems than they solve.

High-performance windows. The challenge we have in cold climates with windows is the massive daily swings in relative humidity (RH) that make it difficult to avoid condensation on the glass in winter. No one wants to keep the indoor RH so low in winter they get nosebleeds. So if we don't want water beading around the edge of the glass and a biological dance party around the sill, we need to choose windows with the right attributes. For the project shown here, we went with Sierra Pacific's H3—an aluminum-clad window on the outside with solid wood inside snapped onto a vinyl frame: a durable, attractive, and almost completely thermally broken window. The units we chose have a U-value around 0.22 (R-4.7) and a CR (condensation resistance) value around 68, which is one of the highest we've found stateside. Here, too, we have an affordable, easy-to-source product with no change in the installation. Any window crew can install the windows and not screw them up.

That's true at every step in this wall assembly. You would have to work really hard to make this wall fail. Which is awesome.

Michael Ansel is principal of Otagawa-Ansel Design Build, based in Minneapolis, Minn.



On this project, Celect cellular PVC cladding is installed over Slicker, which provides omni-directional drainage and drying over the entire wall (7). The trim is packed out so the cladding can move freely under the trim, and the cladding doesn't butt up tight to the trim at any point (8). This provides superior air movement without restrictions though the Slicker and eliminates all caulk joints.

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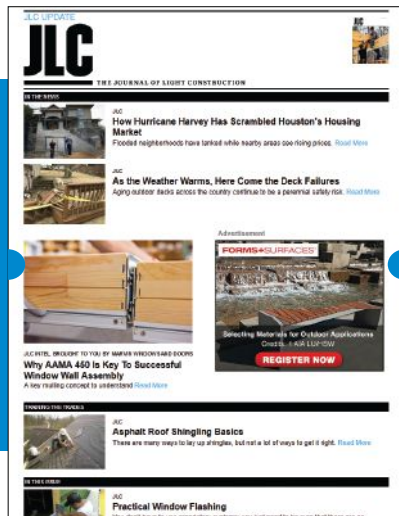
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Building Recessed-Panel Post Sleeves

by Robert Kiefer

Curved railings are one of the signature design features on the outdoor living spaces that my company builds, and on a recent project, we decided to add an elegant touch: recessed-panel posts and columns. As we did for the railings, we built the frame-and-panel design out of low-maintenance PVC to contrast with the home's ipe decking and accentuate the "beach house" feel of the Staten Island, N.Y., home.

PVC Frames

We cut the stock for the frames from $\frac{3}{4}$ -inch-thick PVC sheet goods in our shop, ripping eight square-edged stiles to about 2 inches wide and 39 inches long for each of the 4x4 pressure-treated posts that we had bolted to the deck framing. We also ripped some longer stiles to make the sleeves for the 6x6 columns supporting the deck's pergola. Next, we ripped sheet stock into $3\frac{1}{2}$ -inch-wide pieces, which we cut into 8-inch-long-by- $3\frac{1}{2}$ -inch-wide lengths for the rails.

We assembled the frames a couple of different ways. One was to use a fast-cure PVC cement, clamping each frame up one at a time. Because we set up two pairs of clamps, we were able to take advantage of the cement's five-minute cure time to assemble, glue up, and clamp one frame and then quickly move on to the next one (Figure 1).

We also tried gluing up several frames at once. To do this, we used slower-curing Extreme White Hot PVC adhesive, a white, high-strength glue with a longer, 60-minute cure time. While this gave us



Figure 1. After cutting the stiles and rails to size from $\frac{3}{4}$ -inch-thick PVC stock and setting up his gluing station (A), the author used fast-cure PVC cement to glue up the frames one at a time (B). Switching to a slow-cure adhesive allowed him to glue up several frames at once (C), but the frames needed to remain clamped for an hour.

EYE FOR DESIGN

enough working time to glue and clamp multiple frames, it meant that we also needed to leave the frames clamped for about an hour, which actually slowed production.

When the adhesive had cured, we cleaned up the glue joints with a random orbit sander and 120-grit sanding discs. Then we used a router with a rabbeting bit to cut a $\frac{3}{8}$ -inch-deep rabbet around the inside edges of each frame to accommodate its panel.

For the panels, we cut $\frac{3}{8}$ -inch-thick PVC sheet stock into pieces that measured $4\frac{5}{8}$ inches by $23\frac{3}{4}$ inches and clipped each of their four corners at a 45-degree angle to fit into the rounded corners of the rabbeted frames. Then we glued the panels to the frames using the White Hot glue (Figure 2).

Fabricating the Post Sleeves

Now that the frames were glued together, complete with panels, we ran them through a table saw to cut clean 45-degree miter angles along the edge of each stile. Then we assembled the frames into post sleeves, gluing them together with White Hot adhesive and tacking the corners together with stainless steel $1\frac{1}{2}$ -inch gun nails. During assembly, we carefully checked the glue-ups to make sure they were square.

After the glue dried, we spackled the nail holes with exterior putty, sanded the post sleeves smooth, and gave them a coat of Benjamin Moore MoorGlo soft-gloss paint in white to make the post sleeves more mildew-resistant and give them the look of painted wood.

Caps and Base

Before packing the post sleeves up and taking them to the jobsite for installation, we fabricated the post caps from a sheet of $1\frac{1}{4}$ -inch-thick PVC. First, we cut the sheet into 10-inch squares. Then we ran the squares through the table saw on edge with the bottom face against the fence and with the blade tilted 12 de-



Figure 2. On most frames, the author cut a $\frac{3}{8}$ -inch-deep rabbet with a router around the inside back edge, then glued the $\frac{3}{8}$ -inch-thick PVC panel to the frame. Clipping the panel edges at a 45-degree angle allowed the panels to fit the rounded corners of the rabbet (A, B). For a deeper, $\frac{3}{4}$ -inch panel reveal, the panels could simply be glued and stapled to the back of the frame (C, D). The edges of each frame were ripped to 45 degrees so that they could be glued together to form the post sleeves (E).

grees, repeating this cut on all four sides of each square (Figure 3).

We also cut $1\frac{1}{2}$ -inch-wide lengths from the $\frac{3}{4}$ -inch PVC stock, then cut a cove-shaped profile along the bottom edge with a router. We used these strips to build mitered boxes sized to fit snugly around the frame-and-panel post sleeves, pinning the miters together with fast-cure PVC cement and stainless brads. After the

PVC cement cured, we cleaned off the excess glue, and then glued and tacked the boxes to the bottoms of the post caps.

We also used the $1\frac{1}{2}$ -inch-wide stock that we had ripped from the $\frac{3}{4}$ -inch sheet stock to make bases for the post sleeves. Instead of creating a cove profile, we used a roundover bit to ease the top edge of the bases with a slight radius, then assembled them the same way.

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Figure 3. Cut from $\frac{3}{4}$ -inch-by-1 $\frac{1}{2}$ -inch PVC, the sleeve bases (A) and cap trim (B) were sized to fit snugly over the post sleeves. The cap trim boxes were nailed and glued to the caps, which were cut from 1 $\frac{1}{4}$ -inch-thick PVC stock (C).



Figure 4. The author sanded the sleeves, caps, and bases and gave them a coat of 100% acrylic latex paint, then assembled all of the components on the jobsite (A). The rails were fastened to the posts with 4-inch-long screws (B).

Assembly

After cleaning everything up with the random orbit sander and 120-grit sandpaper, we gave the bases and post caps a first coat of paint and brought all of the pieces to the jobsite. Earlier, we had packed out each post with a pair of $\frac{5}{4}$ x6s on either side to allow for some adjustment when we were installing the frame-and-panel sleeves. We slipped the

post sleeves into place over the posts and inside the bases (Figure 4).

We used temporary shims to plumb the sleeves and when fitting the rails, which we attached directly to the posts through the sleeves with 4-inch screws. Once the rails were in place, we removed the shims to allow for movement of the PT posts within the sleeves. We also didn't nail the bases to the post sleeves,

but we caulked the joint after the sleeves were fastened in place.

After we installed the railings and low-voltage lighting fixtures, we slipped the post caps down over the post sleeves and completed the assembly. To finish up, we gave everything a second coat of paint. ❖

Robert Kiefer owns Decks by Kiefer, in Martinsville, N.J.



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Joist Hangers for Decks

Choosing the right hangers and fasteners and installing them properly is trickier than it looks

by Mike Guertin

Joist hangers are not the most visible part of a deck, but they are one of its most important components. If they aren't sized correctly and installed properly with the right nails or screws, the deck won't have the necessary load support, uplift capacity, and lateral rotation resistance. But hangers don't come with printed installation instructions; you need to search through a maze of technical notes, installation notes, load tables, product information, fastener information, and more to uncover everything you need to know in order to select and install joist hangers—and the joists that rest in them—properly and safely.

Or, you can read this article, in which I'll cover the basics.

Choosing the Right Hanger

Joist hangers are sized by joist depth, and run about 1/2 inch shorter than the nominal size of the joist (you can size deck joists by referring to Table R507.6 in the 2018 IRC, which lists spans for deck joists sized from 2x6 to 2x12). For example, a 2x8 joist hanger is about 6 5/8 inches tall.

Usually, the hanger size is the same as the joist size, but you can use a hanger that is one dimensional size less than the joist depth—a 2x6 hanger can be used with a 2x8 joist, for instance. Keep in mind that the load capacity of the smaller hanger needs to be adequate to support the load on the joist. In the instances I looked at, the load capacities for the shorter hangers exceeded the live, dead, and snow loads required for the

deeper joists, provided the joists didn't have large gaps between the ends and the ledger or beam. If you try to buy joist hangers for 2x12 joists, you'll find that the common 18-gauge hangers used for deck construction top out at the 2x10 size (**Figure 1**).

The end joists on a ledger need a hanger just like the rest of the joists, but using a regular joist hanger with out-turned flanges presents a problem: The outside flange extends beyond the ledger. Extending the ledger an extra couple of inches beyond the end of the deck so you have something to nail the flange to is one solution. Others include attaching the joist to the ledger with toenails (a practice not permitted by the IRC); installing an angle bracket on the inside

Joist Hangers for Decks

face of the end joist; or smashing the out-turned flange of a regular hanger over onto the end of the ledger and nailing it (a practice definitely not supported or approved by manufacturers).

Fortunately, several years ago hardware manufacturers introduced “concealed flange” (in-turned flange) hangers, on which the ledger flange is bent inward towards the joist pocket and concealed by the joist when it’s installed. Unlike regular hangers that can be installed after the joists are placed, concealed-flange hangers must be installed first and the joists dropped into them. To account for the thickness of the hanger flanges and fasteners, you need to trim the joists that rest in concealed-flange hangers slightly shorter. I usually install these hangers with connector screws, so to account for the extra thickness, I trim the joists short by $\frac{1}{4}$ inch.

Concealed-flange hangers are also handy for the deck joists where lateral load hardware will be installed. The flanges on regular joist hangers interfere with the bolts used to install 1,500-lb. lateral load tension ties and the screws used to install 750-lb. lateral load tension ties. By installing concealed-flange hangers on those two or four joists, the tension-tie bolts or screws can be run through the ledger without flange conflict. If the design calls for concealed- or in-turned-flange hangers, Simpson Strong-Tie only makes two sizes in its LUC product—one for 2x6 and 2x8 joists, and a larger size for 2x10 and 2x12 joists. Mitek/USP makes one for each joist size between 2x4 and 2x10 (the one for 2x10s also works for 2x12s) in its JLIF product.

Hangers and Corrosion

All deck hardware is subject to corrosion because it’s used outside and in contact with pressure-treated lumber, which can have corrosive effects on steel and galvanized coatings. Hangers with thicker, G-185 galvanization offer better corrosion resistance, but some building mate-

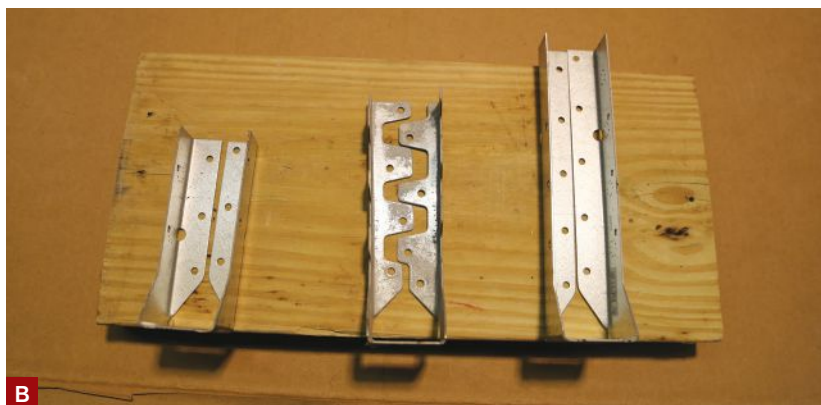


Figure 1. Hangers can be used with both their matching nominal joist size and the next size up—2x10 hangers are approved for use with 2x10s and 2x12s, for example (A). Concealed-flange hangers (B) are designed for use at the end of a ledger (C) but can also be used to avoid conflicts with lateral load hardware.

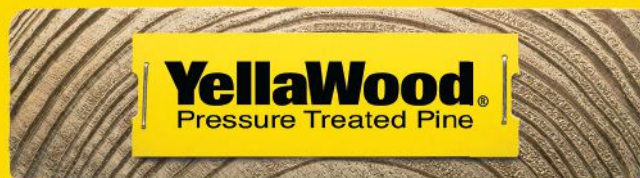
rial dealers may only carry joist hangers with G-90 or G-60 coatings, which are less expensive but are intended for interi-

or use only. When purchasing hardware, check the stamp or label for the level of galvanization (**Figure 2**).



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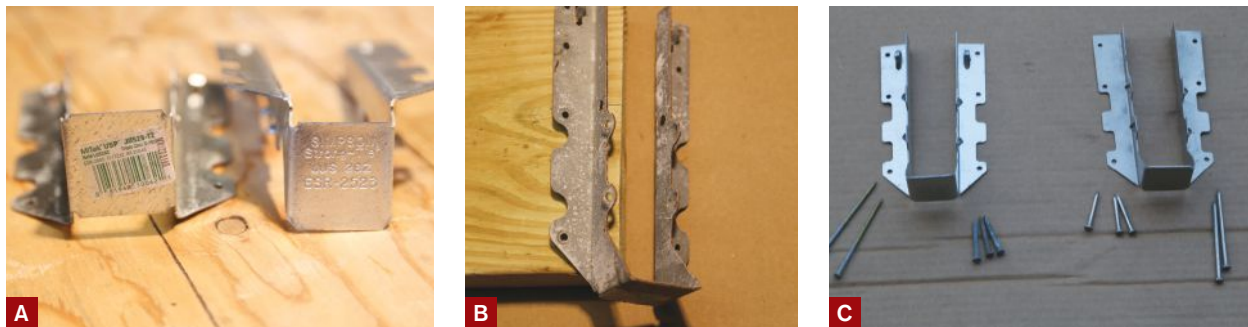


Figure 2. G-185 hangers can be identified by the brand name Triple-Zinc and the letters “TZ” on Mitek/USP products, and by the brand name Zmax and the letter “Z” on Simpson Strong-Tie products (A). After just a few weeks of exposure to salty air, corrosion is visible along the edges of a G-185-coated hanger (B). Stainless steel hardware (C, at right) is the best choice in a coastal environment. Always use fasteners of the same metal as the hanger.

Even G-185-coated hardware may not be suitable for all locations. Stainless steel hardware is a better choice near salt water, alongside roadways on which salt chemicals are used to melt snow and ice in winter, for decks and landings on which the owners may apply ice-melt chemicals, and in regions that receive acid rain.

Stainless steel hardware is expensive, so when owners don’t want to spring for the extra cost, you can reduce some of the corrosive factors by installing an isolation membrane to separate the joist hanger from the treated lumber. Applied to the end of the joists and over the led-

ger or beam where hanger flanges touch the wood, staple-on and self-adhering membrane will break the galvanic reaction. This method won’t solve exposure to salt from coastal proximity, ice-melt products, and acid rain, but it can help (Figure 3).

Always use fasteners that are the same metal or have the same coating as the joist hangers. Avoid mixing metals; for example, don’t use stainless steel fasteners with G-185 hardware, or galvanized fasteners with stainless hardware. The less-noble metal (steel with zinc coating) will corrode rapidly in contact with stainless steel.

Fasteners for Hangers

When you purchase a joist hanger, the fasteners required for installation in each hole on the hardware aren’t listed anywhere. To know, you have to dig into the manufacturer’s load tables, but nail diameters and nail lengths for metal connectors can be confusing. Sometimes, the required nail size is listed by penny size—8d, 10d, or 16d—while other times the size is listed by diameter—0.131 inch, 0.148 inch, 0.162 inch—and by length—1½ inches, 3 inches, 3½ inches. Sometimes, the diameter is indicated by penny size, and the length is listed by inches.



Figure 3. Applying a staple-on isolation membrane or a self-adhering membrane to joist ends (above left) and the ledger (above right) reduces the rate of galvanic reaction between the treated lumber and the metal hanger.



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Figure 4. Be sure to match the nail diameter and length to the joist-hanger manufacturer's requirements (top). If you are using connector screws (bottom), they must be the same brand as the hardware and approved for use with the specific hardware you're installing.

If you use a smaller diameter or shorter length fastener than a connector requires, then you have to apply a load reduction. If you use a larger diameter nail than a hole requires, you will end up either deforming the hardware or stripping the galvanized coating off the nail. Your best bet is to check the manufacturer's hardware table—as confusing as it may look—and select the right nail for each hole (**Figure 4**).

Luckily, it's pretty simple to size joist-hanger nails. The nails that penetrate through the ledger or beam flange are listed as 10d diameter (0.148 inch) x 3 inches long. The diagonal nails that

enter through the side of the joist and penetrate into the ledger or beam are the same—10d diameter (0.148 inch) x 3 inches minimum. If you're installing the joists to a single-ply ledger (1 1/2 inches thick), the 3-inch-long nails will poke through the wall. When the ledger is in direct contact with the wall sheathing, this may not be a problem. But if you space the ledger off the wall by 1/2 inch [as permitted in the Deck Ledger Connection to Band Joist - Table R507.9.1.3(1)], then you may want to use only 1 1/2-inch nails—which is what most installers use.

Technically, using 1 1/2-inch-long nails from the hanger flanges into the ledger

or beam instead of the required 3-inch nails means you should reduce the gravity/download capacity of the hanger by 0.64. But I ran a few tributary load calculations with allowable maximum joist span and live/dead/snow load combinations, and the down-load on any hanger never exceeded one-half of the hanger capacity. So even if we do multiply a hanger load by 0.64 to come up with the reduced load, there's still enough load capacity to handle deck joists framed to a single 2-by ledger.

Instead of nails, you can now use metal-connector screws made specifically for use with hardware. Keep in mind that metal-connector screws are brand-specific; you can't use one brand's screws with the joist hangers from another company. Nor can you use a screw not intended for use with hardware.

Metal-connector screws come in different diameters (#9, #10) and lengths (1 1/2 inches, 2 1/2 inches), and in most cases, the load capacities of connector screws are similar to those of nails. You might think that substituting a 2 1/2-inch screw for the 3-inch diagonal shear nail on a hanger would result in a load reduction, but the opposite is the case: There's usually increased capacity. Connector screws are more expensive than nails but can be faster and easier to install, especially in tight quarters where swinging a hammer or maneuvering a metal-connector nailer into position is difficult.

Hanger Installation

I like to install hangers on the beam or ledger before placing joists, because I think it's faster to install the fasteners and roll the joists into place that way. But there's a downside: If the joists are of inconsistent depth, the surface of the deck framing will vary, which can especially be a problem with more-flexible composite decking. So before I set the hangers, I check the depth of the joists; usually, there are just a few that are more than 1/8 inch deeper or shallower than

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the rest. I either position the hangers for those joists to adjust for the difference of depth from the norm, or I cluster those joists near the middle of the deck and graduate them up and down so the crown in the deck that results from the tops of the joists being slightly higher than either end of the deck is blended and less noticeable.

To ensure all joists are set at the same position, I install the hangers using a “T” jig that has a top leg to ride the ledger and a 1⁹/₁₆-inch-wide upright whose length is equal to the depth of the joist. A couple of tack nails hold the “T” in place while I fasten the hanger to the ledger or beam (Figure 5).



Figure 5. The author prefers to install joist hangers prior to hanging joists, using a site-built T-jig to quickly and accurately place the hangers. When using this method, be sure that the joists are uniformly sized.

Tight or Loose Fit?

Any gap greater than 1/8 inch between the end of a deck joist and the ledger or beam results in load reduction for uplift capacity and down load (gravity load). Simpson Strong-Tie's load table doesn't deduct anything from the rated hanger load values for gaps up to 1/8 inch but lists specific allowable loads for gaps between 1/8 inch and 3/8 inch. For gaps that exceed 3/8 inch, there is no load data and the company doesn't support the installation. Mitek/USP's technical bulletin USP#990 has load reduction multipliers in 1/16-inch increments, starting at a gap of 1/8 inch (1.00 or 100% of maximum load capacity). Two USP tables outline the two main loads: gravity loads and uplift loads. Gravity load multipliers for common joist hangers allow for up to a 3/4-inch gap with a 0.40 multiplier. The uplift load multipliers end at a 1/2-inch gap with a 0.35 multiplier (essentially one-third of the maximum uplift capacity).

While the gravity/down load capacities don't suffer as significantly for gaps up to 3/8 inch, the uplift capacities do. In part, this is due to the diagonal shear nails that penetrate through the end of the joist and into the ledger or beam. Once the gap is greater than the set-back position of the fastener hole, the fastener no longer captures the end of the joist (see photos, below). So when a deck is framed with a cantilever, there isn't any uplift capacity for joists with wide gaps, and the joists could lift out of the hanger when the cantilevered end is loaded.

Rotation is another issue. The side flanges on joist hangers stabilize the joists from rotation when a load is applied on top. If the decking boards are nailed or screwed to the top of the ledger board or rim beam and the top of the joists, then the joists are stabilized by the decking. But when hidden fasteners are used to install decking or the deck board isn't adequately fastened to both the deck joists and the ledger or beam, then the sides of the hangers have



As gap size between the joist and ledger increases, the holding power of diagonal shear nails decreases, reducing the joist hanger's uplift capacity.

to do the stabilizing work. With a wide gap, the joist is no longer fully retained by the side flanges.

On concealed-flange hangers, the fasteners are driven perpendicular to the joist. With no diagonal shear fasteners, there is no uplift load reduction and the minimal down load reduction won't exceed the maximum live/dead load for a given joist depth and maximum span for gaps up to 3/8 inch.

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Joist Hangers for Decks



Figure 6. Paslode's pneumatic metal-connector nailer (A) and DeWalt's battery-powered nailer (B) have probe tips to guide nails into the hardware holes. Bostitch's pneumatic nailer (C) exposes the nail tip, which is placed in the hole before the gun is fired. Placement is critical since a misfire can damage the joist hanger or send a nail hurling back towards the operator.

Joist hangers can also be installed after the joists have been toenailed in place. The challenge is sinking the toenail heads so they don't interfere with hanger installation. The advantage to installing the joists first is the tops can be flushed with the ledger if there is a variation in depths.

Whichever method you choose, make sure the seat (bottom) of the hanger is square and tight to the bottom of the joist, the side flanges are snug to the joist, and the side flanges are flat against the ledger or beam.

Tool-Driven Connector Nails

Metal-connector nailers speed nail installation but can be tricky. Some tools have a probe nose, while others use the tip of the collated nail to index the nail with the hole. In either case, it's critical to make sure the hanger is securely in place before triggering the tool, as the impulse of the nailer can shift the hanger out of position. Also, make sure the force you apply to the tool is in line with the direction of the nail. If you force the tip of the probe or nail in the direction of the magazine, the nail may not hit the hole. Misplaced nails are not permitted by the manufacturers, so if you misdrive a nail, you should remove it and discard the joist hanger (**Figure 6**).

Most nailers will only drive 1½-inch or 2½-inch nails, so you won't be able to drive the diagonal shear nails (3-inch minimum length required for nails). You'll still need to hand drive those nails or use connector screws. Or you can use a palm nailer to drive nails individually. Make sure to adjust the depth of drive so the nails don't overdrive and deform the joist hanger. Check all the nails driven with a nailer to see that they are seated as well. It may take a hammer blow to finish off a proud nail or two. ❖

Mike Guertin is a remodeler in East Greenwich, R.I., and leads the Deck Workshop demonstrations at JLC Live and Deck Expo. Follow him on Instagram @mike_guertin.



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Managing Large-Scale Outdoor Living Projects

To keep larger and more complex jobs on track,
grow your team and improve your systems

by Matthew Breyer

Times are changing, and client expectations are evolving. The rebound after the recession a decade ago, combined with the expansion of internet commerce and easy mobile web browsing, has fundamentally altered traditional business models. As I review the last couple of decades, we've definitely seen a progression in our own firm. Where we were once hired to build single, simple "things"—like a deck—now we are often asked to build multilevel decks with a roof, a patio, lighting, conditioned space, a fire feature, and often major yard reconstruction.

The increased complexity brings with it

the necessity for more material suppliers, subcontractors, detailed building plans, and multiple inspectors and inspections. We need to be able to communicate effectively and efficiently with all of them. At the same time, we need to be able to interact with educated and involved clients, many of whom have construction time-frame expectations built on years of watching HGTV episodes.

Even if you could try to keep it simple and shy away from the "million dollar" backyards, logistical complications will follow you into the simpler projects as well. The environment we all work in has changed so drastically that even single-

service providers must become proficient at these new skill sets.

Fortunately, the tools and techniques to mitigate problems, manage expectations, and deliver consistent results have been in use by larger full-service remodeling companies for years and, with some refinements, can be adapted to work well for us as deck builders. Let's look at a few of these tools and their application: the people, the paperwork, the conversations, contingencies, and completion.

Invest in the Right Personnel

Skilled craftspeople are obviously key to the success of a construction company,

Managing Large-Scale Outdoor Living Projects



To keep multiple jobs on schedule, an effective production manager coordinates the subcontractors for not just one project but for many different projects, so that equipment and resources are available when needed.

but the supporting cast is just as important in meeting the demands of a modern business. In a smaller company, a single individual might hold several job titles, but as a company grows, these positions will eventually need the full-time focus of a dedicated person.

Front office and initial client communication. The first point of contact with a prospect ideally gleans as much information as possible about the project and the client expectations and sets the stage for how the relationship will continue moving forward. Though this task can be outsourced, it's difficult to find a third-party provider who can communicate the culture of your firm over the phone as well as someone who lives and breathes it every day.

Production management. This role, though often overlooked and passed off to lead carpenters/project managers, is the "network hub" of all upcoming projects, all ongoing projects, and any past projects that may be up for warranty work. This individual looks at the backlog to optimize the schedule and make sure resources are lined up and ready at just the right time. The focus is on overall production, not just a single project.

Project management/lead carpenter. The title and nuance of the job description will vary with each firm, but the basics generally include interacting daily with the clients and ensuring that project details are completed on time and on budget, with expectations met. On-the-fly adjustments and quick communication without creating panic are important, as well as knowing when to let someone else do a specific task.

Punch-out person. Maybe this is a handyman, or perhaps a "director of complete client satisfaction." Either way, this person ensures one last time that the jobsite is clean and that any special requests have been addressed, prospective future projects have been noted, and, of course, outstanding payments have been collected.

With a good team, you can cross-train and make sure that these responsibilities are covered even in times of growth or attrition. As an added benefit, members of a great team will keep each other accountable and encouraged.

Managing Paperwork

The "paperwork" doesn't have to actually be paper; I think of it as the tools

and process that a company uses to track job progress and make sure nothing is overlooked.

Lead/prospect tracking. Whether you use a complex and customized commercial program or a simple spreadsheet, it's imperative to know when someone contacted you, what they contacted you about initially, and why they reached out to you specifically, along with any notes. If you don't know what forms of advertising are generating the best leads, you're flying blind. Use this tool to also gather insights that can be passed along to the rest of the team, to exceed expectations at every interaction.

This information should be shared between your front office and design/sales staff, with any pertinent notes gleaned and passed along to the production teams.

Project backlog report. Let's assume that the project is designed, estimated, and proposed accurately (that is a detailed discussion of its own). To determine how much work we can accomplish in each upcoming month and quarter, we need to know what types of projects pair well together and we need to have historical data to measure expectations against. Done well, this report lets you optimize your schedule for greatest productivity without burning out your team, while giving advance notice if you're starting to slip, or if there might be an opening coming up that could be filled.

This information should be shared among your production teams (management and subcontractors specifically), your design/sales team so they don't over-promise anything, and your company ownership, who will need to know if things are slipping or if there is room to grow in a specific area.

Jobsite project notes. This often takes the form of a stripped-down proposal, without pricing but including any design images as well as notes on existing site conditions, client "special requests" that

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Jobsite Project Notes



Create a Custom Composite Deck:

- Utilizing existing framing and structure, install additional framing members and sub structure to create a deck frame approx. 14' deep and approx. 29' wide.
- The new deck space will have two clipped corners (not shown in renderings) - only if the final design **does not** include the pergola option.
- Existing decking and railing will be removed from the frame.
- The frame will be cleaned, inspected, and adjusted as necessary to support the new decking installation.
- The existing steps will be removed and a new set of 6' wide steps will be installed on the side of the deck.
- In front of the door, an additional 4' wide set of steps will be installed.
- The new deck area will be framed using Pressure Treated lumber and includes all applicable hangers, hardware, and fasteners.
- TimberTech Terrain decking, in your choice of color, will be installed with hidden fasteners where applicable.
- The railing will be a custom BCL vinyl railing in White with round black aluminum balusters.
- The concrete pad for a propane tank will be removed and mulch will be installed in its place.
- All old materials & construction debris will be removed & disposed of, and the site will be left "broom clean".

Trim & Fascia Option:

- Deliver and install White PVC fascia around the exposed edges of the deck and steps.

Create a Custom Walkway:

- At the bottom of the 4' set of steps, install a walkway, approx. 4' wide down to the lower patio level.
- The walkway will include approx. 10 Cambridge Palisades steps to more comfortably navigate the elevation change in the yard.
- A Westbury aluminum railing will be installed along the steps.
- The pavers used to create the walkway will be matched as closely as possible to the existing patio block.

The author consolidates renderings and project information from the original proposal onto a single page, which he distributes to the project manager and to subcontractors. Sometimes, but not always, the jobsite project sheet includes a detailed set of construction drawings, depending on project complexity.

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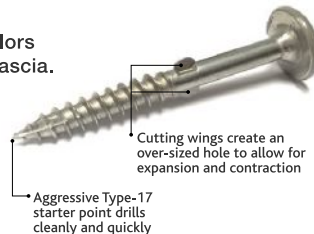


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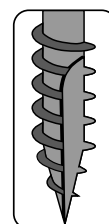


T-20 Star Drive eliminates driver bit camout

Trim Undercut Head traps loose material while countersinking

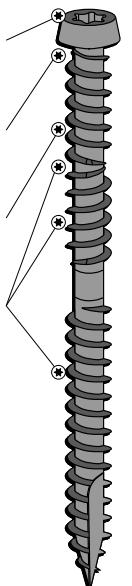
Top Threads Push composite material back into the deck - No Mushrooming

Deep Tri-Thread Design for superior holding value



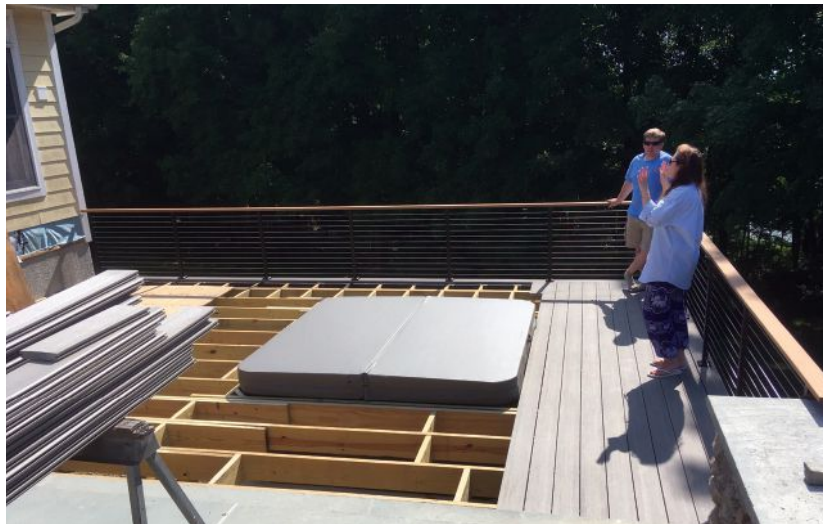
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 - TAN
 - REDWOOD
 - BROWN



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Managing Large-Scale Outdoor Living Projects



Each job's project manager (or lead carpenter) should be able to communicate effectively with both clients and team members to make sure that project details are completed on time and on budget.

may have been captured earlier, and any permitting information (including the required inspection schedule).

This information should be readily accessible on site and copies shared with any project leads and primary subcontractors. If it's updated, make sure the updates get out, and the old copies are eliminated. For example, if the clients buried a beloved pet where a deck footing might go, this is where it should be noted.

Completion report. This can take many forms, depending on your staff and the level of trust. It could be the entire client folder, or a few selected documents, or just a summary sheet with notes. It's what your punch-list crew will carefully review to make sure that everything has been addressed, all inspections have been passed, payments have been received, and any possible future projects or sales notes have been passed back to the design team and front office for follow-up when appropriate.

The on-site team, the designer, and the production manager should review this information for accuracy. We also utilize GuildQuality to perform client satisfaction surveys; if anything was over-

looked, we schedule an additional visit to address it. We also use feedback from the surveys to improve how we handle this final stage.

Conversations and Communication

When we think of conversations, often we focus on how we communicate with the clients. It's also important to view those conversations all together as a story line, not isolated chatter. There must be clarity and continuity in what is presented, from the initial prospective phone call all the way to the final cleaning. If you answer the phone and say you also remodel bathrooms, you had better not have an employee along the way saying that you're terrible working inside a client's house! More than simply making sure you "keep your story straight," it's about making sure everyone on the team understands the company's vision, values, and priorities.

Team members also need to be on the same page when discussing project-specific concerns with the client. For example, if you no longer use "X" brand of decking or pavers because of

something specific, make sure everyone knows the reason, so that there is alignment and clarity.

Conversations should also naturally encompass the hand-off of each piece of reporting referenced above, including any updates to those notes. If something changes, make sure to communicate with everyone who might be impacted.

Expect the Unexpected

Deck builders are problem solvers by nature. Where others see gaping holes and inaccessibility and impossible budgets, we see solutions, opportunities, and perfect entertaining spaces. But we're also idealists at times—having trained ourselves to look for the potential, we risk overlooking the pitfalls. On a large project especially, it's important to build in a margin of error for uncertainties.

We don't have to know *which* uncertainty, but it's rare to complete a project without a rain day, or a supplier delivering a damaged board, or a mistake about a client's new color selection, or even a miscut railing. Something is going to go wrong, so plan for "something," and when it inevitably happens, you will be better prepared to address it.

For us, this takes shape in how we book appointments (with a few gaps in the schedule in case meeting times change), how we plan projects (with extra helpers or some additional time allocated), and how we budget (both for our client projects, as well as in our corporate long-term planning). With townships and permit approvals, it's best to have plans submitted a month early, rather than the week prior to project commencement. With subcontractors, always have a back-up contractor or a company "pinch hitter" should you need to bridge the gap while your subcontractor is running behind.

Completing the Project

The completion is where it all comes together. Full disclosure: This is currently our firm's greatest challenge.

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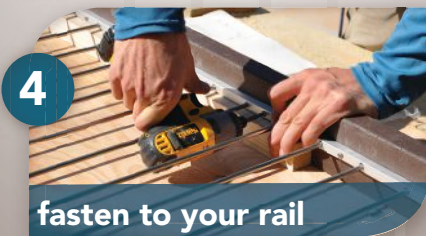
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n'-drop



3

insert damper



4

fasten to your rail



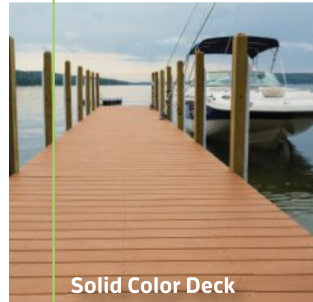
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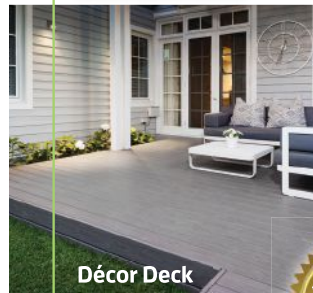
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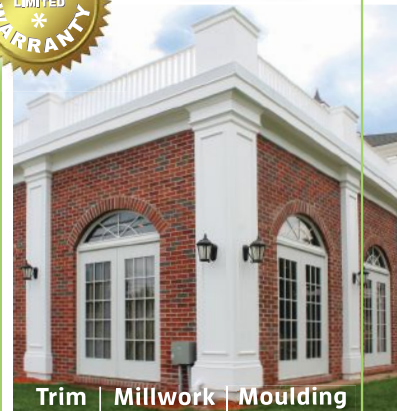
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Managing Large-Scale Outdoor Living Projects

BC&L WEEKLY CONSTRUCTION SCHEDULE

	Monday, August 13, 18	Tuesday, August 14, 18	Wednesday, August 15, 18	Thursday, August 16, 18	Friday, August 17, 18	Saturday, August 18, 18
Reed		Excavation, Site Prep KE, D, TN	Concrete Forming SD	Concrete SD	Grading, Seed SD	
Booth Jackson		Pergola, Column JB, JP	Grading, Stone, Lighting JS, D, N, TN	Grading, Punch KE, JS, D	Framing/Final Insp 8:30-12	
Bickel		Framing, Roof Beam JY, JS, N	Roof Framing JB, JP, JY	Roof Framing JK, JY	Framing, Stairs, Decking, Electric JB, JP, JY, CS	Roofing, Beam Wrap KL
Cocchimiglio				Framing Insp 10:00	Demo, Site Prep, Footers JS, T, D	Footer Insp 2:30
Crestmont		Footers SD	Footer Insp 9:00			
Gibson				Excavation, Piping, Rocks KE, B, N		
Ohnsman			T-Framing, Prep, Door Trim, Paint JK, E	Garage Framing, Beam, Trim JK, JP, T	Garage Door Shank	
	Kelly - Electric - CS					
		Kaag - JK, E			Berger - Demo, Site Prep - JS, T, D	
	A - Off, JB - Off	A - Off	A, Off, TN - Last Day	A - Off	N - Off, JK - Off, A-Off	

Distributed weekly to the entire team, the schedule helps keep projects, employees, and subcontractors on track. The schedule includes a few gaps to allow flexibility for weather problems and subcontractor delays.

These comments are painful and come learned (and re-learned) at great expense. What we've learned is that the completion efforts done by your punch-list team require steady, methodical people who are detail-oriented, and focused. Not "big picture" people, but "list people." Here are some of our takeaways:

- When a project is finishing up (not two weeks later), be sure to ask your subcontractors for feedback on what project notes were vague or what site layout items could have been improved upon; if

you wait too long to ask, they will forget.

- While giving the deck or patio a courtesy wash after completion, point out the need to schedule an annual cleaning. It's also the perfect time to view the backyard with a new perspective from the new deck and perhaps discuss the idea of a future shed or fire pit with the client.

- Completion also touches on nagging warranty work. Sure, it may not be your fault that the neighborhood squirrels left their vegan diet to dine on your clients' low-voltage wires. And while by contract

you could bill your clients, sometimes promptly replacing the nibbled light fixtures is a small expense now that can deliver *huge* referrals later. You need to be prompt and proactive, and not reactive or antagonistic.

One last note: Completion work spans beyond the specifics of the project, or even the potential for future work. Think of it this way: Your clients have just completed what was for them a big investment, and it can be an emotionally sensitive time as they evaluate the perceived value they received and work through expectations against the completed realities. Sometimes having a friendly, approachable listening ear can help reassure your clients that yes, this was a big investment, but it really was worth it. Thank-you cards, small welcome gifts, and the like work well to add that "little extra" to the experience. And at the end of the day, it's often that final "feel-good" experience that will make your firm memorable enough to mention for years to come. ❖

Matthew Breyer is president of Breyer Construction and Landscape, in Reading, Pa., and current president of NADRA (the North American Deck and Railing Association). He's a former chairman of NADRA's Education & Codes Committee and a regular PDB contributor.



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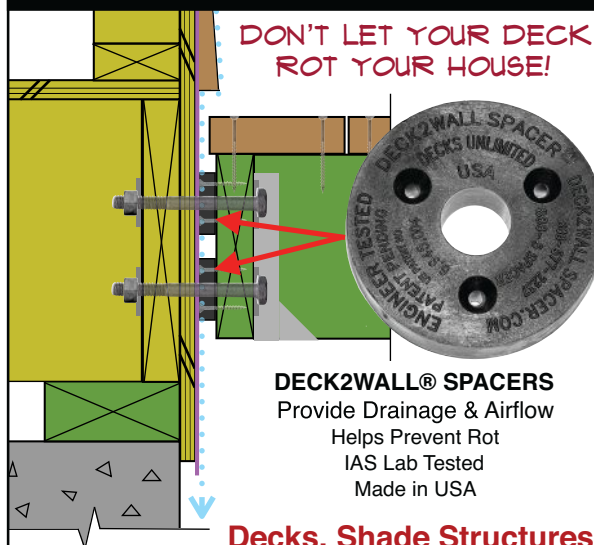
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DAY'S END

Focus on good design and clever construction



Elegant Elliptical Stairs for a Multilevel Deck

by Sean McAleer

Built on a steep lot overlooking the New York City skyline, our clients' home offered both opportunities and challenges ... just the way our deck-building company likes it. The steep lot created the perfect scenario for building a multilevel deck with dry, usable living space on the ground level. Our clients wanted to maximize the size of the upper deck to take advantage of the views, while minimizing the size of the lower deck to preserve as much of their lawn as possible. Besides the structural challenges of framing the upper and lower levels, the trick would be to integrate them so that they would flow together (A).

Our solution was to connect the two levels with a gracefully curving elliptical staircase with wide treads and low

risers. We fabricated the stringers in our shop, first drawing the stair layout in full-scale onto a temporary plywood "deck," then using 2x4s to frame curved walls representing the inside and outside edges of the stair. We ripped 1/2-inch pressure-treated plywood into 16-inch-wide lengths and laminated these sections together in multiple layers to build up the curved stringers, using the framed and reinforced 2-by walls as forms (B).

After determining the actual riser and tread dimensions, we laid out the horizontal tread cuts and vertical plumb cuts on the stringers. Then—with the laminated stringers still fastened to the form walls—we carefully cut the sawtooth pattern in the stringers (C).

Before disassembling the forms, we

screwed 2-by PT subreads and 1/2-inch PT plywood subrisers to the stringers. Then everyone on the crew helped hoist the assembly onto a flatbed trailer so that we could haul it to the jobsite.

After manhandling the rough stairs down the steep bank at the side of the house and installing them, we finished the carriage with PVC risers and skirtboards, and Zuri treads to match the decking used on the rest of the outdoor living space. Finished with custom curved powder-coated aluminum railings and LED riser lights, the stairs offer an elegant and easily navigated transition between upper and lower deck levels (D). ❖

Sean McAleer owns Deck Remodelers Inc., in Sparta, N.J.

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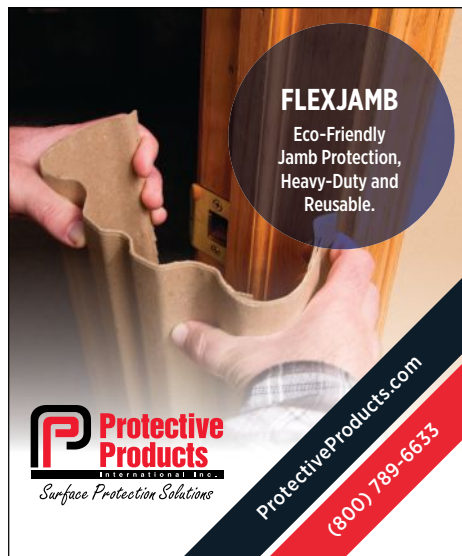
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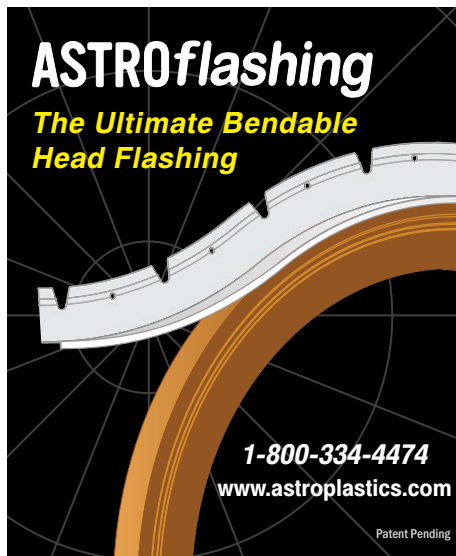
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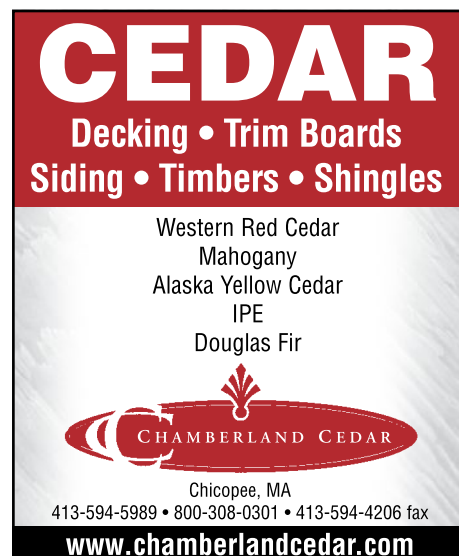
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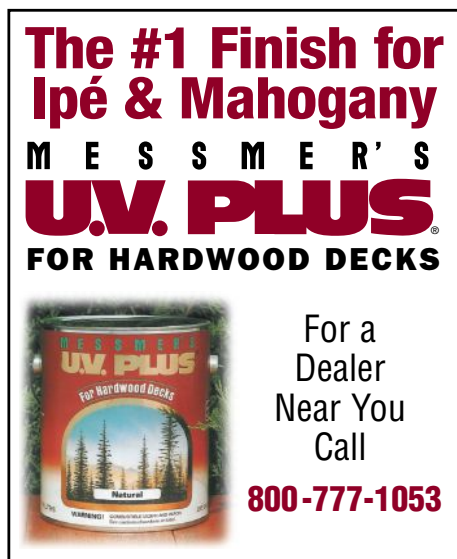


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BY SYMONE GARVETT



1. Light Composite Decking

A new decking profile from Fortress Building Products, the Infinity-I Series, uses a bamboo capped-composite formulation to provide strength, durability, and performance. The boards feature slip resistance, heat dissipation, and moisture resistance, according to the manufacturer. The decking is available in a selection of earth-tone colors and is dual-embossed for variation in grain pattern. Pricing ranges from \$2.80 to \$3 per lineal foot; contact a local distributor for more accurate pricing. fortressbp.com

2



2. Modern Bar Pull

Top Knobs unveiled three new hardware collections at the Kitchen and Bath Industry Show: the Ellis collection of knobs, pulls, and appliance pulls; the Ryland collection of decorative hooks; and the Amwell series (shown), a new entry in the Bar Pull Collection. The Amwell Series consists of 56 pieces, each with a unique knurled design, in four finishes: ash gray, honey bronze, flat black, and brushed satin nickel. Contact a local distributor for pricing. topknobs.com

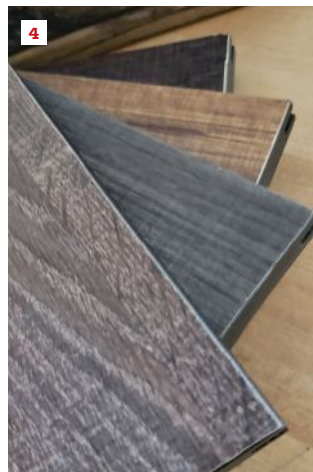
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3. Smart Water Sensor

The new Flo by Moen Smart Water Detector is a stand-alone sensor that can be placed anywhere in a home to alert users via push notification if it detects moisture, a change in temperature, or a change in humidity. Users can place one or more sensors in areas deemed high risk, such as the basement, laundry room, or attic. These sensors may be used in conjunction with the existing Flo by Moen Smart Water Shutoff, which actively identifies leaks and automatically shuts off the water when a leak is found. Pricing starts at \$50, or \$130 for a pack of three. meetflo.com

4



4. Earth-Friendly Plank Decking

MonaDeck, a new line of decking from Monarch Technologies, is manufactured using a proprietary bio-based resin system to bind recycled FSC-certified wood fiber and bamboo fiber into a sustainable, wood-simulating composite that has a hardness rating that rivals ipe, says the company. Resembling century-old wood, this decking is produced in 12-inch widths and has a Class-A fire rating. Contact a local distributor for pricing. monarchtechnologiesllc.com

Products

5. Polymer-Based Water Screen

The LP WeatherLogic Water Screen consists of a matrix of polymer-based filaments held in place with a felt-like scrim. Designed to create a gap between the exterior sheathing and cladding, the screen can be used either with OSB and a WRB housewrap or in conjunction with an integrated panel, like LP WeatherLogic Air & Water Barrier, to provide ventilation and drainage behind the cladding. The screen is lightweight, easy to install, and mold-resistant, according to the manufacturer. Contact a local distributor for pricing. lpcorp.com



6. Code-Listed Post Bases

Simpson Strong-Tie's MPBZ line of column and post bases were designed to provide moment resistance by encapsulating the bases with an overlapping sleeve to resist rotation at the base. Available in 4x4, 6x6, and now 8x8 sizes, all three are code listed under ICC-ES ESR-3050 for uplift, download, and lateral resistance, as well as for allowable moment in reinforced concrete footings. The MPBZ-reinforced concrete footings provide higher load values for the connection, giving designers more flexibility. Pricing ranges from \$100 to \$200. strongtie.com



7. Folding Glass Wall

NanaWall Systems recently launched its SL84 aluminum framed system. With its slim frame intersection of just 3 7/8 inches, SL84's four-fold and six-fold panels can reach a maximum height of 11'-6" and a maximum width of 3'-7". Available in inswing or outswing configurations, the system offers three sill options—hybrid, low-profile saddle sill, and flush—and can accommodate open corner designs. Contact a local distributor for pricing. nanawall.com



8. Wind-Resistant Shingles

GAF's new series of Timberline shingles, Timberline HDZ, incorporates the manufacturer's Layer-Lock technology to mechanically fuse the shingles' common bonds. The shingles create a dual-phase, shingle-to-shingle seal when used with GAF's DuraGrip sealant, as well as an asphalt-to-asphalt monolithic bond. In addition, the new StrikeZone nailing area is up to 600% larger than the nailing area of Timberline HD shingles, providing better nailing accuracy and faster nail fastening during installation, according to the manufacturer. Contact a local distributor for pricing. gaf.com





9. Lightweight Reinforced Siding

CertainTeed Certaplank wide-faced, vinyl cladding combines modern hardboard looks with a lightweight, 7-inch, slim but rigid profile. Due to the product's light weight, contractors can unload the siding by hand, without any special equipment. Its foam backer and panels both meet the code-specified Class A flame spread rating. They also feature a post-formed factory lock, heavy-duty thickness, and rolled-over reinforced nail hem, which has been designed to withstand hurricane-force winds. Contact a local distributor for pricing. certainteed.com



10. Color-Matched Fasteners

After consulting composite-deck-board manufacturers and professional contractors, FastenMaster developed the TrapEase Fascia Color Matched Fastening System. Sold in kits to complete 100 lineal feet of fascia, the system is available in 18 colors to match all Trex, TimberTech, and Fiberon fascia. A kit includes 200 1³/₄-inch screws, a counterbore tool, and a TORX ttap driver bit for a quick two-step installation, according to the manufacturer. Pricing ranges from \$65 to \$75. fastenmaster.com



11. Capped Composite Decking

Envision Building Products' newest composite decking, Ridge Premium, has a fluted bottom with a wide edge to provide room for driving screws. Crafted using Envision's proprietary technology, the cap and core are bonded together with heat and pressure to squeeze out air pockets and create a deep grain. Ridge Premium is available in three colors—black walnut (shown), light brown vintage oak, or gray gunstock—and in 12- and 16-foot lengths with a square edge profile. Contact a local distributor for pricing. envisiondecking.com



12. Industrial-Style Ranges

Bosch has introduced a series of industrial-style ranges and rangetops to its 800 Series line. They are available in 30-inch and 36-inch sizes, with a stainless steel finish or black stainless steel option for ranges. Both products sport industrial touches—including die-cast metal, continuous cast iron grates, and pedestal feet—and both feature the Bosch Dual-Flame ring burner, which uses two flame rings to deliver a wide range of temperature control. The cooktops range from four to six burners, depending on model and size. The new collection will be available mid-year 2020. bosch.us

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TOOLS

OF THE TRADE

Cordless Metal Connector Nailer

BY TIM UHLER

Fasco America recently released its gas-powered hoseless positive placement nailer, the F70G, and sent me one to review. If you've read other reviews I've written, you know I am a big fan of using cordless and hoseless equipment when it makes sense.

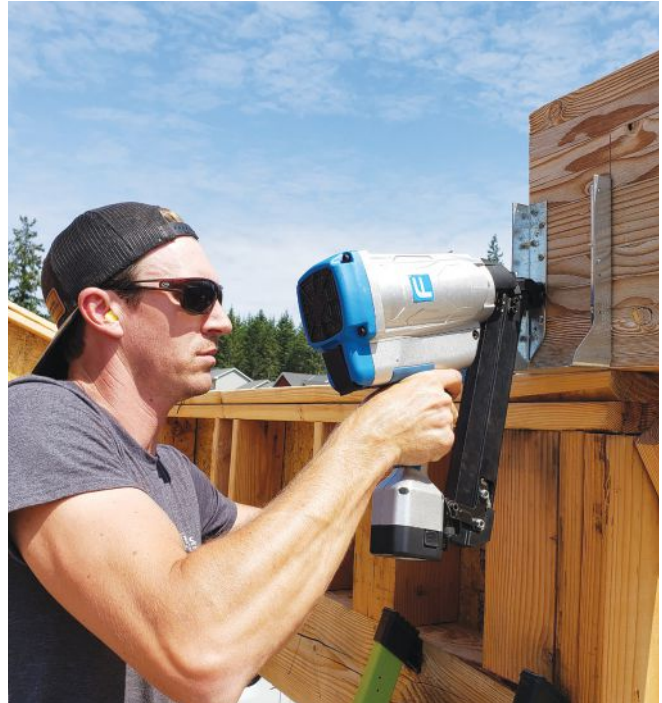
Features. For those who have ever used a gas-powered nailer, there won't be anything new here. This 33-degree strip nailer has a rear-loading magazine that holds one strip of nails (if you break the strips in half, it will hold one-and-a-half strips). While the nailer weighs close to eight-and-a-half pounds and looks rather large and bulky, it is well balanced. It shoots fasteners ranging from 1½-inch x 0.129-inch-diameter nails up to 2½-inch x 0.169-inch-diameter nails (we commonly use 1½-inch x 0.148-inch-diameter nails and 2½-inch x 0.162-inch-diameter nails).

The gun runs off gas that is ignited from a spark, so you need both a canister of gas and a charged battery to ignite the gas (the tool comes with two rechargeable NiMH batteries, but you need to buy the gas canisters separately). One thing to note is that repetitive nailing—shooting off tie-down straps, for example—heats up the gun. To illustrate, shooting off 10 Simpson Strong-Tie STHD-14 straps in a row required 22 nails per strap, or 220 nails in a row. When I was done, the gun was what I would call hot. This didn't affect its performance, though, and the gun did a great job of consistently sinking the nails.

The gun has a belt hook and nice rubber grip. To locate the nail in the connector, the gun relies on the nosepiece rather than the nail itself. This can lead to missing the hole and firing the fastener into the hardware. If the hardware is a heavy-enough gauge, then you will get major recoil from the gun.

Performance. I had zero issues nailing 2½-inch x 0.162-inch-diameter nails. The gun consistently set them just right, thanks to the dial-type depth adjustment located above the nosepiece. In use, the gun doesn't feel heavy and bulky, and I don't have any reservations about recommending it based on performance and convenience alone.

The gun retails for \$760, which for our crew and the type of work we do is a little too steep. On the other hand, I could see that this nailer would be a good fit for



Kyle Davis installs a joist hanger using a Fasco America F70G gas-powered hoseless positive placement nailer.



The gun is powered by a fuel cell (left), which slides into the back of the tool (right).

Photos by the respective authors

a large crew that installs huge amounts of hardware. And once you factor in a hose and compressor and setup (though it's likely that a compressor and hose are already set up on most framing sites), the price differential between this gun and, say, the Metabo HPT NR65AK2(s) pneumatic nailer (at \$390) isn't that great.

A hoseless gun is much more efficient to use than a pneumatic one, and working without a hose is safer and certainly much more convenient. The F70G is a great gun that has proven to be very reliable. fasco-tools.com

Tim Uhler is a lead carpenter for Pioneer Builders in Port Orchard, Wash. He is a contributing editor to JLC and Tools of the Trade. Follow him on Instagram @awesomeframers.



Power to ignite the gas is supplied by a small rechargeable NiMH battery. The gun comes with two of them.



The nosepiece, rather than the tip of the nail itself, is used to locate the nail, which can occasionally lead to misplaced nails.

Premium Caulking Gun

BY IAN SCHWANDT

As a carpenter, I have a love-hate relationship with caulk guns. My days working in commercial construction taught me the value of a good one, but I do have a pile of the cheap blue-metal guns kicking around, purchased out of convenience or desperation. Recently, though, I added an Irion XP-Delta caulk gun to my kit and hung the cheap guns in the shop.

The XP-Delta is a premium caulk gun for standard 10.5-ounce tubes, with a switchable trigger thrust ratio of 25:1 or 12:1 and a dripless function that can be switched on or off. In the hand, the Irion feels like a real tool, the kind you would be unlikely to lend out on the job. The handle and trigger have a grippy rubber coating that is comfortable to hold. A painter colleague called the handle ergonomics “near perfection.” The knobs for the thrust and dripless functions are easy to use; they do require a second hand to switch, though I have not found this to be a problem during use. The ability to switch between a 25:1 and a 12:1 thrust ratio is what makes the XP-Delta worth the money, especially if you frequently use adhesives or work in cold climates.

For a controlled test, I used Dap DynaFlex caulk and PL Max Premium under winter conditions (overnight in my truck with low temperatures in the 20s) and summer conditions (each tube heated



The Irion XP-Delta caulk applicator has a switchable 25:1/12:1 trigger ratio for more power in cold conditions and more control in warm conditions. Its rubber-coated trigger and handle are comfortable and grippy.

to 115°F in a water bath using my wife’s immersion circulator).

In the cold test, the XP-Delta pushed both materials with ease at the 25:1 setting. At the 12:1 setting, the gun struggled with the PL Max, and while it did push the DynaFlex, it required a great effort to squeeze the trigger. The dripless function performed well in the cold test, as expected.

In the summertime-condition test, the XP-Delta performed equally well. At 12:1, it pushed the PL Max fine, and at 25:1, the gun pushed it like it was room-temperature butter—truly a joy to use when you find yourself using copious amounts of polyurethane adhesives. The same was true of the DynaFlex at 12:1, but the 25:1 setting provided

too much power for laying a controlled bead. The dripless function worked well with the heated PL Max, and I was able to lay consistent 6-inch beads with no drips. I was unable to develop the touch to caulk trim using the dripless function with the heated DynaFlex.

Overall, the Irion XP-Delta far outperforms the other, standard caulk guns in my tool kit and has a spot in my “not for rent” toolbox, as it should for being a premium tool at a premium price. It costs \$42 at windowanddoorparts.us. irion-america.com

Ian Schwandt is a lead carpenter and estimator for Hudson Valley Preservation, in Kent, Conn.

Savage Sailcloth Bag

BY JAKE BRUTON

Like every carpenter and tradesperson, I am constantly on the lookout for a better way to carry the tools I use on a job. This search has taken me from buckets with “organizers” to bottomless tool bags to fancy pack-out systems, all in the hope of finding the perfect way to carry the tools that I need the most. About a year ago, I discovered my best solution to date: the Savage Industries EDC One. The brainchild of Adam Savage of MythBusters fame, the EDC One breaks the tool-bag mold in quite a few ways to make it the most effective tool bag that I own.

Let’s start with the obvious: This bag is white, both on the outside and—more importantly—on the inside. This means that when you’re looking for something in the bag, you can see what’s in there. No more black hole. I am much more likely to double-check what is in my bag before I leave my truck to do a job.

The bag is made from recycled sailcloth, making it much lighter than its canvas or ballistic-nylon competitors but still tough enough to stand up to the rigors of a construction site. Combined with the clam-shell opening that actually opens all the way—and stays open so you don’t have to constantly fight the bag—this lightweight bag is just the right size and shape to carry everything I might need for

a particular job. And let’s not overlook the benefits of a single open compartment, which means I can fit all the tools I might need for a task without stuffing them into special little pockets or holders. This also makes cleanup a breeze: Open the bag, shove everything back in, and zip it shut.

This bag does have its downsides, though. First of all, the price. At \$225 for what amounts to a gym bag with no fancy organization, I would say it is a little overpriced. Then there is the shoulder strap, which is way too skinny to comfortably use when the bag is full (though the magnetized handles, which I use more often when lugging the bag around, are fine). Also, the white sailcloth that makes it so easy to find tools quickly becomes dirty after a few weeks of use. While the bag is machine washable, it still ends up looking a little too dingy to carry into the homes of some of our higher-end clients.

After putting the bag through a year of daily use, however, I have found the pros to outweigh the cons. adamsavage.com

Jake Bruton is the owner of Aarow Building in Columbia, Mo. Follow Aarow Building on YouTube, and follow Jake @jake.bruton on Instagram.



Finding what you are looking for is easier in a white bag than in a black one. The trade-off is that the bag, though washable, starts to look dingy over time. The sailcloth the bag is made of is lightweight and durable.

BY ROE OSBORN

Treasure From the Deep

In the late 1980s, I had the unique experience of being an assistant caretaker on Nashawena, a privately owned island in the Elizabeths off the southern Massachusetts coast. The only public island in the chain, Cuttyhunk, sat next door, and I had many good friends there. One particular friend had a pile of old, gray, weathered logs next to his back entry, and I quizzed him about it one day. He told me to pick up one of the logs, and when I did, I was immediately taken aback by its extreme weight.

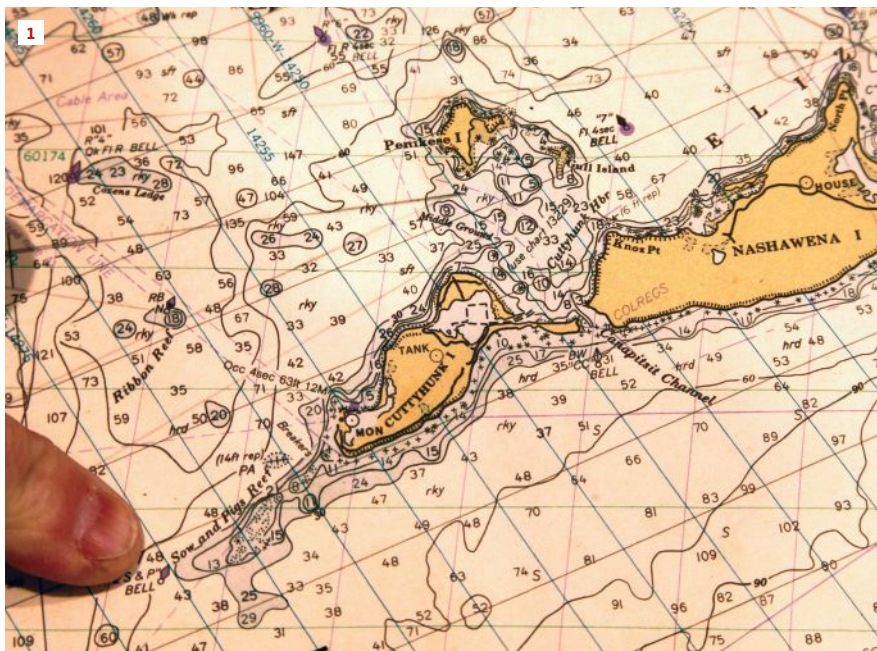
“Ebony!” When I looked surprised, he chuckled and explained that in the 1940s, a boat had wrecked on Sow and Pigs Reef south of the island (1). The boat’s cargo, a cache of exotic hardwood—including this ebony—had spilled out of the hold as the boat broke apart on the rocks. Much too dense to float, the heavy logs bounced along the rocky bottom over the years and finally washed up on Cuttyhunk’s shore. Beachcombing islanders like my friend had found the logs and brought them home. Just before I moved back to the mainland, he presented me with a couple of the ebony logs as a parting gift, and I’ve had them in my stockpile ever since.

At one point, I cut a section off one of the logs and milled two

small boards from it that I combined with glass for a sculpture (2). Otherwise, the logs have rested patiently in that “do-something-with-someday” pile of wood. Then this year, I asked a good friend, Karl Hoyt, to do some CNC work for me. Karl makes and repairs stringed instruments, so in exchange, I gave him one of the logs. With images of ebony fingerboards in his head, Karl re-sawed the log into planks on a large, heavy-duty band saw (3). The edges of the planks still have gnarled wane from the log being pummeled against the ragged seabed. But the exposed grain of the ebony has a luxurious luster—even through the marks of the saw blade.

The name of the lost boat carrying the ebony is still a mystery (at least to me), so most likely I’ll never know the exact origin of the wood. Suffice it to say, this old-growth ebony is probably the hardest wood I’ll ever encounter. Karl let me choose two of the planks to keep, and I’m hoping that this exquisite wood will find its way into another one of my sculptures in the near future.

JLC senior editor Roe Osborn is a sculptor, musician, and photographer who lives on Cape Cod, in Massachusetts.



Sow and Pigs Reef southwest of Cuttyhunk Island has been a notorious graveyard for ships (1). In the 1940s, a boat laden with exotic hardwood wrecked on the reef. Among its cargo were ebony logs. The author was given a couple of the logs and made this simple sculpture (2). Recently, a luthier friend milled one of the logs into planks for making musical instrument parts (3).

Photos by Roe Osborn

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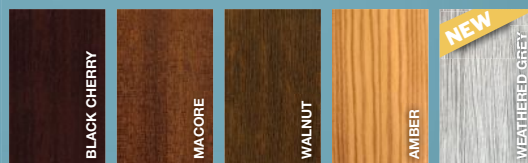
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