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On the cover: Andrew Philipp, a carpenter with DBS Remodel in Poughkeepsie, N.Y., reframes the floor during an extensive kitchen rehab. See the story on page 37. Photo by Mike Whalen.

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BY JOHN SPIER

Rules for Better Framing

A couple of decades ago, a young fellow by the name of Ben Morton came to work for me for a summer. He had just finished a two-year college program in building construction technology at Eastern Maine Community College, and I was his first real-world employer. It was a temporary job while he saved up enough money to through-hike the Appalachian Trail, which he subsequently did. He was a big, good-natured, easy-going kid, nice to have around; he naturally got the sobriquet "Gentle Ben."

One day early on, I had him help me build a set of stairs in a house that I was remodeling. The next day, I pointed him at the rough opening in the floor to the basement and told him to build the stairs. He was in disbelief, but I said, "Look, I showed you how to do it, just figure it out. I'm right upstairs if you have any questions." It took him all day, but he did a great job; those stairs are still there.

About 10 years later, he had gone on to start his own construction company, Ben Morton Builder (benmortonbuilder.com), in coastal Maine, and has become a truly extraordinary framer who has left me far behind in the sawdust. He told someone once that my trusting him to build those stairs was the best thing anyone had ever done for him. He's also told me that he has incorporated what I call my "Rules for Framers" in his company handbook. Here they are:

A DOZEN RULES FOR GOOD FRAMING

Whether you're the guy reading the plans or the guy banging the nails (or both), there are two general parts to being the framer that everyone wants to work with. The first is to understand and appreciate the big picture; you have to see the framing as an integral component of a complex project where all of the systems and subs have to work together efficiently. The best way to gain this understanding is to work with and learn from seasoned professionals in all of the other trades.

The other part is to master the thousands of tricks and techniques that make assembling wood easy and efficient. This comes with experience, from apprenticeship, from learning to select good tools and use them well, and from paying attention to minimizing wasted time, energy, and material. The rules listed here focus on the macro and management element.

1. Learn the plans. If you're building a ranch house with 8-foot walls on a slab and trusses on top, you can probably just show up and do it. But most modern custom homes are a lot more complicated than that. Take the prints home and study them. Reconcile the plans, sections, and elevations, and study the details. Trace the load paths, and figure out the engineering and hardware. Compare the architectural plans with the structural plans and make sure they match. Get your mind wrapped around the whole building and how it goes together.

2. Do your homework. Make sure you have all the information you're going to need. Study the architectural details and manufacturer's specs, and create a schedule of rough-opening dimensions (don't trust the list that some draftsman pasted into the plans). Download and print the framing specs for every piece of equipment

Photos courtesy Ben Morton Builder LLC

Pictured at left is Ben Morton, who owns Ben Morton Builder, a residential and light commercial construction company in Raymond, Maine. Following graduation from Eastern Maine Community College, Morton spent the summer of 2006 working as a laborer for the author. It was Morton's first construction job.

At left, Morton is operating a Manitou MRT 2260 Vision+, one of the two Manitou rotating telehandlers that his company owns. Though he's in the machine's cab here, most of the time he works outside thanks to the this telehandler's remote control functionality.

Morton likes to break a project down into the largest liftable pieces possible, then assemble them with the help of a telehandler to avoid working off of ladders. On a large, complex project like this one, having what you need on site when you need it—see Rule #3—is critical in keeping the job moving.

in the house: fireplaces, wall ovens, elevators, dumbwaiters, air handlers, you name it. Review the plumbing specs and know where the drains and valves are or whether you need a dropped section of floor. Figure out if there's anything that won't fit through the doors or windows later.

3. Get what you need on site. Do a materials takeoff, and break it down into delivery packages that work logistically. If you need structural steel, get it specified and ordered, and figure out how you're going to move it. Stay ahead of your requirements so that you're not waiting for anything, but bring materials in as you need them so you're not working around them or trying to uncover them. Also, get all of the framing hardware, hangers, straps, sill seal, adhesive, nails, anchors, and other sundry materials you will be using.

4. Get a good start. I like to start small, working alone or with just one helper for a few hours to get the layout done, lines snapped on the foundation walls, and perhaps the mudsills installed. There's no such thing as a perfect foundation or framing job, but if you start out as close to it as possible, you'll still be within tolerances at the ridge.

5. Come to work prepared. Nothing causes mistakes faster than a crew of young framers standing by with saws and nail guns while you're scratching your head figuring out where to start or what to do next. So, while I'm doing my homework, I develop cut lists and figure out a logical framing sequence. Reducing a stack of lumber to piles of studs, trimmers, headers, sills, sill jacks, cripples, and blocks will keep a crew busy, as well as make the framing process smoother, faster, and more efficient. Good cut lists also specify

A remote control allows Morton to follow the boom of the telehandler around and physically see what he's lifting from any angle. Having a clean and organized jobsite—the author's Rule #11—helps Morton to move around safely while operating the machine.

the material that those pieces come out of; minimize waste by ordering 18-foot stock for 9-foot headers, or 14-foot stock for 81-inch jacks.

I also bring a working set of plans, with notes and sketches, dimensions, diagonals, details, drain locations, and other reminders written on it. For complicated frames, I'll use colored highlighters to identify structural elements or critical details.

6. Know the five commandments. Level, square, plumb, straight, and flat are all interrelated. The first three are directly connected; if you put a square wall on a level surface, the top will also be level and the ends will be plumb. And, if you get it straight, it will also be flat, and vice versa. Levels, lasers, lines, measurements, and vigilance are your tools here; don't let anything get away from you.

7. Maintain a common layout. Everything on layout from sill to ridge should align vertically, in both directions. This makes the whole go more smoothly, especially for the sub trades: A plumber drilling a hole in a framing bay upstairs should know that he'll find the same bay underneath. It's also useful later to be able to find a framing member (or an open bay) anywhere in the house by knowing where to measure from.

8. Symmetry is your friend. Symmetry gets mixed reviews in the world of architecture these days, but for a framer, it's crucial. Identical things should be identical; they're faster and easier to build that way, and they look better when you're finished. If you see a row of identical dormers or windows, or matched gable ends, cut all of the pieces at once and assemble them in sets.

9. Think like a subcontractor. The best framers are people who have built a few houses from start to finish. Understanding what the other trades need is key to building a good house with minimal wasted time. The drywallers and finish carpenters need nailers and blocking, the mechanical trades need room and clear routes for their pipes, wires, ducts, and equipment, and everything needs to fit in where it belongs. Even the simplest courtesies, like not putting nails where someone will need to drill, go a long way toward efficiency. The easier you make their jobs, the less they'll hack up yours!

10. Get it right as you go. "I'll fix that later" is a recipe for frustration, poor quality, and sometimes disaster. Also, the first corollary to Murphy's Law is that errors always multiply; they never cancel each other out. The more you pay attention and do correctly as you go, the shorter your punch list will be at the end.

11. Keep a clean site. A clean, organized site is a safe site, one that doesn't waste time and material, and it's also a pleasant place to work and your best advertising. Take the time every afternoon to sort and stack scrap, sweep the floors, and maintain and put away your tools and equipment. Start each day fresh; if you arrive to yesterday's mess, you'll be tired before you even get moving.

12. When it's done, it's done. At the end of your framing job, it should be ready for everyone else to do theirs without your needing to come back. Walk through the whole job with a long level, checking for level and plumb. Pass it over critical walls to check for bowed studs. Police each room for missing nailers, loose ends, fat openings, protruding nails, unfastened hardware, etc. Leave the subs some neat piles of scrap for blocking or mounting boxes and equipment. And leave the whole place broom clean, including the wall cavities.

PAYING IT FORWARD

In addition to his construction success, Ben is back at the community college he attended as a student, now mentoring young people who want to work in the trades. Somehow, he has managed to find the time to chair the advisory board for that college. But he's also found a way to balance work and family life, hiking and canoeing with his wife, Kate, and—in the winter—trading in his hammer for an ice ax to climb mountains.

John Spier owns Spier Construction, a building and remodeling company on Block Island, R.I.

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Q Can an intense fire damage a poured concrete or slab foundation?

*Peter Marxhausen, a forensic structural engineer and civil engineering instructor at the University of Colorado Denver and author of "Engineering Evaluation of Fire Damage to Concrete Foundations" (*Structure*, August 2014, structuremag.org/?p=4102), responds*: Yes, an intense wildfire or structural fire can cause significant damage to a poured-concrete, CMU, or slab-on-grade foundation. The damage is generally associated with structural degradation due to high heat combined with internal nonhomogeneous thermal stresses. With the combination of externally applied forces, internal thermal-induced stresses, and the degradation of the concrete strength, the foundation may continue to stand, or it may collapse.

I have evaluated hundreds of structures that have been damaged by fires, including wildfires **(1)**. Over the past 25 years, I have found that if the structure is wood-framed and burns without being quickly extinguished, the resulting temperature increase can be sufficient to cause irreparable damage to the concrete foundation at the areas of exposure to high heat.

I have also evaluated concrete foundations that have been damaged by ordinary house fires and have always found that the concrete foundation becomes unusable where the structure is burned to ash without the benefit of being extinguished. In those cases where the heat is high for several hours, the exposed concrete becomes soft and powdery and can easily be broken apart with a framing hammer to reveal perfectly intact rebar (which, by the way, doesn't melt in a fire).

On the other hand, firefighting professionals typically extinguish most structure fires before the concrete is heated to an extent that it becomes weakened. Where a traditional fire response extinguishes a structure fire, the evaluation methods that I discuss below can help determine whether a foundation is safe to be reused in the repair of a structure.

In 2012, the Waldo Canyon wildfire near Pikes Peak in Colorado burned more than 18,000 acres of land and destroyed 346 homes. Here, the author surveys some of the damage caused by the fire.

Photos by Peter Marxhausen

EVALUATION

When I first started evaluating fire-damaged foundations to determine if they were safe to rebuild or needed to be replaced, I would typically obtain concrete cores of the damaged foundation, then submit those samples to a third-party testing agency to conduct a chemical analysis, compressive strength tests, and a microscopic/petrographic analysis. Testing like that would often take four to six weeks and could cost thousands of dollars, depending upon ease of site access and the number of cores to be extracted and evaluated. More recently, I've developed methods for quickly and economically evaluating concrete slabs and foundations for heat and fire damage.

Visual assessment. I look for patterns of scorch marks, heat exposure, cracks, changes in color, and surface spalls. I also look for leaning or tilting of the walls, which may not be due to heat damage but to the loss of diaphragm support after a structure has been consumed by a fire.

Typically, normal concrete is not significantly altered or damaged below a temperature of 500°F; however, rapid heating of the concrete can cause pore water to boil rapidly, which can cause surface spalls. These can also result from sudden cooling and contraction after being sprayed by a firefighter's hose. Spalled areas should be carefully examined to determine whether they are a sign of widespread heat damage or an isolated occurrence that could be addressed with a targeted repair patch.

The color of the concrete paste should also be reviewed since a color change may indicate exposure to temperatures greater than 550°F. Concrete exposed to temperatures greater than approximately 570°F often turns a shade of pink, associated with chemical changes of the iron-containing compounds in the aggregates and paste matrix. At much higher temperatures—which are not commonly encountered during typical structure fires—the concrete can turn back to a light gray and then eventually to a yellowish-brown color. Concrete that has turned pink is damaged and should be replaced **(2)**. Smoke stains and scorch marks can point to areas that were exposed to high heat when compared with areas exposed to less heat, indicating the need for further evaluation.

Concrete exposed to intense heat often has a pink hue, a strong indicator that it is severely damaged and shouldn't be reused for reconstruction **(2)**. A few strikes with a framing hammer on the corner of this heat-damaged foundation **(3)** were enough to fracture the concrete and expose rebar **(4)**.

Audible changes. Striking various exposed surfaces with a sounding hammer—typically, a framing hammer with a hardened steel handle—and listening to the resulting sound the hammer makes can help differentiate between undamaged and damaged concrete. In general, healthy, undamaged concrete will cause a hammer to have a high-frequency ringing sound when struck. A consistent dull thud or soft noise can indicate damaged or poor-quality concrete.

Fracture mechanics. Healthy, undamaged concrete will typically fracture in a plane through the aggregate. In heat-damaged concrete, the paste matrix is often much weaker than the aggregates; therefore, the fracture plane will break around the aggregate pieces. To facilitate an evaluation of the fracture mechanics, the edge of the concrete can be struck with a framing hammer. Undamaged concrete will typically be difficult to break, which may be an indication there is no damage. By comparison, heat-damaged concrete will crumble away with a few rigorous hits.

A quick way to convince a homeowner who may want to reuse their heat-damaged foundation to choose otherwise is to show them a photograph or two illustrating how easily a few hits with a hammer can dislodge concrete and expose rebar **(3, 4)**.

Relative concrete strength. A Schmidt hammer, also known as a rebound hammer or a Swiss hammer, is a calibrated device that is used to measure the elastic properties or surface strength of concrete. Although the results of the Schmidt hammer test can be used to determine an approximate concrete compressive strength through use of empirical tables, the original as-built design compressive strength is often not known and, therefore, that sole data point is of minimal benefit.

As with nearly all of the aforementioned evaluation methods, especially the Schmidt hammer evaluation, more meaningful data is obtained by a comparison of test results from at least four areas of the foundation. One way to do this is to conduct a Schmidt hammer test below grade at an excavated surface (where it was protected from heat by the soil) or at a lower, inside foundation corner to obtain a baseline value for areas that were exposed to minimal or less heat. If areas of the foundation that were obviously exposed to high heat exhibit a 20% or more decrease in concrete strength compared with areas that were not exposed to heat, those results should be reported to the client and considered in the analysis of whether to reuse the foundation.

In the event that 50% or more of the foundation system exhibits damage, the entire foundation is typically removed and replaced. However, an owner may want to preserve as much of a foundation as possible—for example, if the building is historical or the owner has minimal insurance coverage. In that case, additional evaluation, which would likely include laboratory analysis and/or nondestructive location of the embedded rebar, may be necessary to determine if the structure is safe to support the anticipated loads and what repairs are needed to fortify deficient areas.

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AZEK EXTERIORS

Meet the "Maven" of Exteriors: Amanda Veinott

The owner of Maven Roofing & Exteriors ditched the corporate world for construction and hasn't looked back since.

Veinott operates in the competitive northern New Jersey market. To differentiate her service, she pursues homeowners who "want to do projects, not necessarily need to do projects," Veinott says. These customers are willing to spend more on higher-quality materials. That's why it's important that she presents options that not only look great but can also perform in the Garden State's challenging climate. Where other materials fail, she says AZEK Trim goes the distance.

"People opt for PVC because they know it's not going to warp, splinter, rot or do any of the other things that wood does here in New Jersey," Veinott says.

FROM CONSULTING TO CONSTRUCTION

After serving in several high-profile consultancy roles, Veinott left the corporate world and accepted a marketing position with a local roofing company. She transitioned to sales and quickly became the second-highest grossing salesperson in the company. In March of this year, she struck out on her own with Maven Roofing & Exteriors in Succasunna.

"We sort of shot out of the gate right away," she says.

Drawing on her marketing background, Veinott scores jobs not through traditional means of advertising but through her large social media following. She has thousands of engaged followers between her personal Facebook and Instagram pages where she posts about company projects and updates.

"I'm the brand and the face of the business," she says. "Every single job we've done has come through organic marketing."

With her reputation on the line, she can't risk using underperforming materials or callbacks. She credits AZEK Exteriors for helping put her on a path to success. Veinott has been through AZEK's training program in Scranton, Penn. three times: first as a salesperson, second as a businessowner and third as an employer.

"I know that when we're doing an installation, what has to be done to make sure that it lives up to the standards of the manufacturer," she says.

GOING ALL IN ON AZEK

Having been in business since only March, Maven Roofing & Exteriors has already done several impressive projects, but Veinott's favorite isn't her biggest job. Rather, it's a relatively straightforward trim replacement that demonstrates how a little exterior improvement can dramatically enhance curb appeal.

She replaced 300 linear feet of rotting wood trim along the gable peaks and multiple layers of frieze board with AZEK Trim and changed out the house's original wood columns with six-by-six wood posts surrounded with AZEK Column Wrap. It's a remarkable transformation.

"The house looks more modern. It gave it such a fresh, crisp look," Veinott says. "Now a house you might not have noticed is getting everyone's attention in the neighborhood." ■

Learn more about Maven Roofing & Exteriors by following Veinott on Facebook (Amanda Veinott-Praml) or Instagram @theroofmaven, and for more on AZEK, visit **www.AZEKExteriors.com**.

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BY PETE FOWLER, WITH CONTRIBUTIONS FROM MIKALA GLAZA

Civil Litigation for Construction Professionals

As a construction professional, you have probably heard the term "civil litigation." With the large number of players involved in building projects—including developers/owners, designers, contractors, subcontractors, sub-subcontractors, suppliers, and more—it is nearly impossible to avoid a legal dispute at some point in your career. When two parties just cannot come to terms, they are likely to end up in civil litigation. And with so many parties involved, even the most simple building project can quickly become "complex litigation" (see sidebar "From Bad to Worse: A Common Example of How Construction Litigation Emerges," page 15).

Over the last 30 years, I have worked on thousands of litigated projects as a contracting and estimating expert witness. But I am not a lawyer, and a little knowledge is dangerous. For most lawyers, though, their depth of knowledge can actually make it difficult for them to explain the process simply. So, I worked with some lawyer friends to write this plain-language "map of the terrain" of civil litigation for non-lawyers who need to understand the process to help make smart business decisions.

Put simply, civil litigation is any noncriminal dispute resolved by a lawsuit using the court system. These cases are commonly settled before they reach the courtroom, but I will walk you through the entire process.

COMMON TYPES OF CASES

Civil litigation covers a huge variety of cases, but there are common claim types building professionals face.

Construction defect litigation begins with allegations of physical problems and damage that are usually related to leaks or structural deficiencies but that can be related to any workmanship or performance problems on any building element (roofs, windows, walls, foundations, framing, plumbing, electrical, HVAC, and so forth). Defect allegations might be made during construction or not until many years after project completion. In some states, an entire "CD industry" has developed over the last 40 years, with attorneys and expert witnesses who work full time pursuing and defending these claims.

Personal injury (tort claims) is the type of lawsuit filed when an individual or business has been harmed by another. These claims include injury to someone, their reputation, or property due to fraud, negligence, or intentional acts. Common examples of this type of claim would be an auto accident, a premises liability slip, trip, or fall, a product defect, and many others. The goal is to seek compensation for physical, emotional, and financial damages incurred, including medical expenses, lost wages, pain and suffering, and other related losses.

Jobsite accidents are typically covered by workers' compensation (see "Insurance Basics for Construction Professionals," May/21) but, in many situations, a civil suit can also be filed against other parties that might have all or a portion of the responsibility due to negligence. In these cases, OSHA's rules for multiemployer work sites often come into play.

Property claims refer to insurance or legal claims made to seek compensation for damage or loss to property. The damages are often caused by activities covered by insurance, such as fire, theft, vandalism, or natural disasters. Litigation is required only when the parties cannot agree on the extent and cost of the damages. For contractors, this can occur when they cause damage to property via a plumbing leak, a fire, equipment, or vehicles.

Contract claims arise from a party not fulfilling contractual obligations. These can be simple or very complex. When a contractor abandons an incomplete home-improvement project, unprovoked, it is simple. When a four-year renovation of a $10 million home for a television star goes bad, it is very complex. When a general contractor has a dispute with a trade contractor based on a poorly written contract with unclear terms, it is somewhere in between.

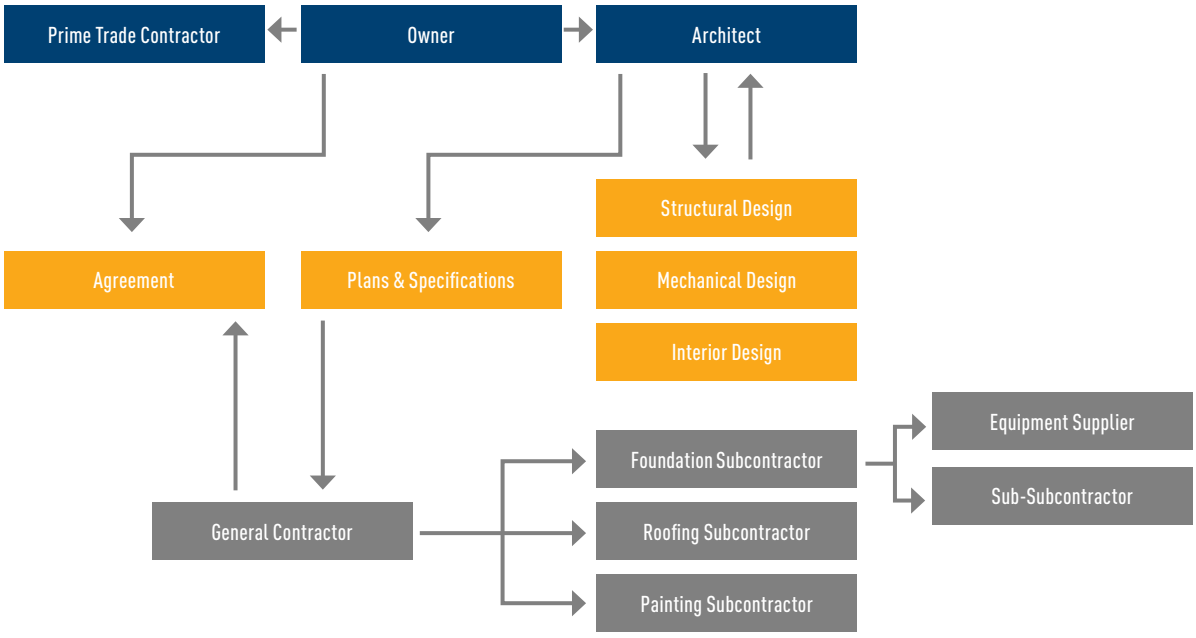
Subrogation claims are pursued by insurance companies to recover money for damages or losses caused by another party that the insurer believes is at fault. For example: If a contractor burns a house down sweating a copper pipe, the homeowner's insurance will usually pay the claim and then seek reimbursement from the contractor. On large claims with unclear origins, this is sometimes contentious litigation requiring intensive work by expert consultants.

Equitable claims involve one party suing another to prevent a future, harmful act rather than suing for money. If there is a dangerous property, one party can ask the court to make the owner fix it. Or, if someone is doing something that could damage someone else's property, the court can order them to stop. We have worked on many neighbor disputes over property lines or new construction blocking a view.

ROLES AND RESPONSIBILITIES

As with any aspect of our business, a big-picture understanding of the roles and their responsibilities during civil litigation is an

Charts by Peter D. Fowler, adapted by JLC



Example project organizational chart. When two or more players in a construction project cannot come to terms, they are likely to end up in civil litigation. Litigants will need to be clear on the roles and responsibilities of each player.

important requirement for construction professionals. Here are the basics:

A plaintiff is the person or company that initiates the lawsuit by filing a complaint against another party with the court. A plaintiff is also known as a claimant.

Attorneys represent plaintiffs, defendants, or cross-defendants. They are often referred to as "litigators" or "trial lawyers." Attorneys generally manage all phases of litigation from beginning to end.

A defendant is a person or business that a lawsuit is filed against. It is important to remember that, in civil litigation, the defendant is accused of a civil wrong, not a criminal offense. These "wrongs" usually involve a failure to carry out legal duties, such as breaches of contract, or doing something they should not have, like causing damage.

Insurance companies sell insurance policies to insureds (in our case, to contractors) that include a "duty to defend" as well as the "duty to indemnify." The duty to defend provides the insured with legal representation when they are sued, so insurers hire and pay attorneys to represent insureds. Insurers typically do not pay to pursue claims as a plaintiff. The duty to indemnify pays for any legal judgments against insureds or, more often, to settle for damages that might be the insured's responsibility. This is a complex topic far beyond the scope of this article. Suffice it to say, as soon as a claim is made or an accident happens, all parties should notify their insurance companies immediately.

Insurance professionals, namely claims handlers or "adjusters," work for insurance companies and will be assigned to figure out what happened and how much the claim is worth. Early in my career, veteran insurance pros taught me that "a closed claim is a happy claim." The common belief that these professionals are trying to pay less than the reasonable value of the claim is inconsistent with my experience. Their goal is usually to pay only what they believe the insurer owes, no more nor less.

Cross-defendant or third-party defendant is a third party being sued by a direct defendant in litigation, when the defendant believes the third party is partially or entirely responsible for the claims by the plaintiff. For example: A general contractor is sued by an owner for roof leaks. So the general contractor sues the roofing subcontractor. The roofing subcontractor is the cross- or third-party defendant (see chart, page 16).

A judge plays a different part depending on whether the trial is a jury trial or a bench trial (where a judge renders the verdict, not a jury). In both types, however, the judge is responsible for making sure everyone in the courtroom follows procedure, as sort of an all-powerful traffic cop. A judge should provide impartial, fair, and unbiased rulings throughout the case and is required to follow the law.

A jury includes between six and 12 community members selected to hear evidence and arguments during a trial. At the end of hearing evidence and arguments, they meet to deliberate and render a

FROM BAD TO WORSE: A COMMON EXAMPLE OF HOW CONSTRUCTION LITIGATION EMERGES

This is a painful example of a project type we have seen hundreds (seriously, hundreds) of times. A wealthy family wanting to build their dream home is friends with the spouse of a local custom builder. They reach out to the builder and hit it off immediately; on paper, it seems like a perfect match. They quickly reach an "agreement," and construction begins with excitement. The builder receives the first few progress payments, and the process seems to be humming along.

Then, things take a turn for the worse. It turns out the "contract price" was really a budget. Every choice the owner makes—from roofing and siding to cabinets and flooring—exceeds the budget's "allowance," causing the price to rise weekly. The honeymoon is over. The tension is palpable. The owner and builder barely speak. Adding insult to injury, the owners begin to catch mistakes. Requested changes to bathroom three have been forgotten by the builder. The wrong plumbing fixtures are installed by seemingly incompetent subcontractors. Electrical outlets are in wacky places. Concerned about the situation, the owners audit the invoices and discover discrepancies. They hope these issues stem from negligence, but their concern grows as they notice that each "mistake" benefits the builder.

Construction limps toward completion. A certificate of occupancy is finally issued. The owners move in at last, but the home took twice as long to build and ended up costing twice as much as promised. Even worse, more problems emerge. The wood doors, which the owner insisted on placing in direct sunlight despite the builder's warning that it would result in warping, have now begun to warp. The home automation system never works. Cooling bedroom two to a comfortable temperature turns bedroom four into an icy meat locker. The first rains come, and water pours into the home from the roof and windows.

The owners insist the builder immediately fix everything. As a precaution, the owners withhold final payment. The builder then stops responding to complaints, causing the owners to go ballistic and instruct their personal lawyer—who has no construction law experience—to file a lawsuit. The owner and builder are now engaged in litigation for years. *—P.F.*

decision based on the "preponderance of the evidence." This is in contrast to criminal cases, where the standard of proof is "beyond a reasonable doubt." The jury decides if defendants are "liable" or "not liable" and determines the amount of damages.

A mediator is a neutral third party, often a lawyer, who facilitates communication and negotiation between disputing parties in an effort to reach a voluntary settlement. Unlike a judge or arbitrator, a mediator does not make binding decisions or impose solutions. Mediators in building claims help parties explore possible resolutions to their conflict, often by explaining the law, exposing weaknesses in the case and strengths of opposing parties' cases, and calculating the costs of further litigation. This helps parties make a "business decision" rather than seek their version of "justice."

An arbitrator is similar to a judge in that they oversee dispute resolution, but arbitration is private, outside of a courtroom, and less formal. The parties in the claim make arguments and present evidence and the arbitrator makes judgments on liability. The decision can be legally binding or nonbinding, depending on the language of the contract or situation.

Expert witnesses have specific knowledge, education, experience, specialized training, or some combination thereof in a field beyond what a normal person would have, and they can "aid the trier of fact" (judge and jury) in understanding the technical issues. There can be multiple experts on multiple topics in a single case. For example, a simple building litigation might have experts in leak investigation, product manufacturing and installation, repair costs, and contracting standards of care. Complex cases might have dozens of experts.

LITIGATION STAGES

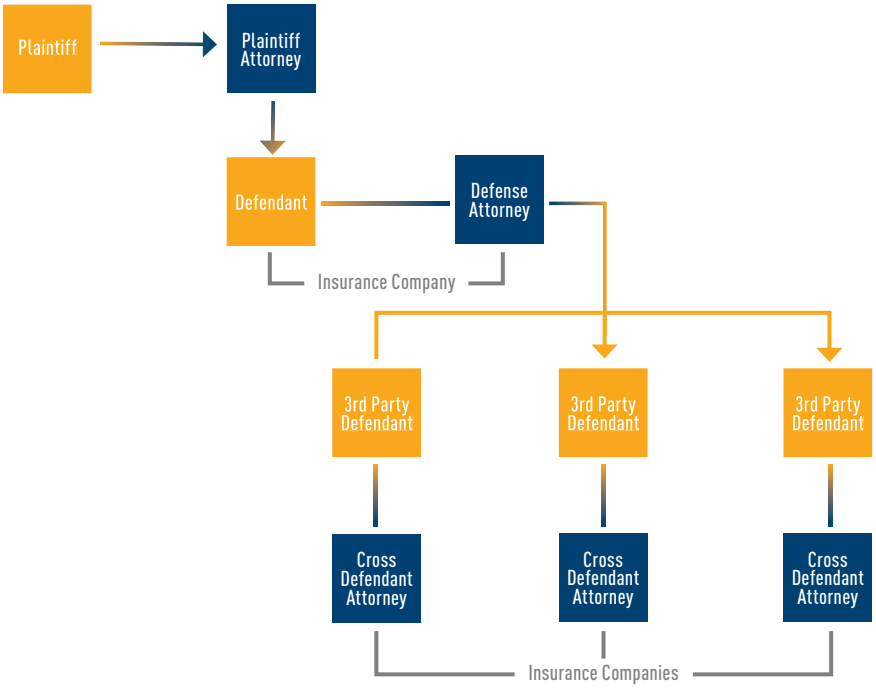
After a lawsuit is filed, civil litigation proceeds in specific stages.

Pre-filing is anything that happens before a party files a complaint to begin litigation. This is the time when the dispute arises and steps are often taken to resolve the dispute, even before lawyers are involved. Many contracts require mediation before a lawsuit can be filed.

Pleadings are the initial step of filing paperwork by each party in a lawsuit. Pleadings explain each party's side of the dispute. The plaintiff will file a "complaint" with the court and must also deliver, or serve, the defendant with a copy of their complaint. The defendant will file an "answer," which is a response to the complaint. A defendant might also file a "cross-complaint" against the plaintiff or additional cross-defendants or third-party defendants.

Discovery is a phase that involves gathering and sharing information, both from parties involved in the case and from third-party sources. Discovery can include requests for copies of documents, deposition of witnesses, and written requests for admission. This is often the longest, most complicated, and most expensive phase in the litigation process, so it is best to have a discovery plan. This should entail identifying the primary issues, determining what needs to be proven to win, deciding if the goal is alternative dispute resolution or trial, and strategizing the most time- and cost-effective path forward.

Pre-trial phase involves preparing for trial. This may include getting evidence in order, preparing witnesses for testimony, having settlement discussions, and offering motions to resolve the case or narrow the issues brought to trial. This phase is typically expensive and stressful for everyone involved.



All civil litigation has a plaintiff, plaintiff attorney, defendant, and defense attorney. Building-related claims often have many cross-defendants (commonly trade contractors and suppliers) and their attorneys, as well.

Trial is where evidence and arguments are formally presented to judge and jury. There are a lot of rules and formality. Both parties give opening statements that are a brief overview of their arguments. Witnesses give sworn testimony, and both sides present evidence, first the plaintiff, then defendants. Ultimately, the judge and/or jury will decide the outcome. It is stressful and difficult and therefore expensive. This is why only 1% or fewer civil litigation cases make it to or through trial. In 99% of cases, trial is best avoided.

Jury trials have a judge to make sure the parties follow the law and to decide what evidence and witnesses can be presented. The judge will also provide the jury with instructions about the law to guide their decision on a verdict (outcome) and the award of damages (usually money).

Bench trials have no jury; the judge is responsible for hearing the evidence and arguments, determining liability, and setting the judgment amount.

Post-trial phase usually involves the prevailing party filing a motion to request the court to order the losing party to pay their costs and fees associated with the case, including costs of the trial. These awards may or may not include attorney's fees. The post-trial phase can also involve appeal of the case. If the losing party does not agree with the court's decision, it can file an appeal to a higher court for a second look at the case. These appeals are usually granted only if the higher court finds a legal error, not because of factual evidence.

ALTERNATIVES TO LITIGATION

For good reason, most civil litigation is settled before trial. This is usually more cost-effective and time-efficient.

Settlement occurs any time plaintiffs and defendants come to terms to end a dispute before a formal verdict by judge or jury. This often happens during the discovery phase after some facts come to light that inspire the parties to settle instead of going to trial.

Mediation involves a neutral third party (mediator) working with plaintiffs and defendants to negotiate a settlement. This is a nonbinding forum. Sometimes, judges are available as mediators but, more often, lawyers with specialized mediation training are used as the neutral party. All parties, sometimes all together, present their information to the mediator but, more often, the mediator meets with each side individually. The entire process is confidential, and the discussions cannot be used in litigation or trial.

Arbitration, like mediation, involves a neutral third party (arbitrator) to resolve the dispute but is more formal than mediation. It is a form of privatized litigation intended to be faster and cheaper than civil litigation. Many contracts contain an arbitration clause requiring disputes to be resolved through binding arbitration, rather than litigation. Arbitration can be binding or nonbinding.

Pete Fowler is president of Pete Fowler Construction Consultants, with offices from California to Florida serving construction professionals throughout the U.S. Mikala Glaza serves as the company's content coordinator.

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On Site With Mel-Rol Foundation Waterproofing Membrane

BY IAN SCHWANDT

Water is the main enemy of any structure, especially here in the Midwest, where spring floods and summer storms can damage or even wash away buildings. Most residential carpenters are well-versed in flashing and other techniques that protect buildings from the force of nature that water can be. Some of the materials we use can even be considered sacrificial; roofs, siding, and windows, for instance, can all be repaired or replaced when they become damaged and no longer provide bulk-water protection. Because all of these components exist above ground, it's easy to see failures and execute repairs. However, water is a completely different enemy below ground.

My personal home and a new home that my company, TDS Custom Construction, is currently building are on sloping lots, and a significant portion of the living space is in the basement. In both cases, cost and design goals were major drivers in this decision. Two bedrooms with en suite baths occupy 75% of the basement space of my home, while one bedroom with an en suite bath and a large multipurpose room occupy 60% of the basement of the new TDS home project. Both homes are located on clay-soil sites near wetland areas and built using super-insulated assemblies—R40+ for walls and R70+ for the roofs—to a sub-1.0 ACH50 air-tightness standard. These performance standards and the low heating and cooling loads they require coupled with the below-grade living space put extra emphasis on waterproofing, as the HVAC equipment wouldn't run frequently enough to help control humidity and aid in the drying out of the foundation.

WATERPROOFING MEMBRANE

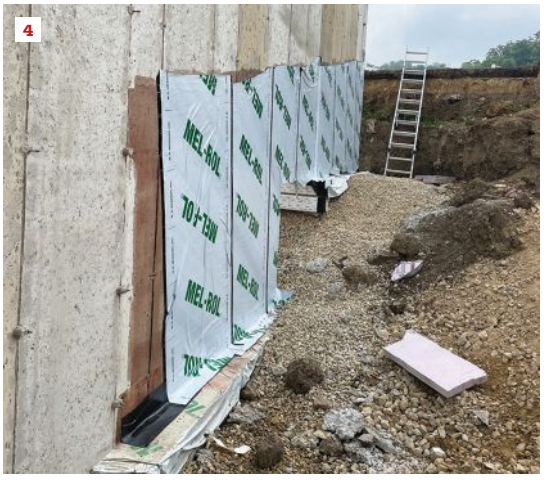
In my area, most foundations receive the old-school asphalt-based spray method of "waterproofing," but I needed a more robust solution for my home and went searching for other options. I settled on a belt-and-suspenders approach: using a foundation wall coating along with a drainage mat that would separate the coating from the stone used to backfill the foundation wall. I decided to also use the wall coating on the faces of the foundation footing to act as a capillary break at the wall/footing joint to keep moisture from wicking up through the footing into the poured concrete wall. After researching various coatings available from major and niche manufacturers, I decided on the Mel-Rol system from W.R. Meadows because of its local availability through a concrete specialty supplier, its price, and its carpenter-friendly installation methods that did not require the purchase of any specialty tools.

Mel-Rol is a flexible, bituminous, 60-mil roll-type waterproofing membrane composed of two components laminated together: a 56-mil layer of polymeric waterproofing membrane on a 4-mil-thick, cross-laminated polyethylene carrier film. It comes in 38 1/2-inch-wide by 62 1/2-foot-long rolls marked for 2 1/2-inch overlaps, and is available in versions for air and surface temperatures from 20°F to 60°F and for air and surface temperatures down to 0°F.

The membrane is adhered to concrete using Mel-Prime adhesive, which comes in solvent- and water-based versions. I typically use the solvent-based adhesive, as it is commonly available locally. The Mel-Rol system also includes accessory tapes, mastics, and sealants

After rolling Mel-Prime adhesive on the footings, the author's crew wrapped them with Mel-Rol waterproofing membrane **(1)**. Applied prior to forming and pouring the foundation walls, the membrane provides a capillary break that blocks moisture in damp soil from migrating up through the footings and into the concrete foundation. Once the walls were poured, the crew prepped the corners and wall-to-footing joints with more primer, then applied 9-inch-wide Mel-Rol detail tape to seal these tricky intersections **(2)**.

Photos: 1–8, Alex Bartlett/TDS Construction; 9, 10, Ian Schwandt



After taping corners and footing-to-wall joints **(3)**, the crew applied sections of membrane vertically to the primed foundation walls **(4)**. The membrane terminates 12 inches below finish grade **(5)**.

that are available when called for in the specification. After the Mel-Rol membrane is applied to a foundation wall, it is covered with a drainage mat to allow water to drain down to the footings without obstruction. In one application, I used CertainTeed Platon drainage mat, and in another, we used W.R. Meadows Mel-Drain, a drainage mat covered in geotextile filter fabric.

INSTALLATION

My crew and I found the installation of the system to be straightforward and within our capabilities. One unexpected challenge did arise: Alex Bartlett, the lead carpenter on our new build at TDS, pointed out that the products—with their boxes, backings, and other packaging materials—produced a large volume of jobsite trash before we had fully mobilized and set up dumpsters.

Footings. The Mel-Prime specifications call for the concrete foundation to cure for 72 hours and all large voids to be filled prior to the install. From a scheduling perspective, this can be challenging when you are also using the Mel-Rol membrane as a capillary break between the footings and walls, as we were. The install sequence that we followed started with the Mel-Rol wrapping all three faces of the footing to create the capillary break.

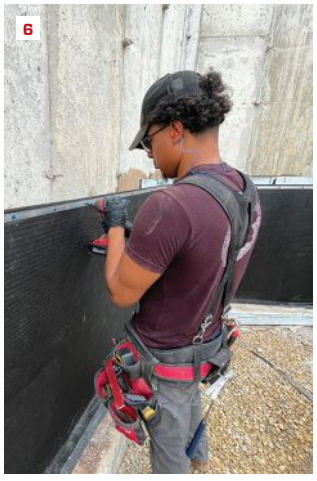
The manufacturer's instructions call for filling any voids in the surface of the concrete, but we had no issue with the Mel-Rol adhering to the mag trowel finish on the footings. We wore 3M respirators with magenta cartridges while we applied the Mel-Primer using a foam paint roller and pan. To simplify the Mel-Rol install, we cut the membrane into shorter strips that fit between the rebar uprights installed by the concrete crew. By the time we finished cutting the strips, the Mel-Prime was tack-free and ready for the membrane. Provided that it is tack-free and clean of dirt and dust, Mel-Prime has a strong initial grip to Mel-Rol, making it almost impossible to remove the membrane once they come in contact. Working with such a strong adhesive around the rebar and at dirt level made the footing install more difficult than the wall install that followed.

Walls. After the concrete walls were stripped, we snapped lines for the planned grade heights less 12 inches to denote where we would terminate the waterproofing to keep it below grade and eliminate the need for a protection board. It's worth noting that for both houses, we installed all the foundation insulation—2 inches of XPS rigid foam on my house build and 3 inches of spray foam on the TDS build—on the interior side of the wall to allow the waterproofing system to interact directly with the ground. Next, we precut sections of Mel-Rol to length so we could roll them out onto the primed walls once the rubber-cement-like adhesive was no longer tacky to the touch.

Mel-Rol membrane can be installed vertically or horizontally and either overlapped onto the footing face or connected to the footing with detail strip tape. This 9-inch-wide tape is similar to Vycor and other flashing tape and can be used for inside and outside corners if you find it easier than installing the Mel-Rol through the corners. At the intersection of the house and garage foundations, we chose to lap the waterproofing 3 feet onto the garage foundation walls but otherwise treated the garage as if it were outside the waterproofed envelope, as a means of saving labor and material costs.

With careful layout and installation of the detail strip tape, you can easily install the Mel-Rol from the top down or bottom up, though with the tenacious initial bond of the Mel-Prime, you have only one shot to get it right once you pull the backing from the Mel-Rol and commit to the install. This makes the ability to execute the install top down, bottom up, horizontal, or vertical an important personal preference that needs to be thought through prior to starting.

We then rolled the membrane using Zip System rollers, as they were the tools



Above, a worker fastens one of the aluminum termination bars that hold the Mel-Drain drainage mat in place until the foundation is backfilled **(6, 7)**. Installed over Mel-Rol membrane, the drainage mat provides an escape route down to the footings for water that pools against the foundation wall **(8)**. On his own project, the author used CertainTeed Platon drainage mat over Mel-Rol membrane **(9)**. To ensure good drainage, he laid down geotextile fabric and a layer of clean stone **(10)** before installing a perforated PVC perimeter drain, which will be covered in more stone and wrapped with fabric.

at hand. The Mel-Rol did have some air bubbles that became stuck but, with the thickness of the membrane and the subsequent Mel-Drain creating a belt-and-suspenders system, we felt comfortable not over-focusing time and effort into pushing all the bubbles out.

DRAINAGE MAT

After completing the Mel-Rol membrane installation, we installed Mel-Drain drainage mat in a similar fashion. Mastic or Mel-Prime can be used to adhere the solid top strip of Mel-Drain to a Mel-Rol-covered wall. We used a bead of mastic to eliminate the wait time for the Mel-Prime to become tack-free. We typically select the roll width of the drainage mat to match the foundation height, which makes Mel-Drain and other drainage mats simple to install horizontally. At any fabric overlaps on the Mel-Drain or wall penetrations, we use Detail Strip tape or off-the-shelf spray adhesive to seal the geotextile and protect it during backfill.

Along the top edge of the drainage mat, we installed aluminum termination bars using concrete screws to hold the bars in place. In practice, placing the fasteners no more than 6 to 8 inches on-center is required to keep the drainage mat in place during backfill.

After the drainage mat is installed, you can install your drain tile of choice. On my house, I used perforated PVC drain tile, which I buried in 24 inches of clear stone that I covered with geotextile fabric before completing backfill. On the TDS new build, Alex sourced a drain tile that was wrapped in a geotextile sock.

After two years living in my house and sleeping in my basement bedroom, I have experienced none of the moisture or dampness problems that plague most basements in my area, and my sump pump crock has remained dry. In areas of the country where basements are common, they are frequently turned into habitable spaces and, in many new builds, they are designed to be habitable space as a way of maximizing value. By taking a few extra steps using a waterproofing system that is already compatible with your crew's skill set, you can ensure that habitable spaces you create below grade are just as comfortable as the ones above grade.

Ian Schwandt is production manager for TDS Custom Construction in Madison, Wis.

Portable shop. On large trim jobs, the author rolls out tool cases that double as a miter saw stand—a shorter case **(1, center)** for the saw and taller cases that function as material supports. The cases organize tools by category: pneumatic tools like air guns and a compressor **(1, at left)**; cordless tools and chargers **(1, at right)**; and corded tools in a case with an attached outlet hub **(2)**. Angled tool holders in each case make tools easy to grab but secure for transport **(3)**.

Efficient Tool Organization

BY BRIAN CAMPBELL

In the past decade, tool companies including DeWalt, Festool, Makita, Milwaukee, Ridgid, and others have introduced stackable tool-storage systems that are now found on many a jobsite. I own a number of these, but I've become wary of their limitations. Commercially made systems work well for moving tools and fasteners on and off the jobsite, and they can be convenient storage solutions in a truck or shop. But on the job, they need to be spread out for what's inside each one to be accessible, and I end up stooping or kneeling much more than I want to in order to get to the contents of the boxes.

Perhaps the biggest drawback to these commercially made systems is that it's in the manufacturer's best interest to sell you as many of them as possible, and they often include blow-molded plastic inserts that waste an enormous amount of space in each box. I love most of my Festool tools, but I don't want to carry an entire Systainer just for one screw gun and then a separate Systainer for an impact driver. These are not fragile tools, and it often makes more sense to ditch the inserts and pack several similar tools and their accessories in the same box.

PORTABLE SHOP

The rolling cases shown in the photos at left and on the opposite page mark the beginning of my quest to make more efficient use of toolbox systems. It started with a rolling cart I made to support my miter saw—the center of my on-site shop setup for interior trim jobs. I then developed three other rolling carts that were tall enough to also function as supports for long material on either side of the saw cart. I organized each cart around particular tool types—cordless tools, pneumatic tools, and common corded tools—and included

Photos: Brian Campbell

The reality of stackable tool boxes is that they need to be spread around the jobsite for the contents to be accessible **(4)**. The author uses plenty of them but transports and stores them in rolling cases that allow him to access individual boxes. The modular design of his cases allows any one case to accept any of the brand-name storage systems he owns **(5)**. He often discards the blow-molded inserts included in brand-name toolboxes, as these tend to make inefficient use of the space inside the box. Foam inserts **(6, 7)** are a nice way to organize tools and keep them secure in a toolbox, but they take up more space than tool rolls (see page 25).

the necessary accessories for each: batteries and chargers on the cordless-tool cart; compressor, hoses, and fasteners on the pneumatic cart; and an outlet hub and extension cords, as well as blades and bits, on the corded tool cart.

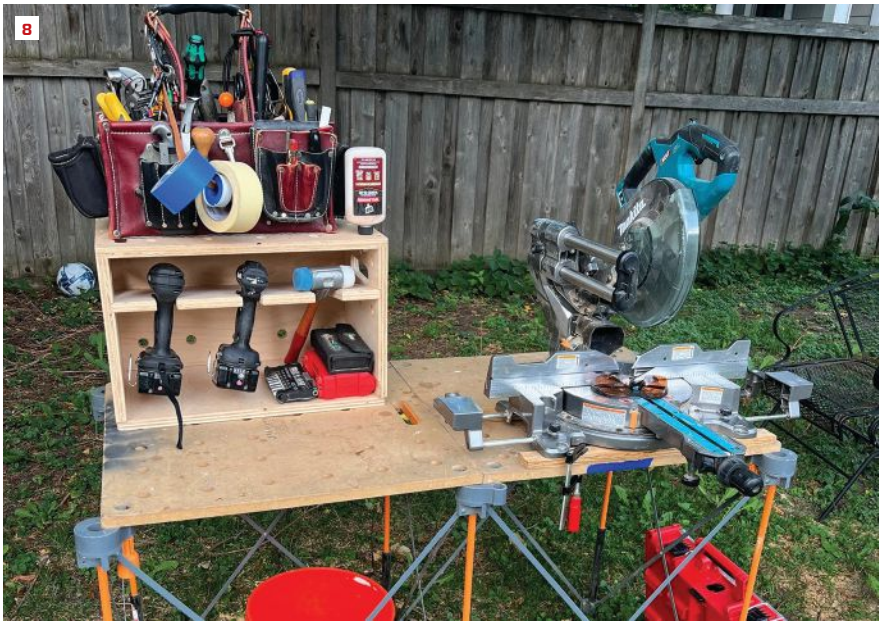
I designed each cart to accommodate the various brand-name toolboxes I owned so I could get at the contents easily by sliding the containers in and out of shelves rather than locking them all together. To minimize wasted space around the boxes, I built carts of different widths, but the sides all have the same shelf increments, which I made by cutting evenly spaced dadoes using the table-saw sled described in my last *JLC* article, "Indexing Jigs for Repetitious Carpentry Tasks" (Sep/Oct/23). After the first dado is cut, I set that dado over the cleat on the sled to produce subsequent dadoes on 3-inch centers for the shelves. I landed on that increment after experimenting with Tanos/Festool and Makita boxes and the Ridgid and Milwaukee small-parts organizers I had. It allows me to vary the shelf spacing to accommodate any of these boxes with minimal wasted space above them.

ORGANIZATIONAL PRINCIPLES

Tool organization systems are not just for transporting and storing tools. If well designed, they have the potential to make me a more efficient carpenter. The following are some of the tenets that I have leaned on when developing tool organization systems to increase my efficiency:

Visible and accessible. Most commonly used tools are best stored where they can be seen and within arm's reach. It's preferable to just reach out and grab the tool you need without opening a box, bag, door, or drawer to get it, and especially without needing to unstack boxes.

Categorized by task. I frequently do the same types of jobs—hang doors, install cabinets, run trim, patch-in drywall, and so forth—so it's useful to have tool collections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10


11

Lightweight workbench. For smaller jobs, the author sets up a simple workstation built on a Centipede CK6S stand **(8)**, which is easy to set up and break down and light to transport. Often for these smaller jobs, he brings what he needs from the truck in an Occidental carpenter case **(9)**. He often carries a portable cordless case **(10)**, similar to his larger rolling case. It is sized to fit on the Milwaukee Packout system, and doubles as a step stool and task oriented workstand **(11)**.

ready to go for specific job tasks. For example, I have a carrying case that doubles as a step stool and allows me to use the top as a mini-workbench for hanging doors. Remodelers who frequently self-perform electrical and plumbing or do tile work and so forth benefit from having setups of the tools they most commonly use for each of those job types, so they can just grab the setup from the truck or the shop and go to work.

Categorized by type. I find it often makes sense to organize tools by type. This is the design principle for the rolling cases, described above, that I set up for cordless tools, for pneumatic fasteners, and for common corded tools, each with the appropriate companion tools and accessories.

Flexible. I am called to do all kinds of jobs. It makes sense to bring in my rolling cases for a major trim job that lasts a week or more, but they're more than I need for small jobs and pick-up work that might take me a couple of hours or less. Smaller jobs call for the lightweight workstation shown above, which I can set up and take down quickly at the beginning and end of each day.

To remain flexible, it's important to have some "empty capacity." I keep a few empty tool bags, totes, or buckets on hand so I can pull together a basic setup for a given task

by tossing in the specific tools and supplies needed for it.

I also like tool organizers that can do double-duty as a work surface. Toward this end, the tops of my rolling carts are drilled out for bench dogs and cutouts that I can use for clamping or mounting a router for a ready-made router table. My smaller tool totes may be heavier than a plastic box, but they serve well as step stools, which often saves me an extra trip to the truck for a stepladder.

Don't carry air. Don't hesitate to ditch or modify the blow-modeled inserts that come with toolboxes for specific new tools. Think small, tight packages that can be grabbed out of a drawer or toolbox. Tool rolls, one of the simplest and oldest ways to organize tools, fit the bill perfectly for many hand tools. I like how they fit compactly into a drawer and can be grabbed easily and laid out where I'm working to provide ready, organized access.

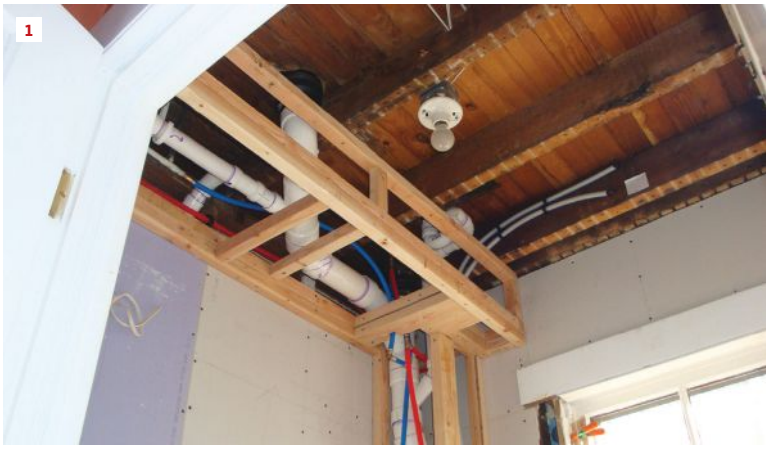
Vehicle compatible. When designing my rolling storage system, I made sure it fit efficiently in my step van, so I can maximize my use of space there as well as on the jobsite. Many commercially made trailer, truck, or van storage systems waste space and limit your flexibility.

Fastener friendly. Some of the commercially available fastener storage systems with clear plastic lids and segmented compartments are great for organizing fasteners, but they work better in a shelf unit that allows for quick access.

For most jobs, I lean on what I call my "80% parachute bag." This contains the fasteners I use about 80% of the time: 2 1/2- and 3-inch GRK general-purpose wood screws; 2 1/2- and 3-inch GRK trim-head screws; 1 1/4-inch Kreg pocket-hole screws, and 2 1/2-inch cabinet screws. Each kind of screw has a color-coded bit in a bit holder that's the same color, hanging with the related screws. The purpose here is to travel light and save trips to the truck. I do have a far more varied and extensive selection of screws on the truck, if I need them.

Brian Campbell is a finish carpenter in the Twin Cities of Minnesota. Join him at JLC Live, March 21–23, 2024.

Grab and go. Tool rolls, such as the author's chisel roll **(12)** and Japanese pull-saw set **(13)**, are useful for grouping and carrying a set of tools, and they store efficiently in the drawers of a tool storage system. The author keeps some "empty capacity" in his truck. One example is an empty Makita tote he has filled with a selection of what he needs for the task at hand **(14)**. For most jobs, the author leans on his "80% parachute bag" **(15)** with the fasteners he uses 80% of the time: 2 1/2- and 3-inch GRK general purpose wood screws, 2 1/2- and 3-inch GRK trim-head screws, 1 1/4-inch Kreg pocket-hole screws, and 2 1/2-inch cabinet screws. Each kind of screw has a color-coded bit in a bit holder of the same color.



To minimize potential water-leak damage and simplify future projects, the author designs for access whenever possible **(1, 2)**. All the mechanicals that service a remodeled second-story bathroom can be reached from a first-floor half-bath by pushing up on a ceiling tile or by pulling back on the soffit board, which rests on trim attached to the wall and is held in place with removable screws along the outside edge **(3)**.

Hidden Bathroom Access Panels

BY TOM O'BRIEN

I hate it when I have to smash through a finished surface in order to deal with a leaky pipe or some other mechanical issue. Whenever it's in my power to install an access panel in a place where such an occurrence is possible, I do so. In most cases, a manufactured panel, drop ceiling, or simple sheet of plywood fits the bill. But when the affected wall or ceiling happens to be in a highly visible location (and the budget permits), I prefer to disguise the means of access. A recent bathroom remodel on the second story of a Victorian-era home provided just such an opportunity.

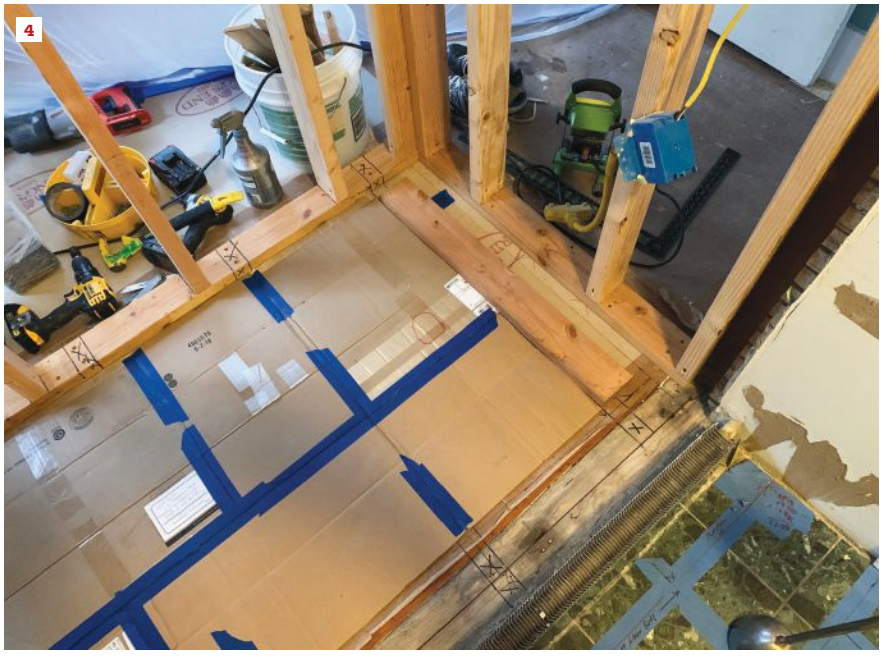
Slide-out soffit. Before the plumbers could rough-in for new fixtures, I first had to remove the plaster ceiling of the half-bath directly underneath the upstairs bath. After the plumbers and the electrician had finished up their work and moved on, I framed a soffit to enclose the drains and began work on the cover-up **(1)**.

Instead of using drywall, I wrapped the soffit with 1/4-inch AC plywood. The face board is securely fastened with finish nails. The bottom panel, however, rests on a narrow ribbon of trim at the wall-to-ceiling joint on all sides except for the front edge, which is held up by five evenly-spaced countersunk screws; when someone needs access, they can simply back out the screws and slide the plywood out like a drawer.

Paneled ceiling. Had all of the fixtures for the upstairs bathroom been lined up along the same wall, the removable soffit panel would have provided enough access from below. But this project featured a tub/shower on the other side of the room and a radiator along the back wall. So I crafted a wooden version of a suspended ceiling using 6/4 pine for the perimeter and 3/4-inch furring strips to fashion a six-panel grid **(2)**.

The two panels in the center are actually a single sheet of 1/2-inch AC plywood, which provides rigidity for the ceiling and support for the light fixture. That sheet is solidly fixed in place: It's fastened to the grid with screws driven from above and supported by tie wire connected to the joists. The remaining panels are 1/4-inch AC plywood, cut

Photos by Tom O'Brien

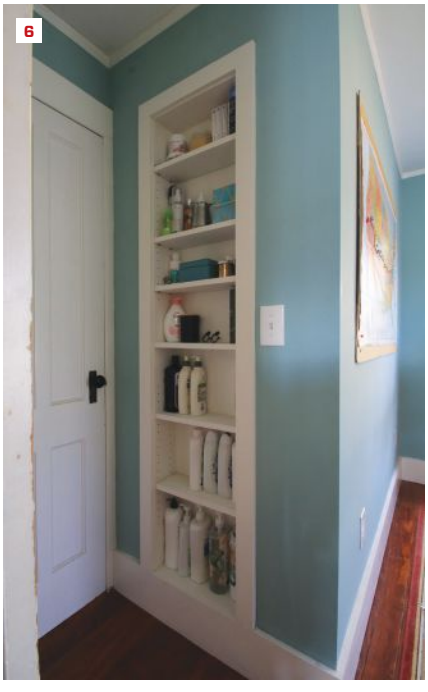


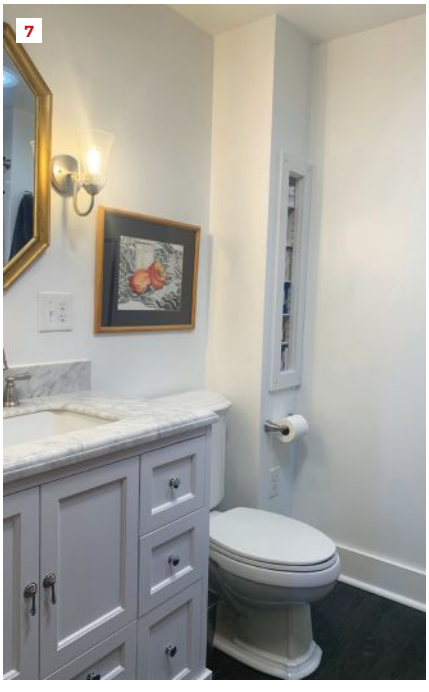
to overlap the grid about 1/2 inch on all sides, and reliant on gravity to stay in place **(3)**.

Built-in shelves. The footprint for the new main bedroom created a 6-foot-wide alcove for the bathtub. After some discussion, the owners decided to downsize the tub to 5 feet and use the space between the wet wall and bathroom wall **(4)** to recess a built-in shelf unit **(5)**. This modification fulfilled their wish for storage and enabled me to hide another access panel **(6)**. If the tub's plumbing ever needs service, the plumber can simply take away the adjustable shelves on the bottom half of the unit, back out five screws, and pull out the plywood that serves as the back panel for the bottom half of the bookshelf.

While I was in shelf-building mode, I noticed how easily the electrician was able to use the box I'd framed around the soil stack as a chase for his new circuits. To keep that option open for future projects, I made a simple, recessed medicine cabinet to fit between the studs **(7)**. It's fastened to the framing with four flat-head screws driven through the casing, so it will be easy to pull out if the need arises.

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





Downsizing the tub unit from 6 feet to 5 feet created room for a double wet wall, as indicated by the extra sole plate in the alcove rough framing **(4)**. This double wall construction makes space available to recess a built-in shelf unit into the outside wall and easily access the plumbing if necessary **(5, 6)**. Should an electrician need to run a new circuit from basement to attic, access to the chase can be had by backing out four screws and removing the narrow medicine cabinet at right **(7)**.

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ONE & DONE

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clean large loads in about 2 hours*

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Discover the **ULTRA FAST COMBO.**

*Based on completing the Normal Wash + Dry cycle with Eco Dry using a 10-lb. DOE or Mixed Load in about 2 hours. See Use & Care Manual for details.

BY TIM FALLER

How to Accurately Price Change Orders

There are a lot of reasons we lose money in this business: estimating poorly, starting projects with incomplete plans and specs, writing insufficient contracts, and improperly managing change orders, to name a few. Sometimes, the reason is obvious, like when we make an estimating error because we didn't have time to put together a proper estimate and missed some critical information. Or we rushed into production with a vague scope of work and everything was an allowance. I've been in the remodeling business since the early 1980s and a consultant-trainer since 2000. Over that time, what I've gathered from personal experience and from the remodeling companies I've advised is the main problem tends to lie with change orders.

There are many ways things can go wrong with change orders: They don't get written up because the change is deemed too small, or the field staff assumes the work is included in the job scope; they take too long to process and a protracted delay can convince the client that the extra work is part of the original contract, so they won't pay for the change; they are inaccurately priced (more on this below); they are not clearly explained in the initial stages of the project and clients don't understand the contract language on how the change-order process works; and they sometimes don't account for disturbance days that inevitably delay a project's overall schedule. (See "Getting Change Orders Right" (Jul/19) for more information how to manage change orders and disturbance days.)

In this article, I focus on how to help prevent inaccurately priced change orders from becoming financial drains to your business. Because if you don't track them in terms of profit and loss, there's a good chance that your losses are occurring somewhere in the change order process. And that slippage can be incremental as you go through a project; you lose a little bit here, a little bit there, and then, boom, by the time you get to the end, you've lost a fair amount.

PRICING CHANGE ORDERS ACCURATELY

When we look at what it costs for a change order to take place, odds are we probably miss important items that should be included. So, you must be careful and take the time to think about everything that's going to be affected by the change and add to your costs.

For example, you're working on a house addition, and your clients come home from work and say, "Hey, we don't think this window is big enough; could you change it? And while you're at it, could you move it over a foot?" At this point in the project, all the framing has been completed and the exterior walls have been sheathed, but no interior work has been done yet. The electrical, plumbing, and HVAC rough-ins haven't been started either. So, what items should be in this change order?

First, you need to account for labor, materials, and any equipment costs related to the demo and reframing of the wall. You need a cost for the new, larger window plus the labor to install it. What about your trade partners? Is there going to be any shift in the electrical? Maybe the receptacle and lighting layout needs to change. What about the plumbing or HVAC? Where is the 98% efficient furnace going to vent now? Does it need to be moved 3 feet over to be far enough away from the new window location?

How about the exterior trim? You need to add 3 feet of trim because your original estimate included only enough to trim out the smaller window. Dump fees? It's not a lot of trash, but nevertheless, you're going to have to get rid of it. Lumberyard runs? I'd put in some money to cover the time it takes to pick up materials.

Last, what about the time that it took to talk to the clients, then figure out the change order estimate? We often don't charge for this, and it is money that we're giving away. Also, if a project manager or lead carpenter is compiling the estimate, it takes them away from other work they're supposed to be doing to create profit for the company. This is lost time, and it might be quite expensive depending on who is writing up the change order.

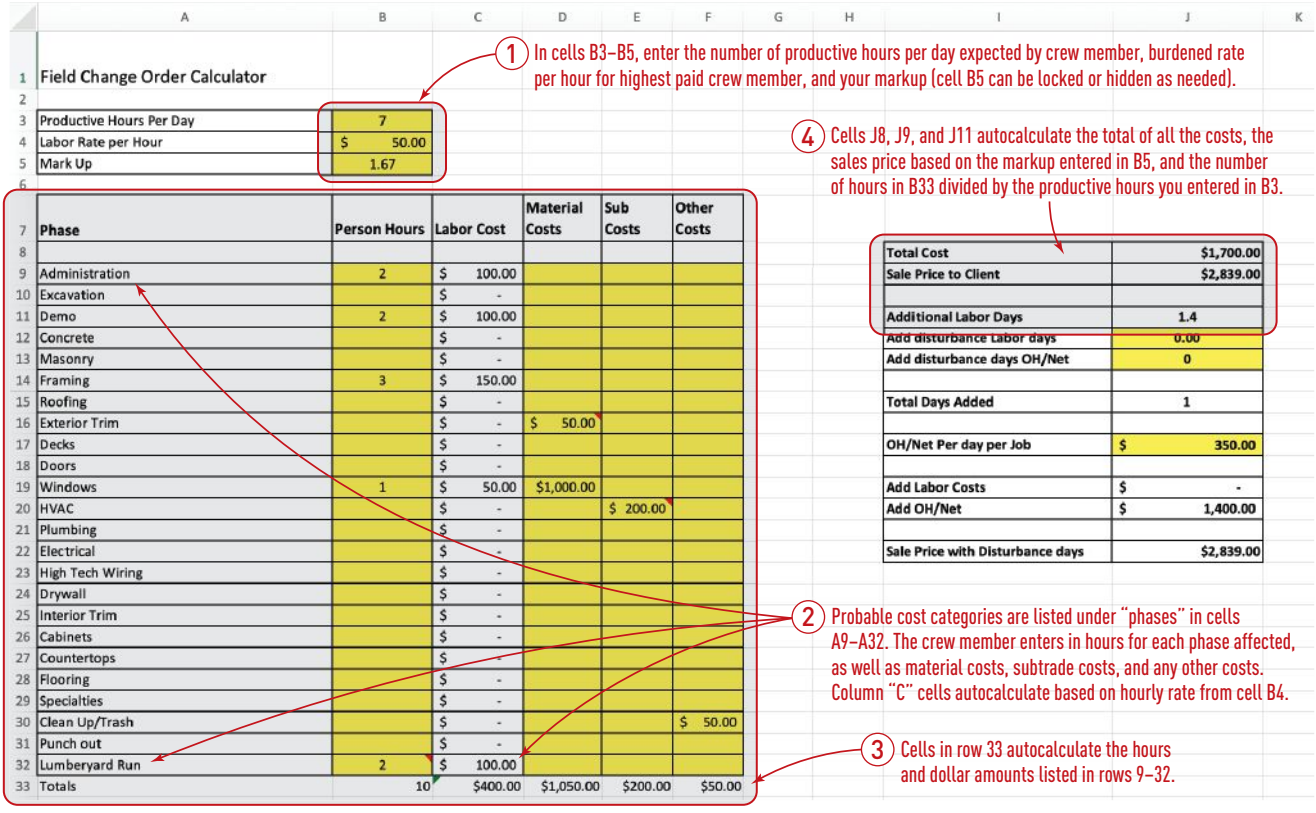
Field change order calculator. To help manage the costs of a change order, I use a spreadsheet tool I developed in Excel; you can download it by scanning the QR code on page 31 with a smartphone camera app. It's easy to use: You simply fill in the pertinent time and cost information about the change in the yellow highlighted cells. The app autocalculates in the clear cells, then arrives at a change-order sale price to present to the client (see Field Change Order Calculator, page 30).

Following through with the window example mentioned above, in cells at the top left of the spreadsheet, you'd fill in the number of productive hours per day expected by crew member (in this case, seven hours), your burdened rate per hour for highest paid crew member ($50), and your markup (1.67%).

Below these items, under the term "phases," I list all the cost categories and project tasks that I would have in an estimate. The idea is to prompt the employee completing the form to think about all the possible implications of the change when reviewing the list. Is there any excavation? No. Any demo? Yes. Any concrete? No—etc.

For administration time, I entered two person hours, which automatically calculates two times the $50 labor rate to $100. I input two hours for the demo work ($100), three hours to reframe the wall ($150),

Field Change Order Calculator



To help accurately price change orders, the author created an Excel spreadsheet tool that can be downloaded by scanning the QR code on page 31. The Field Change Order Calculator reflects the window example noted on page 29, in which the clients requested the window to be larger and in a new location. Labor, materials, and tools related to the demo and reframing of the wall must be accounted for, as well as the costs for the new window and moving the furnace vent location. Other costs include exterior trim, dump fees, time for a lumberyard run, and administration time to estimate the change order.

$1,000 for the new, larger window plus one hour to install it ($50), and $50 for the exterior trim. To move the furnace vent 3 feet from the relocated window, I entered $200 for the HVAC sub, $50 for trash dump fees, and two hours for a lumberyard run ($100). The cells in the last row of the phases section autocalculate the hours and dollar amounts of the filled-in cost categories and project tasks.

The total cost ($1,700), sales price to client based on the markup ($2,839), and the additional labor days (the total person hours divided by the productive hours per day; in this case, 1.4 days) are autocalculated at the top right of the spreadsheet.

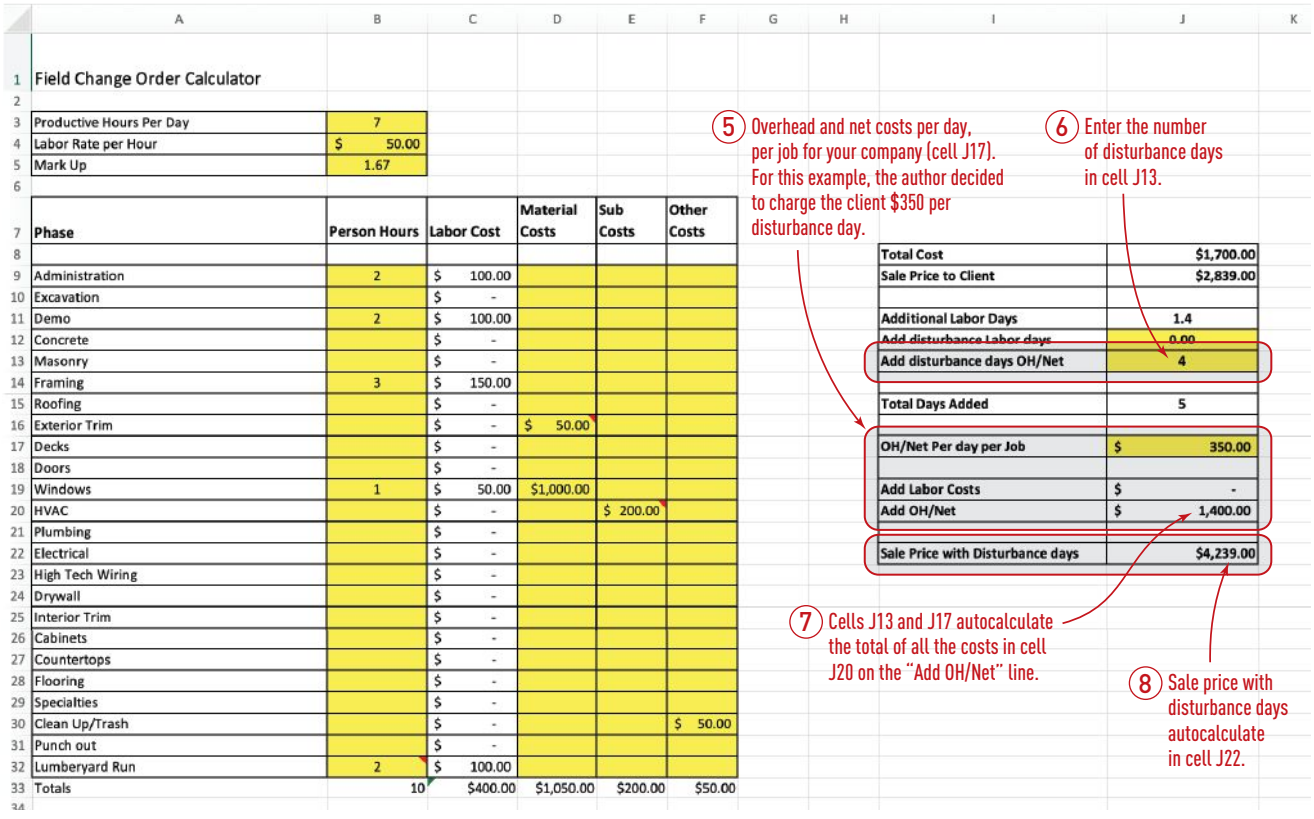
Disturbance days. A disturbance day is simply any day added to the overall schedule that's not accounted for in overhead and net for additional labor as a result of a change order. Typically, if you have two days of labor, you charge for overhead and net for those two days associated with the labor. But if the scope of the change order pushes the job out, say, two days overall, who's paying for those extra days in terms of overhead and net? If you're being held up from finishing the job, how you can you start another? It's called lost-opportunity cost, and you're losing money on this unless it's accounted for in the change order. (See the Field Change Order Calculator with Disturbance Days, opposite page.)

For this example, I've decided to charge the client $350 per disturbance day, which I input in the "overhead and net costs per day, per job" line below the total cost, sales price, and additional labor days. This amount may be on the low side (a company I advise charges $1,275 a day, per job), so you'll need to do the math to figure out what that cost is for your company. You must get compensated for those additional days because a client-generated change can impact your ability to start on future work.

Four disturbance days were added because the change required rescheduling the HVAC sub to move the furnace vent location. The change pushed the job out another four days on the overall

Image by Tim Faller, adapted by JLC

Field Change Order Calculator (with Disturbance Days)



Field Change Order Calculator

Productive Hours Per Day	7
Labor Rate per Hour	$ 50.00
Mark Up	1.67

Phase	Person Hours	Labor Cost	Material Costs	Sub Costs	Other Costs
Administration	2	$ 100.00			
Excavation		$ -			
Demo	2	$ 100.00			
Concrete		$ -			
Masonry		$ -			
Framing	3	$ 150.00			
Roofing		$ -			
Exterior Trim		$ -	$ 50.00		
Decks		$ -			
Doors		$ -			
Windows	1	$ 50.00	$1,000.00		
HVAC		$ -		$ 200.00	
Plumbing		$ -			
Electrical		$ -			
High Tech Wiring		$ -			
Drywall		$ -			
Interior Trim		$ -			
Cabinets		$ -			
Countertops		$ -			
Flooring		$ -			
Specialties		$ -			
Clean Up/Trash		$ -			$ 50.00
Punch out		$ -			
Lumberyard Run	2	$ 100.00			
Totals	10	$400.00	$1,050.00	$200.00	$50.00

5 Overhead and net costs per day, per job for your company (cell J17). For this example, the author decided to charge the client $350 per disturbance day.

6 Enter the number of disturbance days in cell J13.

Total Cost	$1,700.00
Sale Price to Client	$2,839.00
Additional Labor Days	1.4
Add disturbance Labor days	0.00
Add disturbance days OH/Net	4
Total Days Added	5
OH/Net Per day per Job	$ 350.00
Add Labor Costs	$ -
Add OH/Net	$ 1,400.00
Sale Price with Disturbance days	$4,239.00

7 Cells J13 and J17 autocalculate the total of all the costs in cell J20 on the "Add OH/Net" line.

8 Sale price with disturbance days autocalculate in cell J22.

Following through with the window example, the user can account for any disturbance days on the change order, if applicable. Disturbance days are delays to the project on the overall schedule that are not accounted for in overhead and net for additional labor as a result of a change order. On the right-hand side of the spreadsheet, four disturbance days were added because the change required rescheduling the HVAC sub to move the furnace vent location. The change pushed the job out another four days on the overall schedule, which increased the change order sale price.

schedule, which increased the change-order sale price of $2,839 by the "Add OH/Net" amount of $1,400, to $4,239.

When it comes to change orders, we're charging the client for more than just nuts-and-bolts items like the wood and labor. It's incumbent on us to take the time to think about every cost that should be included.

Change orders always cost you something. I think change orders are hard to estimate because they are out of sequence and don't usually fit into the normal chain of events of a project. They can be moneymakers, or they can be money losers, and they generally take longer to create than you think they will. So, when estimating them, if you think it's a three-hour change order, I'd estimate it as five hours, or if you think it's a four-hour change order, put six hours in there.

Also, they always cost you something. And it doesn't matter if it's a no-charge to the client. Any time someone stops to talk about a change order or think about a change order, it costs you money. Some companies I advise charge a fee for any change order that's generated during a project. I don't think that's a bad thing as long as you're comfortable with it. My preference is to do additional work upfront to make sure the clients are willing to spend the money.

Change orders always seem like they're too much money. Again, you must try to think of everything, assume that you missed

Scan QR code above with camera app to download the Field Change Order Calculator spreadsheet tool.

Image by Tim Faller, adapted by JLC

something, and double-check your estimate. You must also realize that change orders always seem like they're going to be too much money. Always.

As an example, a client asks you if you can add another interior door—let's assume the interior doors are Masonite solid-core, six-panel doors with trim. In the original estimate, each interior included everything to install it; the door, trim, labor to install, painting, hardware, the doorstop, etc. That door may have cost $1,500 in the original estimate.

When you come back with an isolated amount of $1,800 to add the interior door, the clients are going to say, "I saw this door at Home Depot for $200. There's no way it could cost that much!" It's going to always feel like, "Wow! This is way too much money both for us and for them." So, you must be ready for that reaction, and whoever is presenting the change order to the client needs to be aware of this and explain what it takes to install a new door from your company's perspective.

Also, remember that what you think may be a no-cost change order always costs you something and will likely result in down-the-road costs that you may not be including.

Here's an example: You're doing an addition with a small powder room. The clients visit a friend's house that has a little powder room, and they start to think, "Oh no, our new powder room is going to be too small." At this point, the interior framing hasn't been done yet, and the clients meet the lead carpenter and ask, "Can we make this powder room just 6 inches bigger?" You know nothing's been done, so you say, "sure no problem." But if you move a wall over 6 inches, what have you impacted? The plumbing? The floor finishes? Say there's imported Italian tile in the bathroom. You now need another 6 square feet of tile—where is it coming from? How much does it cost? Maybe it's in the order already, but you should still get paid for it, right? So, just be thinking about down-the-road costs as you're doing change orders.

Tim Faller is a senior consultant and the "Master of Production" for Remodelers Advantage. For the past 17 years, he has worked with hundreds of remodeling companies, large and small, to help improve profits by creating smooth, efficient production systems. Listen to his podcast, "The Tim Faller Show" at TheTimFallerShow.com. Join him at JLC Live, March 21–23, 2024.

Health Insurance Basics

BY ROB CORBO

Despite all our efforts to create safe, healthy jobsites, accidents do occur and people do get sick. If you want a career in construction, or you're thinking about starting your own construction company as a sole proprietor or with a small crew, you have to think about health insurance.

If you're young and single, you might skip health insurance altogether and charge full steam ahead into your own business. If you're married and have children, you may decide not to start your own business at all. If your spouse works and receives health insurance from his or her employer, you've hit the lottery. *Forbes* reported in May 2023 that the average monthly premium for a family in the Affordable Care Act Marketplace ranges between $928 for a bronze plan, $1,217 for a silver plan, and $1,336 for a gold plan. One thousand dollars a month is $540,000 over a 45-year career. That's lottery-type money. For us small-time business owners, government-provided universal healthcare starts to look pretty good, but until that day comes, if ever, the ACA Marketplace provides a variety of health insurance plans (healthcare.gov).

The Marketplace is designed for people to compare and buy insurance plans. It has four categories of healthcare plans: bronze, silver, gold, and platinum. Bronze plans are high-deductible health plans (HDHP) with low premiums. Platinum plans have the highest monthly premium but pay the most for medical care. (Very few platinum plans are available on the Marketplace platform or directly from insurers.) If you're healthy, a bronze plan may be your best option. If you have a lot of medical expenses, a higher-premium gold or platinum plan may be less expensive in the long run. The four levels of plans are differentiated based on their actuarial value, which measures the generosity of benefit coverage. The higher the actuarial value, the more the plan will pay. The actuarial value of each plan is as follows: a bronze plan covers 60% (policy holder pays 40%); silver, 70%; gold, 80%; and platinum, 90%. When you review plans in the Marketplace for purchase, it's important to understand premiums, deductibles, copayments, coinsurance, and out-of-pocket maximum. We can use a discussion of a bronze plan to illustrate each.

BEYOND PREMIUMS

More than one-third of all health insurance plans, public and private, in the United States are high-deductible plans. In 2021, 55.7% of private-sector workers were enrolled in them, according to a report by ValuePenguin, a division of LendingTree. High-deductible plans are exactly what their title suggests: They have a higher deductible and a higher total out-of-pocket expense in exchange for a lower monthly premium. They best serve people who are generally in good health and don't need a lot of medical services. In a personally healthy year, you will pay your premiums and little else, but, if by chance you are taken ill, you will have to pay up to the plan's deductible before the plan pays anything.

HEALTHCARE IN THE CONSTRUCTION INDUSTRY

Construction workers are more likely to lack health insurance than workers in any other industry, according to CPWR - The Center for Construction Research and Training, the nonprofit construction safety and health research and training arm of the North America's Building Trades Unions. In its April 2020 Data Bulletin, CPWR reported that the percentage of construction workers who were uninsured was 24.6% in March 2019, down from 33.1% in 2012. The decrease was a result of better access, affordability, and discounts from the passage of the Affordable Care Act—yet, still, 1 of every 4 construction workers has no health insurance. For the same period, CPWR reports, the uninsured rate for all industries was 10.9%. Members of construction unions and construction workers employed by large companies are more likely to have health insurance than sole proprietors or those working for small construction companies of 10 or fewer employees. Union members are also more apt to have their health insurance premium paid in full: 47.3% vs. 21.7% for non-union members.

Health insurance in the United States is an employer-based system, unlike in most other western industrialized countries, where citizens have a universal healthcare system—a safety net that provides basic healthcare. In a country with a universal healthcare system, if you're lucky enough to have additional funds, you can augment what the government provides with private medical services.

How did the United States develop an employer-based healthcare system? Before 1942, there were such products as accident insurance, though they were intended more as compensation for lost wages than as a payment for medical expenses, and sickness insurance, sold by hospitals. Then, during World War II, Congress passed The Stabilization Act of 1942, also referred to as the Inflation Control Act, which authorized the president to stabilize prices, wages and salaries to offset the influences of a world war on the U.S. economy. However, the Act excluded controls on worker benefits including "insurances and pension benefits in a reasonable amount to be determined by the President." Because of wage controls and a limited work force due to the war, employers began to offer healthcare benefits and pensions in an effort to attract and retain workers.

Over the next several decades, a strong middle class developed thanks to a good job market, the GI Bill, union membership, and a corporate philosophy that included healthcare as an integral part of compensating employees. Unfortunately, corporate philosophy changed and healthcare costs began to increase.

Fast forward to 2023 and many U.S. employers that used to provide full healthcare insurance and a pension plan now provide a high-deductible health plan that requires employee participation and a 401(k) retirement plan with a single-digit percentage match. The burdens of healthcare insurance and retirement saving have been passed from the employer to the employee. Construction workers and the middle class have taken a big hit. —*R.C.*

For example, for 2023, a bronze high-deductible plan has a minimum deductible of $1,500 for an individual and $3,000 for a family, and has a total out-of-pocket cost of $7,500 for an individual and $15,000 for a family.

After meeting the $1,500/$3,000 deductible, you will have reached the copayment/coinsurance part of a plan. At that point, either you'll pay a fixed amount, or copayment, for a service—say, a $35 copay for a doctor's office visit; or you'll pay a percentage of the cost, or coinsurance—say, you pay 20%, or $200, of a $1,000 hospital visit while the insurance company pays the other 80% (some plans may have a different split from 80/20). The copayment/coinsurance applies until you spend another $6,000/$12,000, bringing you up to the out-of-pocket maximum. Once you hit that, the insurance company will pay all medical expenses until the next year, when the clock starts all over again. So, if you have a lot of unforeseen medical issues in a year, your healthcare costs with a high-deductible plan might be more than expected.

And, don't forget, on top of the dollars discussed above, you still have monthly premiums to pay. Premiums for a bronze plan can cost a 30-year-old individual $430 per month ($5,160 per year) and a family $928 per month ($11,136 per year). In a bad year, a family would shell out $15,000 in out-of-pocket costs plus $11,136 in premiums for a total of $26,136.

By comparison, a gold plan may have a family monthly premium of $1,332, a deductible of $2,500, and an out-of-pocket maximum of $8,500. Total out-of-pocket costs for a gold plan in a bad year would be $15,984 in total monthly premiums plus $8,500 in out-of-pocket costs for a total of $24,484, compared with $26,136 for the bronze plan. However, in a good, healthy year with no medical expenses, a gold plan would run $15,984 in premiums while a bronze plan would cost just $11,136 in premiums.

In-network vs. out-of-network. Has your head exploded yet? No? Let's work on that. In addition to the four tiers discussed above, you need to decide what type of plan you want: one that uses the insurance company's in-network healthcare services of doctors, hospitals, pharmacies, and specialists or one that allows you to access out-of-network services. You should be able to find in-network or out-of-network plans for each "metal" level. Examples are:

- Exclusive Provider Organization (EPO). This care plan requires that medical services be obtained from within the insurance plan's network of doctors, specialists, and hospitals. Only emergency care is exempt.

- Health Maintenance Organization (HMO). An HMO is similar to an EPO. It limits coverage to doctors who work for or are contracted with the HMO. An HMO may require you to live in its service area to qualify for coverage. Emergency care from outside the network is covered.
- Point of Service (POS). With this plan, you pay less if you use in-network services and providers. You need a referral from your primary care physician to see a specialist, and you pay more for out-of-network services.
- Preferred Provider Organization (PPO). You pay less if you use in-network services, but you can use out-of-network services and specialists without a referral—for additional cost.

Regardless of the metal tier or type of plan you select, certain essential benefits will be covered. A deductible, copayment, and coinsurance may apply, but the service cannot be denied. For an insurance company to participate in the ACA marketplace, these essential health benefits must be covered:

- Addiction treatment
- Ambulatory patient services
- Birth control
- Care for newborns and children
- Emergency services
- Hospitalization
- Laboratory services
- Maternity care
- Mental health services
- Occupational and physical therapy
- Prescription drugs
- Preventive and wellness services

One thing is clear about healthcare for the little guy in the United States: You pay. You pay upfront via premiums, or you pay on the back end via total out-of-pocket costs. Healthcare in our country is less a healthcare system than it is a health insurance system.

Government subsidies. So, how does a would-be entrepreneur in the construction trades, or any field for that matter, start their own business, create jobs, and make any money when health insurance is so expensive? Our economic system depends on people starting their own businesses, growing their businesses, employing others, and stimulating local economies. There is assistance available. In addition to providing health insurance plans, the ACA Marketplace offers federal subsidies to those who qualify. If Tesla, GM, and Ford don't hesitate to take a $7,500 subsidy from Uncle Sam for each electric vehicle they sell, why should you hesitate to help your family and your business?

Cost sharing. Government health insurance assistance includes Cost-Sharing Reductions to lower out-of-pocket costs and Advanced Premium Tax Credits to lower monthly premiums. This assistance may make insurance affordable or might make a better plan more affordable. During the Marketplace's open enrollment period, October 15 to December 15 (though this varies by state), you open an account and fill out an application, and the Marketplace will tell you if you qualify for assistance. If your income falls between 100% and 250% of the federal poverty level, you may be eligible for cost-sharing assistance, which can lower your deductibles, copayments, and coinsurance. You must purchase a silver plan to qualify for cost-sharing.

Tax credit. To qualify for a premium tax credit, your income needs to be between 100% and 400% of the federal poverty level. Based on 2023 poverty levels, the income amounts for a family of four are $27,750 minimum and $69,375 maximum for cost-sharing, and $27,750 minimum and $111,000 maximum for a premium tax credit. The minimum and maximum for assistance will vary by family size. The minimum and maximum for a premium tax credit varies from $13,590 to $54,360 for household of one to $46,630 to $186,520 for a household of eight.

If you're healthy, a bronze plan may be your best option. If you have a lot of medical expenses, a higher-premium gold or platinum plan may be less expensive in the long run.

Also, the ACA has a plan for small businesses. Small businesses, 1 to 50 employees, can participate in the Small Business Health Option Program (SHOP). SHOP plans are a way to qualify for Small Business Health Care Tax Credits.

SUMMING UP

Is healthcare a basic human right? Would the construction industry benefit from universal healthcare or Medicare for all? These are tough questions to answer and way above my pay grade. As a citizen concerned about my fellow workers and countrymen, yes, I would love for all of us to have access to good, affordable healthcare and to a healthcare system that educates and encourages healthy behavior (which has been found to have more of an effect on life expectancy than access to healthcare). We have the best healthcare professionals in the world and spend twice as much as other western industrialized countries, but we do not provide the best healthcare for our citizens. According to the CDC National Center for Health Statistics, 28 million Americans did not have healthcare in 2021. Many of them were in the construction trades. Would the construction industry and the country benefit from a better, more-affordable system? I have to say, yes. All workers and citizens would be covered, and a portion of the money saved by each family would find its way into homeownership and home improvements.

Rob Corbo is a building contractor based in Elizabeth, N.J.

TOP 5 REASONS YOU NEED A NEXT GENERATION DEMOLITION SAW BLADE

Improved Blade Designs and Premium Materials are the Real Deal

The modern jobsite has become a tough place. Builders count on their saw blades to cut through a wide range of evolved materials, which are more sustainable, weather repellant and stress resistant year after year.

In fact, most standard blades on the market are now prone to dulling, breaking, and failing outright when jobsite professionals need them most. This costs professionals time and money in blade changes, resulting in longer and more expensive projects.

Fortunately, certain specialized tool companies are stepping up to provide innovative blades that are better equipped for the challenges of a modern jobsite. This "next generation" of saw blades will address never-before-seen challenges with a versatile, one blade premium solution.

Here's five reasons you should add one to your arsenal today:

1. **A Variety of Material Needs to Be Cut with One Blade.**
   Jobsite workers need a blade that can do it all. They need a demolition or framing blade that can cut through not just wood, but also shingles, laminated beams, treated lumber and other jobsite materials. It's important to choose a blade with a specialized carbide, advanced grind technology and sophisticated tooth brazing, as these features typically offer unmatched durability across a wide range of materials.

2. **Cordless Saws Are No Longer an Option—They're Essential.**
   Cordless saws have met the demand of the modern jobsite by offering a powerful option when cords aren't allowed or juice isn't available. They've become the go-to tool over corded saws thanks to their versatility. As such, professionals need a blade that won't waste battery life. A next generation blade offers an optimized thin kerf design for an ease of feed, less friction and reduced vibration. This lets workers get more cuts per charge on cordless saws, resulting in greater productivity.

3. **Older Blades Just Can't Cut It.**
   A saw blade may be intended for demolition and framing, but that doesn't necessarily mean it's equipped to handle the modern jobsite. Older generation blades lack efficiency in new forms of nail-embedded wood, shingles, certain types of laminated wood and even some blends of softwood. They also don't consider the efficiency needed for more prevalent tools such as cordless saws. The jobsite they were specifically designed for essentially doesn't exist anymore, so they often lack specific features that have become project staples.

4. **Material Is Expensive, Recycled and Full of Unseen Obstacles.**
   With new construction material comes new types of nails, screws and other modern fasteners. Workers are asked to work with this material again and again for multiple purposes because of its price. The end result? More cuts. New generation blades meet this challenge head on by incorporating newer, more specialized carbide blends. A blade with technologically advanced, high tolerance 3-grind tooth processes can also keep the saw tracking straight and extend life. When combined, professionals can use a blade that allows them to focus more on getting results and less on wasting material.

5. **Constantly Changing Saw Blades Is Also Expensive.**
   Changing blades for each application—or each time your blade dulls—is an option, sure, but it wastes time and energy that could be used completing a project. Every contractor can relate to searching for that pesky L-wrench! New generation blades are designed to handle any material in demolition or framing, making blade changes a thing of the past. They can also last up to 15-times longer than standard blades thanks to newly formulated carbide blends, optimized thin kerf designs and overall better brazing on each saw tooth.

   Fifteen-times the lifespan means 15-times the savings for each project. The next generation of blade is here and the time to upgrade and save is now.

To learn more, visit **www.ignitethejobsite.com.**

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Photos by Mike Whalen

Peeling Back the Layers of a Kitchen Remodel

An old house presents a host of framing and water-control challenges

BY MIKE WHALEN

I am a lead carpenter for DBS Remodel, based in Poughkeepsie, N.Y., and kitchen remodels are a primary focus of our business. In many of the older homes we work in, however, "kitchen remodel" doesn't always describe what most people think. Yes, it includes new cabinets and finishes—what you see when we walk away from the job on completion. But so much more goes into it, particularly with an old house, which often requires a great deal of remediation to bring all the elements of the room to a "healthy state"—structurally sound as well as free of water and moisture problems and toxic materials.

That was the case on a job we completed in spring 2023 in a house originally built in the 1930s. In the intervening years, the kitchen had undergone at least four major remodels, possibly more; one of these had enclosed an old porch to expand the kitchen, and a wrap-around deck had been added (though it's hard to know if the two jobs were concurrent).

On the latest remodel we were called to do, the homeowner wanted to open up the kitchen as much as possible to the rest of the house and make the room feel less confining, but she didn't have an extra room we could open onto, so we couldn't change the

A view of the existing kitchen interior at the beginning of the demolition phase **(1)**. Over the years, this room had numerous floor coverings, including vinyl, slate, an old linoleum tile, and the original plank subfloor **(2)**. The discovery of the old tile prompted a test for asbestos, which proved positive, requiring a pause in the renovation to remediate the asbestos **(3)**. At the end of demolition, the old porch framing had been removed, and only the original framing of the main floor remained **(4)**.

footprint. The best we could do was open one end to the adjoining living space and raise the ceiling in the part of the room that had been the old porch to create a vaulted area near a new French door that would replace a poorly operating sliding door.

To address a host of structural and water-related problems, we had to take the room down to the studs and joists, removing many layers of flooring and even several layers of ceilings. In our initial walk-through, we had discovered old flooring tiles that we suspected contained asbestos. We tested these and our suspicions proved correct, so we began by removing what we could without disturbing that layer of flooring, and then turned the jobsite over to an asbestos abatement crew. (For a detailed discussion on asbestos abatement, see my article "Managing Asbestos During a Remodel," Jul/Aug/21). We also tested for lead paint but didn't find any, despite the age of this house. It's likely that an earlier remodel, which eliminated the original plaster and lath and the original trimwork, took care of that.

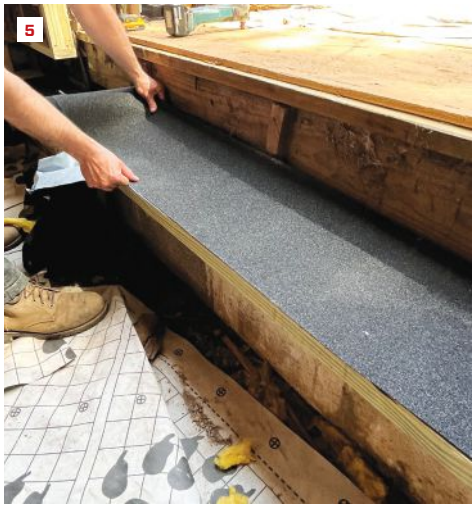
FLOOR STRUCTURE

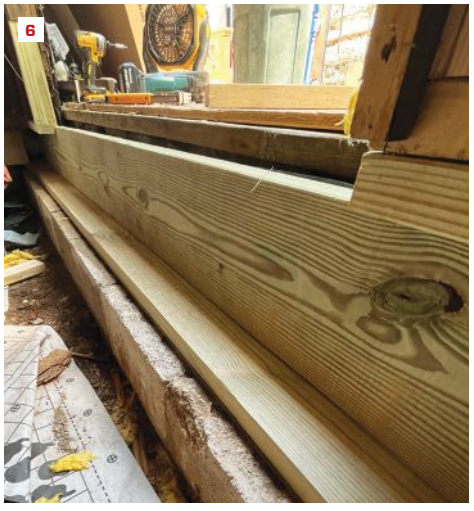
Once the asbestos flooring was removed, we continued with the floor demolition. All of the old porch floor structure was vastly undersized and had suffered a lot of water damage, so we tore it out completely.

The floor joists under the main house were in better shape, but this area of the floor was about 3 inches out of level. Once the framing was level, we would have a step down into the adjoining living room to keep the same kitchen floor elevation as the deck surface. This was a consideration we made sure the homeowner understood going into the design phase of the project.

The sill beneath the exterior door opening had also suffered a lot of water damage. We had to tear out a considerable amount of rot from the sill, rim joist, and some stud ends and tie in new, pressure-treated wood. We also used pressure-treated for the new floor framing over the old porch area because the dirt crawl area had the potential to become wet, and there would be no access to it.

The exterior deck, which was just above grade with no significant crawlspace beneath it, was in good shape and was not part





Reframing the floor began with rebuilding the sill where it connected to the deck. After digging out the rotted framing, the crew installed an ice-barrier membrane on a new rim joist **(5)** and then flipped it up to face the exterior **(6)**. While reframing this area, the author set cross-strings to check the plane of the door opening and corrected for a splay in the wall **(7)**. The main house floor was reinforced with sister joists **(8)**, and the old porch floor was completely demolished and reframed **(9)**.

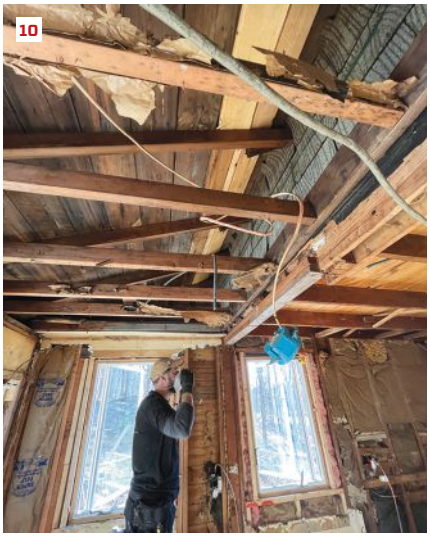
of the scope of work. This meant we had no access to the rim joist and ledger from the exterior. An existing pressure-treated ledger was in good shape, but the rim joist needed to be replaced. To flash the new rim joist, we adhered ice-barrier membrane on new pressure-treated framing material, then flipped it up with the membrane facing the exterior, working from inside the door opening.

While doing this repair work, we also rebuilt the door opening. This included cross-stringing the opening to make sure the wall sections on each side of the door weren't doing a "scissors walk." Part of the wall was out of plane and slightly out of plumb, but we were able to correct this when replacing the rotted stud ends and pushing the repaired ends into position along the new rim joist.

ROOF/WALL/FLOOR STRUCTURE

Once we stripped away the multiple ceiling layers and opened up the roof/floor framing, we encountered a number of structural surprises. We knew we had to install an LVL header in the exterior wall and an LVL beam at the far end of the kitchen where we opened the wall to the adjoining living space. We also suspected we would need to reinforce the intersection of the old porch roof with the main house. But we were surprised to find that there was no structural member at all holding up the roof/floor/wall intersection in this area, and the second floor was almost 2 inches out of level across the width of the room.

To remedy this condition, we started by jacking up the second floor and building temporary shoring walls. We were able to take up some, but not all, of the sag out of the floor above, and then installed a built-up LVL beam, which posted down to the original foundation at one end. The other end of the beam was engineered to bear on the new LVL header over a triptych of new windows in the exterior wall. Following the architect's engineering design, we intentionally built the window header out of level to provide strong bearing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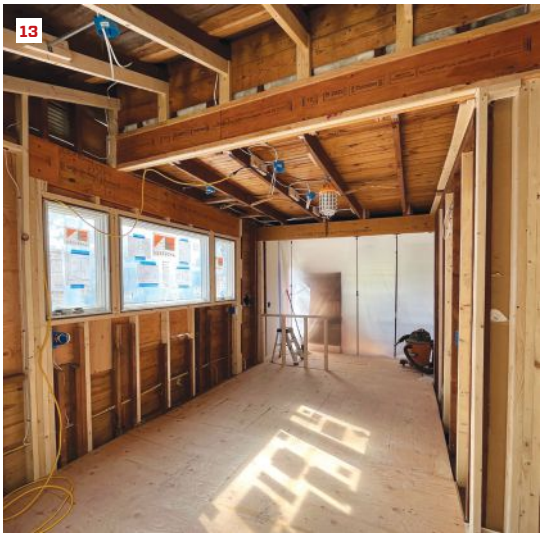
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The owner wanted to raise the roof where the old porch roof had been to create a partially cathedralized area **(10)**. There was little existing support at this intersection, requiring a new LVL beam tied into the second-story wall section **(11)** to support the upper floor and the roof loads **(12)**. This beam landed on top of a new LVL header for new windows **(13)**. Once all the structural work was completed, the exterior walls, roof, and floor were insulated **(14)**.

for both the floor area above the windows, which was out of level in the direction parallel to the joists, as well as our new, level LVL beam holding up the wall/roof/floor intersection. We made up for the difference in level between the header and the windows with short, diminishing cripples above the windows.

BUTTONING UP THE JOB

Once all the structural repairs were completed and the exterior was buttoned up tight against weather and water, we insulated the exterior walls with spray foam. In New York state, we're required to bring remodeled spaces up to code, and spray foam was the most expedient way to reach the insulation requirements, particularly in the roof where R-49 is currently required. (This may go up to R-60 if the 2021 International Energy Conservation Code is adopted in the state; this will be a high bar to get over.) In the floors, we used R-30 fiberglass batts after covering the dirt crawlspace areas with a 6-mil poly vapor retarder.

The remainder of the job proceeded more like a typical kitchen remodel. There wasn't much plumbing rework, as the new sink was installed in roughly the same location as the existing one. That left new electrical, drywall, cabinets, and countertops, which were all typical. We prefer to install the finish floor before the cabinets, but the owner hadn't made a flooring selection by the time the cabinets were ready. To keep the schedule moving, we installed the cabinets on plywood strips and once the flooring selection was made, butted new hardwood to the plywood before installing a finish toekick. Similarly, the lighting had not been selected at the end of the job, so we ended up installing porcelain lamp holders in order to close out the job.

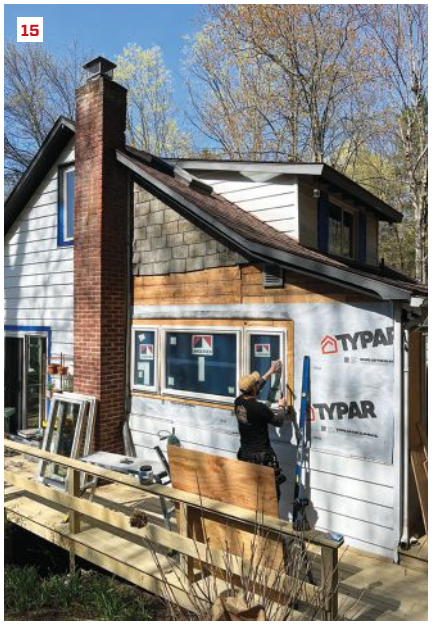
DOCUMENTING THE JOB

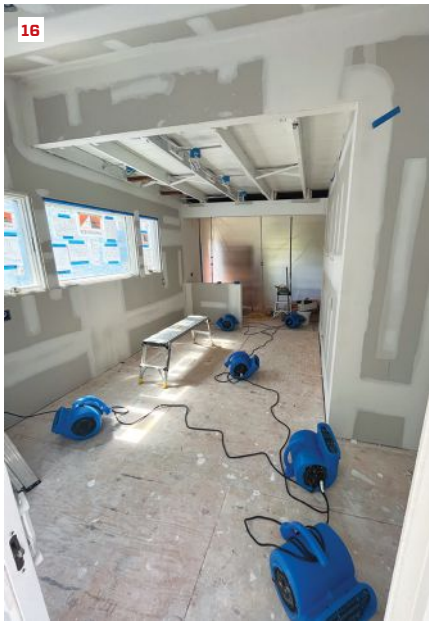
On a job of this scope, we try to anticipate any potential problems that might alter the budget. We can't identify every problem when we do our initial walk-through, but we can identify areas that *might* be problematic. For example, we flagged the possibility the flooring had asbestos, and we assessed that the floor would need some reframing and would result in a step down into the adjoining living room. We also surmised that we would have to do some structural reinforcement to support the upper floor. However, until we opened things up, we didn't have a clear understanding of the extent of these structural repairs, nor were we able to communicate to the owner an exact dollar amount to cover them.

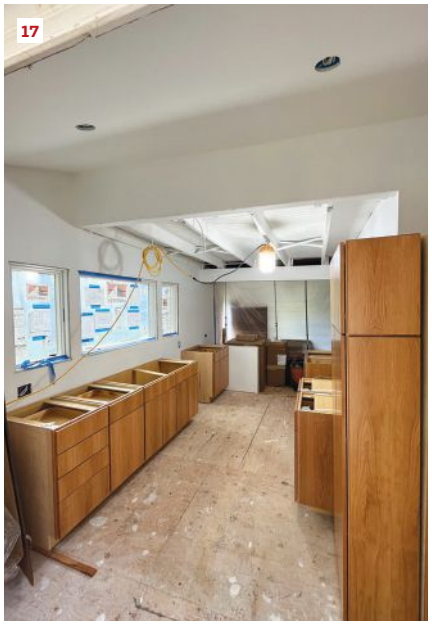
We have learned that it is critical to communicate what we don't know to the client early on and set expectations around areas where more work might be required once we open up the structure and can accurately assess building conditions. This client appreciated that we weren't just throwing a high-dollar figure at the whole job and gambling on how much profit we would make from it. As it turned out, there were significant changes. These change orders were palatable to the owner because not only did we set clear expectations, but we also photographed every step along the way. This allowed us to accurately communicate what we needed to do and build understanding with the owner. She didn't just have to take our word for it.

Slowing down to document a job is sometimes challenging. During demolition, there is a tendency to smash and go and get all the rot and debris into the dumpster quickly so you can work in a clean space. But it's very important to snap photos of all that rot and debris so the client fully understands how dire the conditions are. Doing so on this job gave the owner a stronger appreciation for the value she received, and we feel confident that we walked away from this job knowing that it didn't just look good, but that we had a strong referral for the future.

Mike Whalen is senior lead carpenter at DBS Remodel. Join him at JLC Live, March 21–23, 2024.

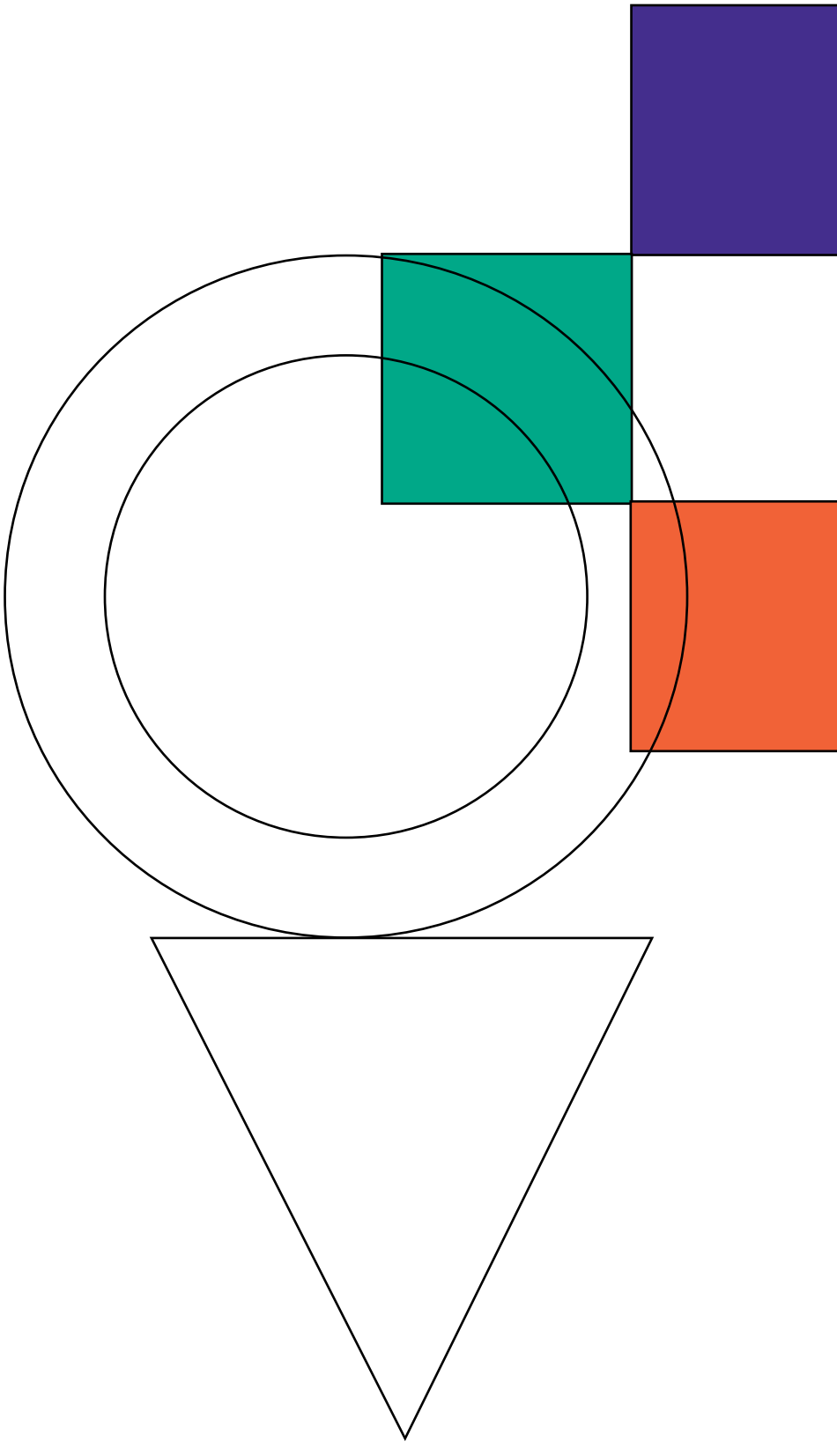






Final steps on the exterior included patching in new aluminum siding to match the existing and trimming out the new windows and door **(15)**. With the house brought back to a "healthy state," the rest of the job proceeded like a normal kitchen remodel, with new drywall **(16)** and cabinets **(17)**. The cabinets arrived before the owner had made a decision on the finished flooring, so they were installed on plywood strips. Once new countertops and flooring had been chosen, the kitchen neared completion **(18)**. The owner chose to leave the ceiling beneath the upstairs floor exposed, but she had not yet made a lighting selection at the end of the job.

JLC



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Tuning Up Construction Stairs

Correct the rise and run on a set of site-built stairs using a series of precisely stacked and staggered blocks

BY DAVE HOLBROOK

I've never made nor worked on a perfect set of site-made stringers. Fast-moving framers can crank out a set of stringers in under an hour—and it shows. However carefully they're made, both drying and humidity will ultimately distort the cutouts. If you expect to achieve a good outcome, rough stringers cut by the framing crew are probably not going to be usable in delivered condition.

A "perfect" stair stringer can be visualized as a series of precisely stacked and staggered uniform blocks, and that's what I set out to create after the fact with the method that I'll describe in this article. On a typical stair, this process takes me a solid day but makes the ensuing job so much smoother and the final product as good as what was initially promised to the client.

STACKING BLOCKS

I begin finishing a set of stairs from their rough stringers by finding the total rise and run, referencing plumb and level laser lines. First, I check for level across the stairwell at the top and bottom of the flight; I want the total height to represent the distance from the highest point at the top to the lowest point at the bottom. I then divide this distance to establish the riser height.

In a home with 8-foot ceilings, a stair layout with 13 risers and 12 treads is common. On the stair shown in this story, the home's ceiling was higher than 8 feet; the first flight had 13 risers and 12 treads and terminated at a dropped landing at the top (an additional riser to the left and to the right of the landing led to a

Photos by Dave Holbrook, Dan Holbrook, and Stephen Najarian; illustration by Tim Healey

second-floor corridor). The staircase was partially open, with the first six risers open on the left and the remaining seven risers between two walls **(1)**.

At the bottom of a stair, I typically shoot the plumb line from the starting riser and the level line from the highest point of the top landing and measure the total rise. I then measure the distance from the landing to the starting riser for total run and use the Buildcalc app on my phone to find the mathematical rise and run, which on this stair resulted in a 7 13/16-inch rise and 9 7/8-inch run. I cut a check-block template of plywood to those dimensions, making certain that its corners were perfectly square, and added a stop-piece to the riser edge to register it against sequential blocks. I also cut a dead-straight piece of 1-by lumber slightly shorter in length than the stair's nominal width and used it as a straightedge to check the level and alignment of the stringers.

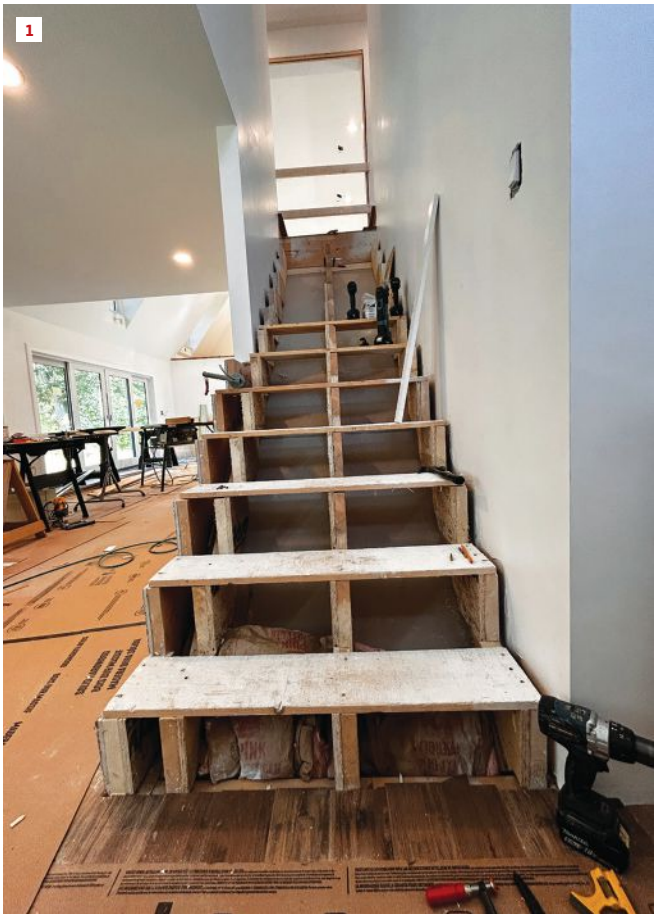
Corrective blocks. Next, I ripped 3/4-inch AdvanTech subflooring (you can use any good-quality plywood, engineered subflooring, or material with a solid core) at the 7 13/16-inch width, then cut the rippings to length against a stop on my miter saw at 9 7/8 inches plus 1/4 inch, or 10 1/8 inches. The extra 1/4 inch is for stacking at the back end, which I'll explain below.

For a three-stringer stair with 12 treads, I need 36 of these identical blocks. They must be perfectly uniform to prevent cumulative, incremental errors from creeping in. If the stair is finished with drywall on its underside, as was the stair featured in this story, I chamfer one corner of each block for clearance. This stair had also been insulated with fiberglass batts, which I removed, then replaced before installing the finish treads and risers.

Beginning at the bottom tread, I applied PL Premium adhesive (loctiteproducts.com) to the face of a block and stuck it against the first outer stringer, adjusting it to align precisely with the plumb line on the wall. (If the bottom of the stair is open on both sides, you'll need to establish a temporary, immovable reference for the plumb line.) The starting riser must be square to the supporting wall, or the entire layout will be out of whack. Stringer cutouts that aren't aligned with each other along the flight are trimmed to the block edges later, as needed.

The adhesive adds grip while I check the block for plumb and square using a good torpedo level (stabila.com). I keep two drill/drivers at hand, one to drill a pilot hole and the other to drive 2-inch screws—I like GRK R4 multi-purpose screws (grkfasteners.com). I often use a clamp to hold the block in place until fastened **(2)**. If I were to simply shoot the blocks with a nail gun, I might struggle to correct for accidental shifting; with clamps and screws, reversal and correction are easy.

With the first block installed, I move to the opposite, outside stringer and repeat the process, again checking that the alignment is square to the wall or general stair layout. I straddle the two outside blocks with a torpedo level riding the 1-by straightedge, checking across the run, as well as front to back, for overall alignment **(3)**. Errors can telegraph all the way up a stair, so I take my time. I then install the center stringer block, using the straightedge for reference on both riser and tread surfaces.

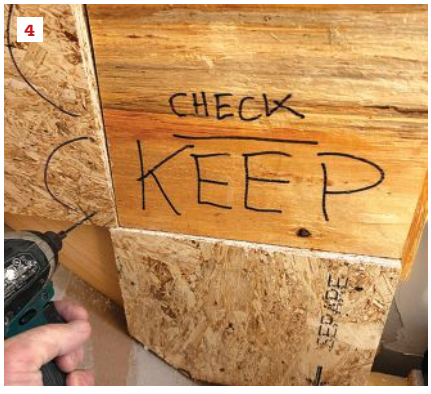


This staircase joining the first and second floors was built with site-made stringers (three main stringers and a fourth, outside stringer) **(1)**. The underside of the stair was drywalled and insulated with batts between the stringers.

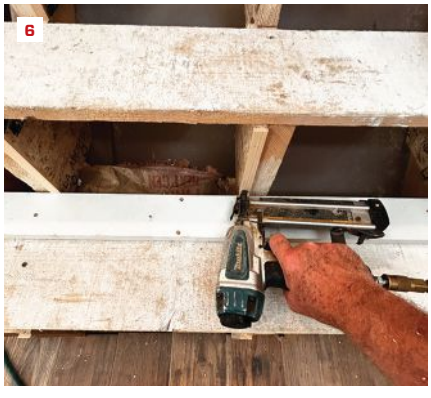
Once I'm satisfied that I have a precise and reliable starting tread, I move on up. This is where that extra 1/4 inch on the block comes into play, as it provides a small extension on which to rest the next block up. With it glued and set in place, I use the check block to ensure the tread depth is accurate, then predrill and drive the first screw close to this lower rear junction **(4)**. (Although the GRK screws are self-drilling, they can still yank the piece around, so I drill first, then screw.)

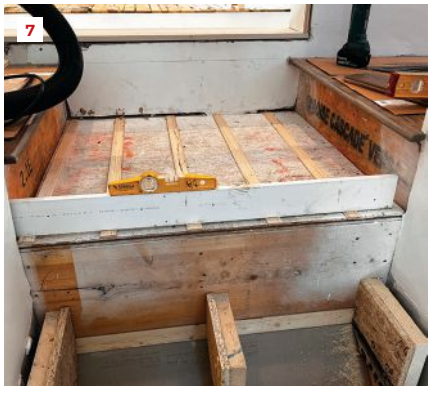
When the block is plumb and level, I add three more screws, one per corner. Next, I use my multi-tool to trim away any portions of the stringers that project past the corrective blocks **(5)**. The AdvanTech blocks become the bearing points for the finish treads and risers, so it's not necessary to shim the stringer treads and risers if the new blocks run proud of them. I continue this process all the way to the top, removing and replacing the temporary treads on the fly.

To correct the existing stringers, the author cut 3/4-inch OSB blocks that he then leveled and glued and screwed to the stringers **(2)**. A 1-by and level are used to check the alignment of the corrective blocks across the stringers **(3)**.



The author used a check-block template to register the corrective blocks, butting its stop-piece to the edge of the preceding block below **(4)**. A multi-tool was used to trim the stringers where they projected past the new blocks **(5)**.





The author added 3/16-inch shims to the riser face of every correction block to allow room for a full 10-inch-wide top tread **(6)**. The landing was out-of-level, which the author corrected with progressively thicker shims on 8-inch centers **(7)**.

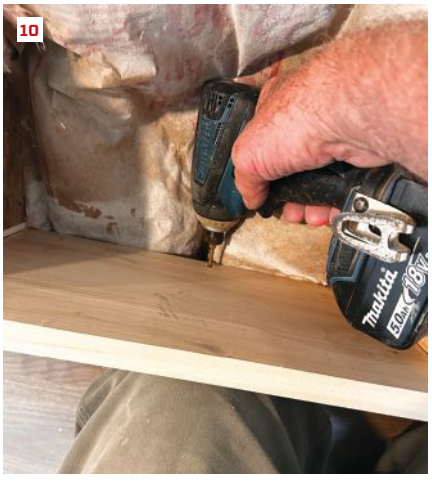
Correcting the layout. When I reached the top of the stairs pictured in this story, I had to trim 3/16 inch from the last block because the landing hadn't been built parallel to the stair layout. Rather than settle for crafting an irregular top tread, I added 3/16-inch pack-out strips to the riser face of every block on the stair **(6)**. Also, the dropped landing was out of level, which I knew from my initial inspection. To correct it, I added progressively thicker strips at 8-inch centers **(7)** to support the oak flooring added later by the flooring installer.

SKIRTBOARDS

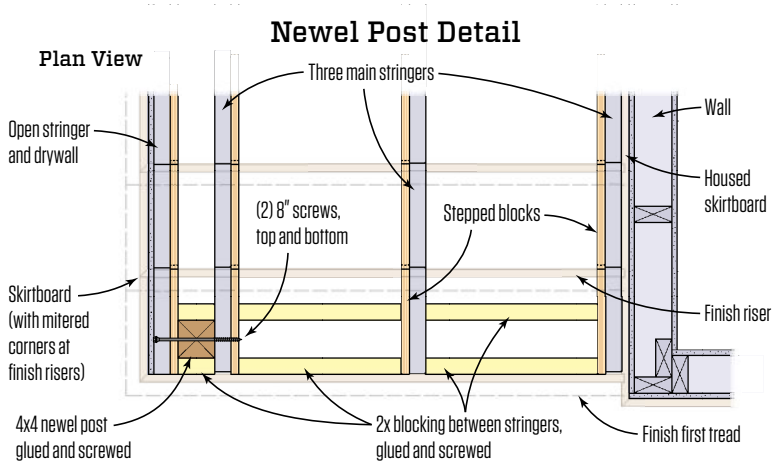
The method I used for this stair involved recessing, or "housing," the oak treads and poplar risers into the face of the poplar skirtboards. (The top seven risers had housed skirtboards on both sides, while the lower six were housed on the right side with an open skirtboard on the left.) The ends need to be inserted only 1/8 inch to be covered, which is done by routing a deeper recess, inserting the end of the tread or riser on one side, then sliding it back in the opposite direction to cover the end on the other side. On this stair, I was supplied with risers that had a groove to accept the tongue along the back edge of the tread, highly complementary to this recessed approach. I cut the treads and risers singly, rather than all at once. Stairwells aren't always truly parallel, growing unexpectedly wider or narrower mid-flight, so it pays not to get ahead of yourself.

I began by cutting the skirtboards to fit, then screw-tacked them to the wall following a chalk line snapped on the wall at the rise angle. Then, using a cut-off tread-and-riser model **(8)**, I traced its outline onto the skirtboards at each step, left and right, ensuring an accurate alignment for final assembly.

With the skirts marked, I used a basic router template **(9)** and a top-bearing straight bit to cut the 3/8-inch-deep recesses. When I made the template, I allowed for a slightly loose fit to enable the treads and risers to slide in as needed. Any dark line showing around finish components gets filled with two-part compound and sanded flush. If these were natural-finish rather



The author used a cut-off model to trace the tread and riser outlines onto the skirtboards at each step **(8)**. Then he used a router template and a top-bearing straight bit to cut 3/8-inch-deep recesses into the skirtboards **(9)**. After gluing and nailing the first tread at every point of contact, the author screwed the second riser to the rear edge of the tread **(10)**.



Solid blocking was installed between all the stringers and to form a pocket to secure the newel post (illustration, above left). After installing the first tread, the author used a story stick to locate the underlying pocket, then used a router to cut a hole in the tread to receive the 4x4 post. The newel was glued and screwed in place **(11)**.

than paint-grade stairs, they would require a tighter fit and more of a struggle, but the method would remain the same.

When making the cut-off model, check to see if the finish treads have a standard width or if there is some variation (as was the case with the oak treads shown here). Unfortunately, I selected a tread at random that was 1/16 inch narrower than the others to make the model, which threw off my tracing of the nosing outline onto the skirtboards on some of the steps. If you do encounter width variation, rip all the treads to the same width prior to making the model.

When installing the routed skirtboards for keeps, I use the cut-off model to check at the top and bottom to make sure it, and therefore the treads and risers, will slide in as intended. I start at the top because it's easier to position the skirt from there, rather than trying to push it up into position from the bottom.

Open skirtboard. On this partially open staircase, there was a fourth, outside—or "open"—stringer that I bypassed in the initial correction phase. Its main function is not load-bearing but projecting the stair profile out to the wall surface. Unsurprisingly, its cutouts didn't align with the corrected main stringers. I easily corrected them with six identical blocks that I referenced against the

Where the lower six treads have an open skirtboard, the author used a multi-tool to complete the groove in the riser to receive the tongued tread. A portion of the open skirtboard miter is cut away **(12)**.

The finished stair with oak bull-nosed treads, newel post, scotia molding (under the tread nosings), handrails, and painted poplar risers, skirtboards, and balusters **(13)**.

straightedge, trimming the stringers with a multi-tool as needed. However, I used the cavity between the open and the adjacent main stringer to capture the 4x4 newel post (more on this below).

I cut the open skirtboard to the rise-and-run profile, mitering the riser cuts at 45 degrees to match the six riser ends. I installed it on the wall, using a short piece of mitered stock to gauge the precise alignment.

The first tread. With the skirts secured, I installed the second riser and first tread (leaving the first riser off until the end of the job makes recovering an accidentally dropped tool easier). First, I provided solid 2-by blocking between all the stringers at the first tread to secure the newel post (see "Newel Post Detail," opposite page). I then applied PL Premium generously under the tread at every point of contact, positioned the tread equally between skirts, and gun-nailed it to the original stringers with 2 1/2-inch, 15-gauge finish nails, kneeling on the tread while nailing to hold it firmly down. Then I screwed the riser to the rear edge of the tread **(10)**. The interlocking tongue and groove make this joint appear flawless; on a simpler, butted joint, the screws pull it tightly together. For this reason, I typically nail the risers only along the upper edge.

NEWEL POST

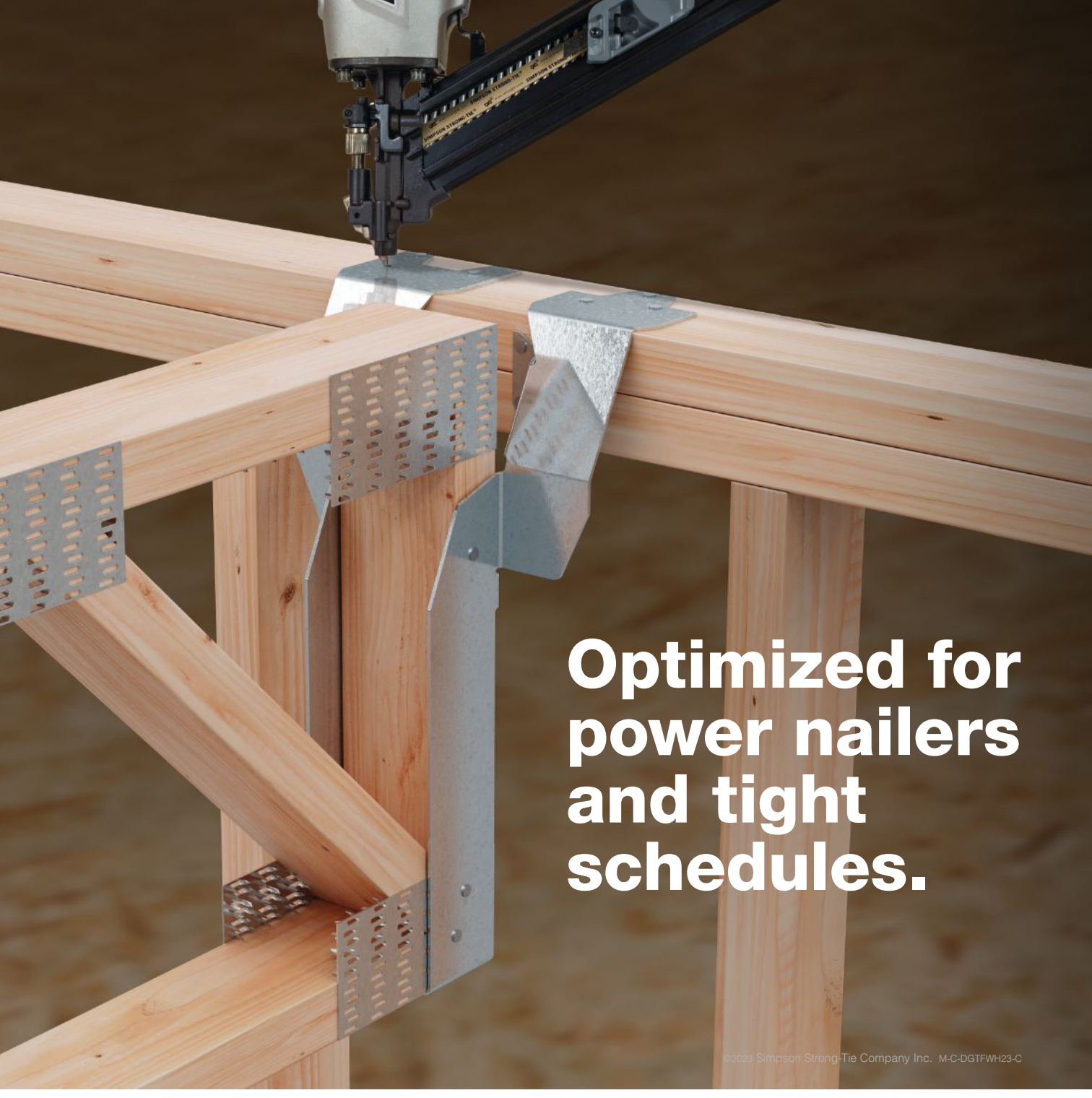
I made the 4x4 oak newel post narrower by 1/8 inch all around from the finished tread line to the subfloor. This created a shoulder on the post to cover the installation hole through the finish tread. Then, using blocking, shims, and glue, I created a tight-fitting pocket in the framing to capture the post, ensuring that it would stand plumb in both directions.

I made a story stick that recorded the pocket's dimensions and distance from the far skirtboard, then installed the first tread. I left the first finish riser off, allowing access for additional shimming, if needed. Referencing the stick, I drilled a starter hole through the tread within the newel zone, then used a pattern bit in my router to trace the pocket in the framing. I squared the cutout corners with a sharp chisel and dry-fitted the post.

After confirming that the post was plumb all around and met the tread seamlessly, I added a copious amount of PL Premium adhesive to the install cavity and slid the newel home. I drove two, 8-inch-long TimberLok screws through the outside stringer and post and into the stringer beyond. Then I installed the finish riser, adding more glue between it and the solid blocking for good measure. I braced the top of the post to protect it from accidental movement and left the glue to set overnight. The following day, it was immovable **(11)**.

Finishing up. I then installed the remaining treads and risers, measuring and cutting them one at a time as I worked my way up the stairs **(12)**. Before turning the stairs over to a professional paint crew to make it all shine, I filled all the nail holes with matching filler. All told, it took five days to complete this stair, including the handrail and balusters, base trim, and dust cap molding **(13)**.

Dave Holbrook is a freelance carpenter and a JLC *contributing editor, in South Orleans, Mass.*



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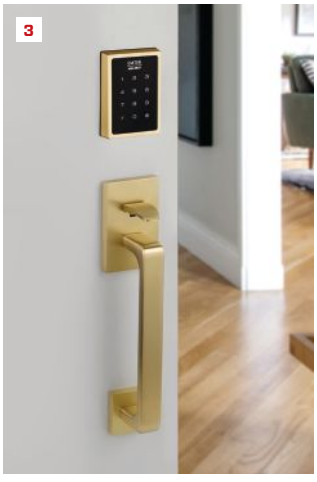
BY VINCENT SALANDRO



1. Smart Breaker Panel
Designed to allow homeowners to prioritize their energy needs in an age of electric vehicles and site-produced power with battery storage, the Span Smart Panel offers visibility and control over circuits and major appliances. Users can decide how to power specific devices at certain times through a mobile app. The product supports Ethernet, Wi-Fi, or Bluetooth connections. Weather-resistant, according to the manufacturer, the panel can be installed indoors or out. Pricing, including installation and shipping, is $3,500. span.io

2. Minimalist Faucet Collection
The Origini by Gessi bathroom faucet collection is offered in five color palettes and in seven styles, including a space-saving, wall-mounted faucet and an arched, three-hole basin mixer (pictured in the accent palette of ochre, matte black, and brass) in medium and tall versions. A finish insert fits inside the faucet knobs, adding an extra element of color and customization. Pricing ranges from $800 to $1,400, depending on size and finish. gessi.com

3. Keyless-Entry Smart Locks
EMPowered Smart Locks from Emtek can integrate with smart home technology. Installed with only a screwdriver, the electronic locks replace existing deadbolts and offer keyless entry, one-touch locking, and remote access and monitoring. The EMPowered Motorized Smart Keypad Lock features a smart deadbolt and a back-lit touchscreen. The smart locks have motors powered by four AA batteries, and angled nose-bolts that can accommodate misaligned doors. emtek.com

4. Colorful Natural Stone Sinks
Crafted from 70% crushed natural stone and minerals blended with resins, Ruvati's epiStone series of bathroom sinks are available in a 19-inch-by-14-inch curved-vessel base Canali model and a 23-inch-by-15-inch straight-sided Omnia model. Ruvati says the nonporous surface is easy to maintain, and the oval silhouette was designed with water drainage and cleaning in mind. The sinks come in five colors ranging from matte white to avocado lime green. ruvati.com

5. Radiant Heat Retro-fit
QuietWarmth Joist Heat Mats for under subfloors are designed to add warmth to existing flooring, including nail-down wood floors and carpet. Installation entails stapling the flexible carbon film between 16-inch-on-center subfloor joists and running pre-attached lead wires to an available thermostat. The mats can be cut to length and come in 120V and 240V versions. We found a 17-inch-by-5-foot 120V mat online for about $50. mpglobalproducts.com

6. Urban Countertop Surface
Cosentino's Silestone Urban Crush countertops are manufactured using 99% reused water and 100% renewable energy, and a minimum of 20% recycled raw material in their composition. Materials such as concrete, limestone, bronze, and ash help create a moisture-, stain-, acid-, and scratch-resistant surface, according to the manufacturer. Available colors are lime delight (pictured), concrete pulse, brass relish, and cinder craze. cosentino.com

7. Single-Room Air Purifier
The Broan-NuTone single-room Air Purifier (model BNAP-100) employs True HEPA filtration and emits no ozone during operation, according to its manufacturer. When the unit's auto-sensing technology detects TVOCs or particulates the size of respiratory droplets, dust, and pollen, the fan speed automatically increases to remove them, then switches back to maintenance speed once the air is clean. In addition, the surface of the unit's filter is treated by a built-in ultraviolet light. It retails for approximately $350. broan-nutone.com

8. Energy Storage System
Panasonic's Evervolt Home Battery System supports both DC and AC coupling, allowing for integration with new and existing solar installations. The system combines a hybrid inverter and lithium-ion battery with an Evervolt SmartBox, which can switch to the battery during outages to supply up to 7.6kW of continuous power to a home. Up to four Home Batteries can be used with each SmartBox to achieve up to 30kW of power and 72kWh of usable energy; maximum battery capacity per system is 18kWh. The unit can be floor- or wall-mounted indoors or installed outdoors. na.panasonic.com

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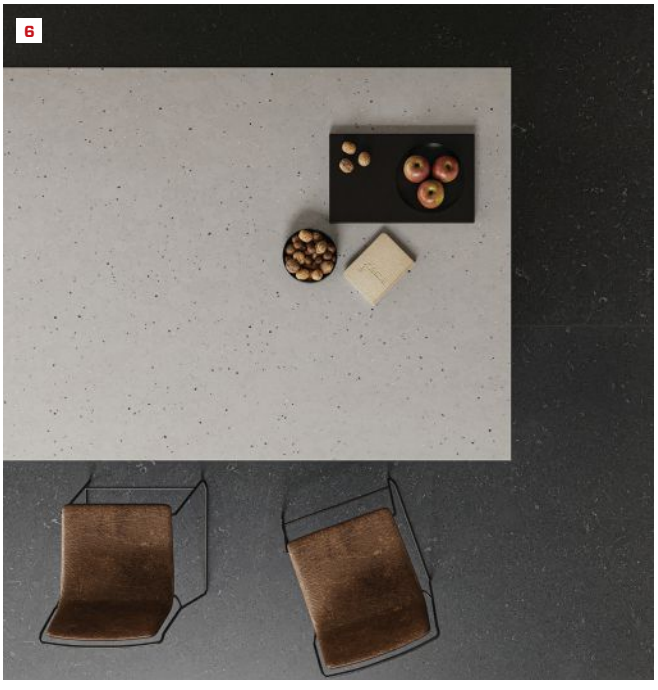

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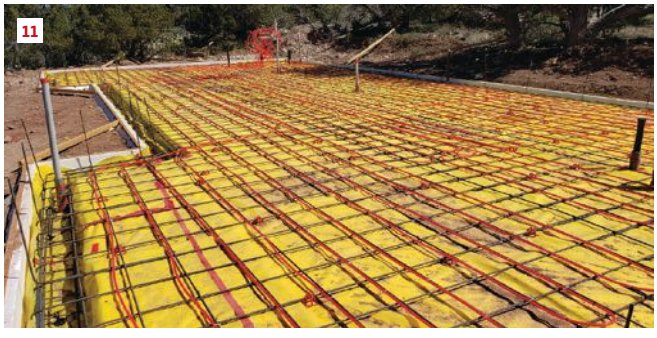

9. Durable Circular Saw Blade
Designed for cutting through nail-embedded wood and abrasive materials such as asphalt shingles, Diablo's Demo Demon Framing/Demolition circular saw blade is well-suited for demolishing old roofs, siding, subfloors, etc., according to the manufacturer. Diablo says the Dura-Blend carbide used in the blades provides up to 15 times the cutting life of standard carbide blades, and the saw's carbide teeth are ground to tight tolerances for improved tracking control. A thin-kerf design promotes speed and accuracy. The suggested retail price is $15. diablotools.com

10. Bathtub Drain Technology
California Faucets' sleek ZeroDrain is now available for bathtub applications in more than 25 finishes. Made from high-quality brass, ZeroDrain for tubs offers a cleaner aesthetic, quicker installation with fewer parts, and easier maintenance than other drains, along with virtually clog-free operation, according to the manufacturer. California Faucets says ZeroDrain fits drop-in or free-standing bathtubs with a standard hole size and with integral (molded into the tub wall) overflow. Prices for ZeroDrain start at $730 for a polished chrome finish. calfaucets.com

11. Shallow Foundation Form
Mono Slab EZ Form for shallow foundations complies with IRC, IBC, and IECC code requirements, combines forming and insulating into a single step, and allows backfilling before concrete placement. Mono Slab says the product is easy to use and saves users time, labor, and money. The only additional materials needed are wood or steel stakes and standard 2x8 lumber. Mono Slab is available in seven different forms. monoslabezform.com

12. Trimboard Protective Film
Westlake Royal Building Products offers its Kleer Protective Film on Kleer Trimboards and Sheets with both smooth and wood-grain surfaces. The film is designed to protect the trim against dust and dirt during storage, handling, and installation. The manufacturer says the film, which should be removed immediately upon installation of the trim, peels off easily without leaving residue behind. Products with the film applied should not be exposed to direct sunlight for extended periods. kleerlumber.com

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Milwaukee M18 Fuel Drill/Driver Combo Kit

BY JAKE LEWANDOWSKI

The team at Great Lakes Builders recently had the opportunity to try out Milwaukee's new M18 Fuel 1/2-inch hammer drill (model 2906-20) and 1/4-inch hex impact driver (model 2957-20), which come packaged as a combo kit (3696-22) with two batteries, a charger, and a blow-molded case. Not a shock: These tools are winners.

HAMMER DRILL

The 1/2-inch hammer drill was an unexpected favorite with the crew, mainly because of its compact size, ergonomics, and fit and finish. Two things that stood out immediately were the knurling on the all-metal chuck and the positive mechanical feeling of the detents when engaging the clutch. I thought that out of the box, the settings for the trigger and the work light were just about perfect, but with the One Key system, you can fine-tune the settings for functions such as the trigger ramp-up speed, the brightness and duration of the work light, and the maximum rpm.

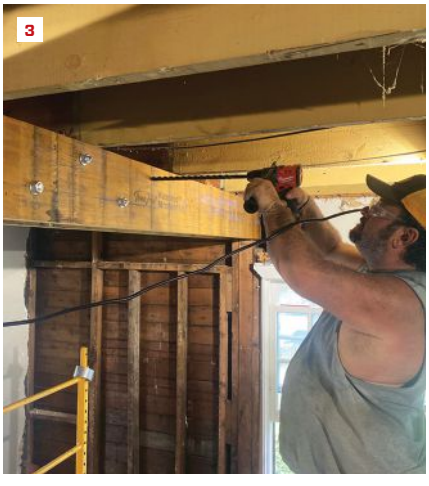
Another great feature is the auto stop function, which prevents over-rotation when the drill binds up. With 1,400 inch-pounds of torque, this is an important safety feature. Again, with the One Key system, you can customize the auto stop control mode with low-, medium-, and high-sensitivity settings.

When equipped with the included M18 Redlithium XC5.0-Ah battery, the drill had excellent runtime.

HEX IMPACT DRIVER

Milwaukee says that this 1/4-inch impact driver is the fastest and most powerful in its class, with 2,000 inch-pounds of torque, and I can't argue with that claim. It has a three-LED work light that does an excellent job of illuminating the work. Bit insertion and removal was a breeze and absolutely top-notch, and we had zero problems driving any of the structural fasteners that we use day in and day out. Runtime (with the 5.0-Ah battery) was also excellent. Like the hammer drill, the impact driver is equipped with the One Key system, so you can dial-in the settings for just about all of the tool's functions.

Ultimately, I really liked this impact driver. However, the crew didn't feel that the additional power it offered was enough to convince them to switch battery platforms. In addition, we often prefer to use oil pulse or hydraulic impact drivers, which are significantly quieter (but not as powerful) as standard impact drivers. We spend a lot of our time driving fasteners inside joist bays, which tend to amplify the sound generated by an already-noisy tool. Quieter tools make a huge difference when you're working in



Photos by Jake Lewandowski

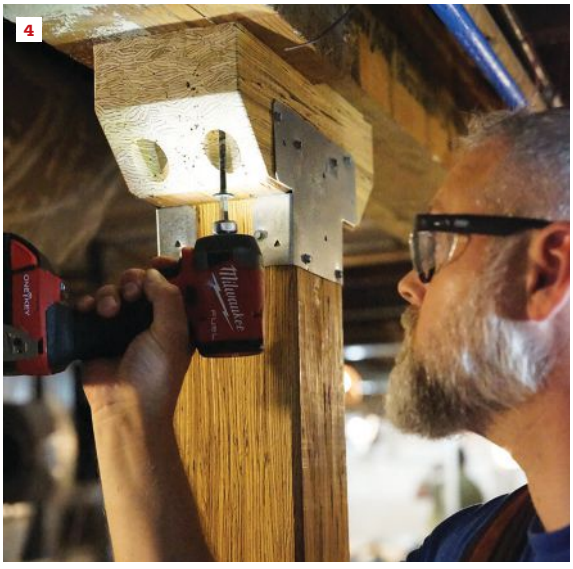
Milwaukee's M18 Fuel drill/driver combo kit (3696-22) includes a 1/2-inch hammer drill and a 1/4-inch hex impact driver **(1)**. With 1,400 inch-pounds of torque, the drill has the power to bore big holes through heavy timber and dense engineered lumber **(2, 3)**, and an effective and adjustable clutch to stop the drill quickly if the bit gets bound up.

framing cavities; for example, when you're retrofitting joist hangers and driving hundreds of 1 1/2-inch and 2 1/2-inch #9 and #10 SDS screws.

CONCLUSION

The M18 Fuel 1/2-inch hammer drill and 1/4-inch hex impact driver are great tools, and I don't think you could go wrong with either one of them, especially if you are already on the Milwaukee M18 platform. With the power and features mentioned above, the combo kit is a great choice, considering that it comes with two 5.0-Ah batteries. But I think it could be even better if you paired this kit with an oil pulse or hydraulic impact (Milwaukee's M18 Fuel Surge model 2760-20, for example) and some right-angle accessories, along with a good assortment of extensions and bits. That combination would be a moneymaker, while making for a safer—and quieter—jobsite. You'd have a heavy-hitting hammer drill that has a great auxiliary handle and auto stop technology in a compact size, a low-torque, low-decibel impact when loud noises are a concern, along with a beast of an impact with enough power to drive the largest of fasteners when you're in open-air conditions. With the combo kit +one, you would easily be able to fasten or drill almost anything.

JLC contributing editor Jake Lewandowski is a construction manager with his family's business, Great Lakes Builders (greatlakesbuildersinc.com), which specializes in structural repairs in Greater Chicago. Follow him on Instagram: @jakemlewandowski.



Milwaukee's compact and powerful M18 Fuel impact driver features 2,000 inch-pounds of torque **(4)**.

Rockler Portable Drill Guide

BY JOHN CARROLL

In his classic treatise *The Nature and Art of Workmanship*, David Pye makes the distinction between "workmanship of risk" and "workmanship of certainty." In my work in residential carpentry and masonry, I usually practice workmanship of risk when I drill holes. I use a portable drill and rely on my eye to get the holes reasonably square to the surface.

In a cabinet shop or a machine shop, where more precision is needed, fabricators usually practice workmanship of certainty. By using a drill press, which holds the drill rigidly in place, they can drill holes that are precisely located and square to the surface. If they want to drill holes at any angle other than 90 degrees, they can rotate the table of the drill press to that angle. They can also adjust a stop on the drill press to regulate the depth of the holes they drill. Once they get their drill press set up, furthermore, they can quickly drill additional holes the same depth, the same angle, and the same distance from the fence of the table.

Although I seldom require the kind of precision that a drill press delivers, I occasionally need more precision than I can get drilling freehand and by eye. Like most experienced builders, I've developed a few techniques to improve my accuracy with a portable drill. For example, setting a block of wood with a perpendicular line drawn on it next to the hole I'm drilling provides a reference to follow as I drill freehand, while taping the drill bit at the required measurement helps me get the holes to the right depth.

These measures help, but they are still in the realm of workmanship of risk. Although the block serves as a guide, I'm still drilling freehand and by eye. The tape doesn't serve as a stop; it's a visual guide, and it usually starts to deteriorate after a few holes.

Because of these shortcomings, I recently invested in a Rockler Portable Drill Guide. While I researched a number of portable guides, I chose this model because it's larger and seemed to be of better quality than the others I looked at. Rockler also provides a very good (and convincing) demonstration of its drill guide on its website.

Features. The Portable Drill Guide has many of the features of a drill press **(1, 2)**. The base can be locked in at any angle from 0 to 60 degrees, readable via a protractor scale on the base. There is an integral depth stop that restricts the depth of the holes bored. The base has strategically placed countersunk holes, which make it easy to attach a fence with screws. It comes with two pins that can be threaded into the base in order to center the drill on a narrow workpiece or the edge of a door. There's also a V-groove on the base that allows the guide to be used to drill round material.

It would be fair to call the Rockler drill guide a "poor man's drill press," and I think a lot of people buy it because they want to reduce the risk of drilling freehand without investing in a drill press. It's also a good choice for people who don't have the space for a drill press.

For me, though, the most important feature of the drill guide is its portability. When building and remodeling, we often can't bring the material we're working on to a stationary tool because the material we're using either is too large or is already installed. We don't run a 3-foot door through a table saw, for example. Instead, we bring a hand-held circular saw to the door. If we want to reduce the risk of a bad cut, we set up a straightedge or a track to guide the saw. Bringing a portable tool to the workpiece and managing to get controlled and precise results is a valuable combination for builders.

Accuracy. The Rockler drill guide does just that. On a recent project, I needed to drill a pair of 5/8-inch-diameter holes horizontally for galvanized bolts that would serve a structural function. The 6-inch-long bolts had to run straight through a 4x4 post and a 2x10 ledger with a small margin for error; if I veered off-center, either I would miss the end of the piece I was attaching, or I would end up in the end of a ledger coming from the other direction. So I used the drill guide as I bored these holes. I started by using a long 1/4-inch bit to drill a pilot hole **(3)**, then switched to a 5/8-inch-diameter bit to finish this boring task. The results were excellent **(4)**.

Lessons learned. The Rockler Portable Drill Guide has served me well when I've needed more precision than I could get drilling freehand. I did need to climb up a learning curve as I worked, however. The first thing I learned is that you need to lubricate the tubular guides. Rockler recommends (and offers on its website) Boeshield T-9 Waterproof Lubricant. If you invest in the Rockler drill guide, you should definitely purchase a container of the Boeshield, too.

The second thing I learned is that you need a sharp drill bit with a brad point or centering screw. After indenting the center of the layout with a center punch, I used my brad point to line up the drill. This step keeps the drill bit from wandering slightly off course.

The third thing I learned is that you have to continuously clear the drill bit when drilling into wet, treated lumber. Doing this requires that you raise the drill frequently to clear the drill bit of wet wood shavings. Despite the drill guide's versatility and precision, it is not a heavy-duty drill press capable of hogging through very hard or wet wood with a large, dull drill bit (remember, the shaft that connects the drill to the 1/2-inch Jacobs chuck is only 1/4 inch in diameter). But if you work within this guide's limitations, you will be able to drill clean and accurate holes at any angle through virtually any material, bringing a degree of certainty to your workmanship. Price: $200. rockler.com

John Carroll, author of Working Alone, *is a builder who lives and works in Durham, N.C.*

Photos by Matthew Navey

The Rockler portable drill guide has a 1/2-inch Jacobs chuck with a 1/4-inch hex shank on top that works easily with most drills **(1, 2)**. To accurately drill 5/8-inch-diameter holes through a 4x4 post and 2x10 ledger, the author first drilled 1/4-inch-diameter pilot holes **(3)**, then switched to a 5/8-inch-diameter bit to finish the holes **(4)**.

BY WILL WALLACE-GUSAKOV

Helping Rebuild Notre Dame

On the evening of April 15, 2019, a fire broke out in the attic of Notre Dame cathedral during a maintenance project **(1)**. The blaze would go on to destroy the entirety of the Gothic church's roof, including its iconic 19th-century spire. A majority of the estimated 400 tons of lead roofing and cladding vaporized from the high temperatures, and the underlying oak timber framing, most of which dated back to the 12th and 13th centuries, was destroyed. Hours later, after the fire was contained, French President Emmanuel Macron set a five-year deadline to restore the sacred structure in the heart of Paris.

An accurate replica. Last year, French colleagues associated with Charpentiers sans Frontières (Carpenters Without Borders, of which I'm a member) contacted me because their company, Ateliers Desmonts, had won the contract to rebuild the timber-framed roof over the cathedral's nave and choir areas. They hired me to help create an accurate replica of the medieval timber frame, down to individual details in each truss and framing member destroyed by the fire. Starting this past January, I spent six months working in Normandy, a few hours outside of Paris, hand-hewing oak beams with a Gothic-style broadaxe **(2)** and laying out and cutting wood joinery.

An important concern was the hand-tooled finish of the oak timbers used (timbers "hand hewn with a broad-axe" was written into the spec of this big government job—a watershed moment for traditional hand-tool carpenters). We researched historical sources and tool marks in extant contemporary frames and set criteria for the hewing axes to be used. We studied historical photographs and experimented with axes, adzes, and chisels to create full-scale prototypes of joinery and sculptural details, which were then reviewed by the project architects. Every effort was made to reproduce the famous medieval roof frame (affectionately known as *la forêt*—"the forest") both in detail and in spirit.

The nave frame. I worked mainly on the principal roof trusses over the cathedral's nave. To help re-create the nave's 11 principal trusses and 46 secondary trusses, we drew from Point Cloud scans, archival photographs, and technical documents from the architectural team. We used traditional *piquage* (French plumb line scribe) methods to lay out the frame. Joinery was cut using modern tools such as chain mortisers and circular saws as well as hand tools like chisels, planes, drawknives, and side axes. To verify everything fit together, we raised the full-scale nave frame at the Normandy worksite. The completed nave frame measured 46 feet wide by 33 feet high by 115 feet long (the 11 principal trusses are spaced roughly 12 feet apart) **(3)**.

I returned home in July just as the nave frame was beginning to be disassembled bay by bay and transported piecemeal to Paris. Because of jobsite constraints, the trusses are being reassembled one at a time on site and hoisted into place. This methodical, bay-by-bay truss installation over the nave and choir areas will take roughly six months.

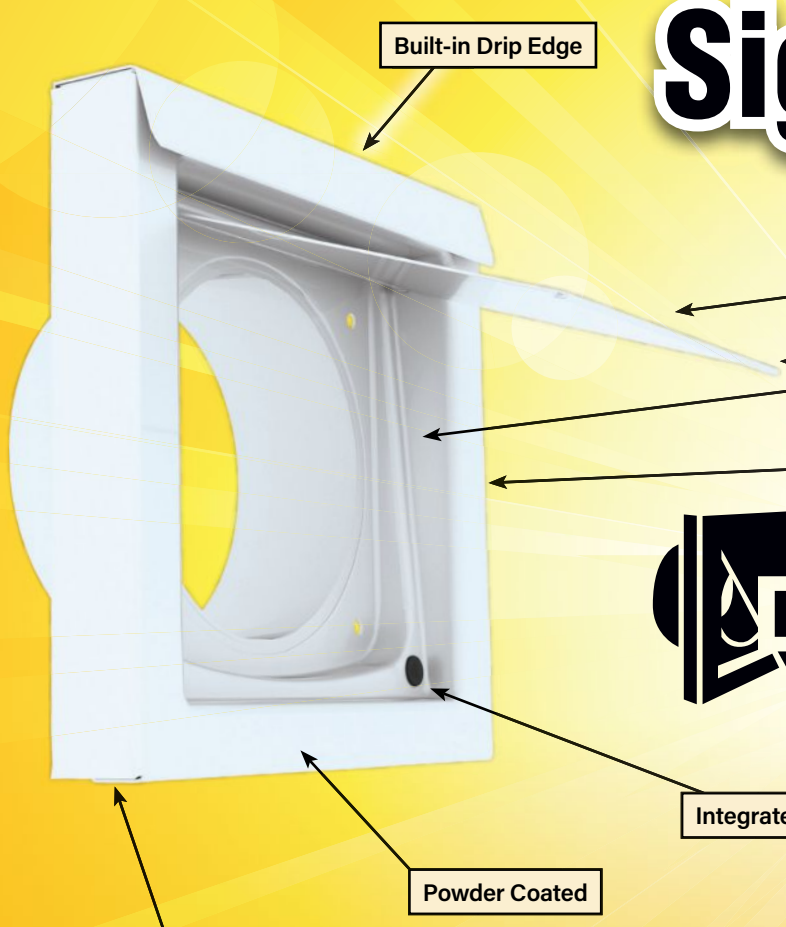
According to French officials, the cathedral will be partially open for mass and to visitors in December 2024. The final restoration work will take years to complete.

Will Wallace-Gusakov operates Goosewing Timberworks in Lincoln, Vt.

Photos: 1, Adobe Stock by David Henry; 2, Will Wallace-Gusakov; 3, Miles Jenness

Upon Closer Inspection Excellence Stands Out

Sight To See



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