News of Interest for and from the Connecticut Association of Home Inspectors, Inc.

CAHI MONTHLY NEWS

October 2021 Volume 14, Issue 10

Presidents Corner

The Connecticut Association of Home Inspectors, INC. was founded in 1992. We are approaching its 30 year anniversary. It was founded on the premise that providing education to home inspectors in Connecticut would make the profession stronger, which in turn would benefit the consumer. It was born a “live” meeting organization and will continue to have live meetings. However, with Zoom, live meeting attendance was waning.

We decided to force members out of their rabbit holes with the September meeting. The September membership meeting was standing room only as we had a rockstar presenter, munchies and a TV raffle. When speaking with members that night I found that most viewed meetings on Zoom, not because of Covid, but because of convenience. All whom I spoke with said it was GOOD to be back in the meeting room and thanked the board for the nudge.

Earlier that night at our board meeting the board voted unanimously to suspend Zoom coverage of the meetings. Zoom was instituted as a stop gap measure when the state closed down and we could not have meetings. It was always viewed as a temporary means to provide education and credits, as the state refused to suspend our credit requirements. We did the best we could, but we were not as good as we wanted to be with Zoom. So, the state reopened and now we are back at what we do best. Live presentation.

Please do not view this as a disregard for the pandemic. However, if we are out there working, shopping, going to restaurants and doing all the other things that life requires, our monthly meetings should be treated no differently. We are aware of the vaccine rate in Connecticut. I track the daily covid positivity rate which has been hovering around 2%. We will always do what is best to keep members safe. But right now, life moves on. See you at the October meeting!

Stan

“You’ve got to roll with the punches to get to what’s real.”
— David Lee Roth

MONTHLY MEETINGS – Details & Info

CAHI’s regular monthly meetings are held at the Best Western located at 201 Washington Ave (RT 5), North Haven. Meetings are also broadcast via Zoom. Meetings are still free to members but RESERVATIONS are a MUST. Reservations can be made at our CAHI website.

Most meetings are on the fourth Wednesday of the month from 7-9pm. Guests are always welcome! Guests may attend 2 free monthly meetings to experience our presentations, meet our members, and receive a CE attendance certificate.

Joining CAHI may be done at anytime of the year through our Membership Page.

INSIDE THIS ISSUE

Meeting Dates!

Oct 27th

Presenter - Greg Bebee

Harvey Windows

Lansing Warehouse
221 Commerce Street
East Haven

Nov 17th

TBD

September Meeting Records High Turn Out

CAHI Members were out in numbers this last month. Social distancing was maintained and our speaker was Great or even Electrifying! Final head count was 55 members.

Long time CAHI member Mike Haertel went home with the big screen TV.   I was really offended when he would not let me load it in my vehicle for delivery.

On the negative side, the traffic flow for food items has to be changed. Set up crew will improve that or be flogged prior to our October meeting.

Hope to see more members at the October meeting.

Pictures follow.

CAHI Scholarship Recipients Announced

CAHI awards monetary academic scholarrships to deserving students connected to our current members. This money can be used toward tuition or other education related expenses.

This years worthy recipients are:

Alexa Reis, Brianna Champagne, and Elizabeth Halbert.

Watch for future request or calls for application for 2022. Questions can be sent to Scholarship Chairmen Woody Dawson or Dan Kristiansen

Charles E. Champagne

Charles E. Champagne, 84, passed away on Monday September 20, 2021. Charlie was a man from a bygone era. He loved big band and jazz, played saxophone and could call up a pitch perfect whistling rendition of his Frank, Sammy or “Dino” favorites. He was a self-made man who could fix or build anything. He never, ever, gave up. In his career, he rose to the position of Director of Physical Plant for Wesleyan University, and later as President of the Home Inspection Institute of America. He was born in Hartford to the late Ernest and Alice (Cotter) Champagne. He now joins his wife of 56 years, Annette R. Champagne and his predeceased children, Karen, Stephen and Jean Marie. Charlie is survived by his children Marialise Maroun, Diane Champagne Ritchie, Daniel Champagne; his grandchildren Thomas, Jessica, Allison, Harley, Stephanie, Daniel, Karen, Stephen, Jennifer, Michelle, Amber and Brianna; fifteen great-grandchildren; his daughter-in-law Annette Champagne; his sister Kathleen and many nieces and nephews. Services were held privately for family and close friends.

In honor of our member and friend the CAHI has made a donation to the American Lung Association

Preserving a Stone Retaining Wall

BY GERRET WIKOFF

The middle third of a leaning, unreinforced stone retaining wall collapsed during excavation by the homeowner **(1)**.

At the street-adjacent curved section of wall, a steel anchor post was driven into undisturbed soil **(2)**. A come-along attached to the steel anchor and a 4-by wall brace pulled the wall back to plumb. Workers reset the 2x4 angled bracing after plumbing up the wall **(3)**.

Last spring, a returning client asked me about repairing a leaning retaining wall for a large planter in his driveway. (The year before, I had repaired the porch on his late 1920s Storybook-style bungalow home in Los Angeles; see "Repairing a Bungalow Balcony," Feb/21). I suggested if he were to dig the soil out from behind the stone wall, we could add rebar, push it plumb, pump in some concrete to bond it together, and Bob's your uncle. Possessing a shovel and the gumption to use it, the homeowner started excavating behind the wall. A few days into the project, the middle section collapsed; he thought that the clay soil must have been holding it in place, but I suspected otherwise **(1)**.

I investigated the collapsed section and found that it was an unreinforced wall with no rebar connecting the stone to its concrete footing and that the site's expansive clay soil had managed to push the stone wall beyond the edge of its footing. Over the years, the clay soil would get saturated, push the wall a little, and then contract, with the remaining gap eventually filling in; the cycle had repeated itself to the point that the wall had nearly sheared off its footing, particularly in the area where it collapsed.

Complicating any repair efforts, the circa-1920s stone wall had been rebuilt in the 1970s using Portland cement mortar, which was stronger than the stone it held together (the stone broke when we tried to chip the mortar off). The original wall would have been built using lime mortar, which is relatively soft and would have been easy to break apart from the stone. As a result, we needed to reassemble the wall with large, salvaged pieces while I tried to get my hands on similar stone for infill.

I didn't want to attempt to move the wall back onto the footing with a Bobcat and risk further collapse while repairing the wall, so my plan was to rebuild the collapsed portion, then bond the driveway wall in situ to a new, poured-concrete retaining wall, doing an end run around its precarious balancing act.

Caught between codes. The client's house is located in one of Los Angeles' several HPOZs (Historical Preservation Overlay Zones), which in this case translated to "keep the wall as close to original as possible." Working in these zones typically involves submitting plans to the local HPOZ committee for review, then several back-and-forth submissions until the committee's satisfied you are maintaining the integrity of the original structure.

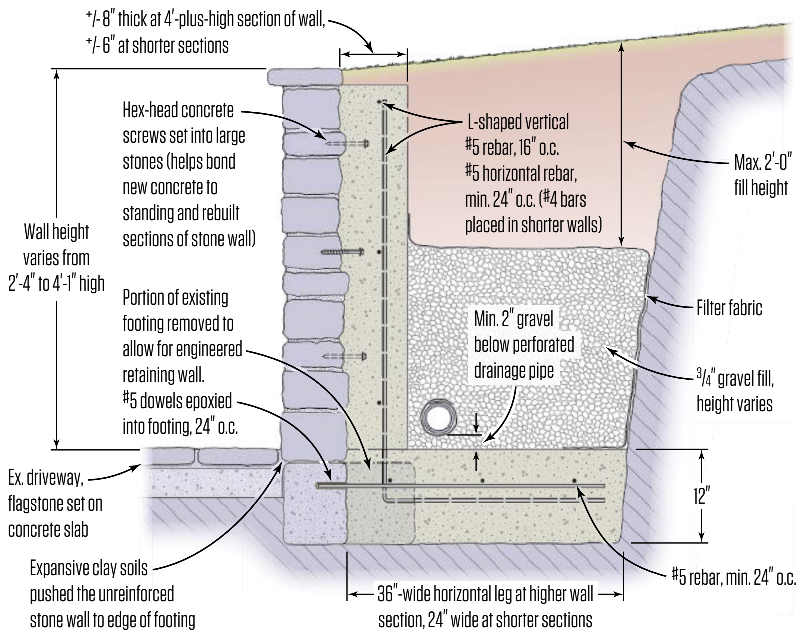
To avoid this potentially long, drawn-out process,

Photos by Gerret Wikoff; illustration by Tim Healey exacerbated by the pandemic, I proposed to the planning official that we replace the fallen-down portion with salvaged original stones as much as possible, which she approved. But, because a portion of the wall exceeded the Los Angeles Department of Building and Safety's maximum height of 4 feet, the wall required engineering and would need to be approved by the city's building department as well.

The design. The driveway wall was a curved "J" shape and was roughly 30 lineal feet long. Its height varied from 2 feet 4 inches high along the curved section adjacent to the city sidewalk to roughly 4 feet 1 inch high where it butted into the home by the garage doors. The middle third of the wall had partially collapsed while the rest of the wall (the curved, shorter wall at one end and the 4-foot-plus-high section at the other end) remained standing.

Going forward, the only practical way to install a new, poured-concrete retaining wall without tearing up the homeowner's

Reverse-L Retaining Wall



4


5


6


7


After the interior side of the standing wall sections were pressure-washed **(4)**, the rebar was placed and the footing was poured using 3,000-psi pea-gravel concrete **(5)**. Horizontal wall rebar was installed, and perforated drainage piping was dry-fit **(6)**. Hex-head concrete screws set into the stones help bond the new concrete to the stone **(7)**.

The collapsed portion of the wall was rebuilt using salvaged and new stone **(8)**. Sheets of 1/4-inch-thick Masonite, 2x4 horizontal blocks, and sandbags were used as wall forms on the shorter curved wall sections **(9)**.

driveway was with a “reverse L” retaining wall. Where I work, the typical retaining wall has the L pointing away from the hill it is retaining. But, with a reverse L, the L shape points toward the hill and its success depends on the weight of the soil pressing down on the horizontal leg of the L to keep the wall from overturning. Therefore, the higher the vertical leg is, the wider the horizontal leg has to be.

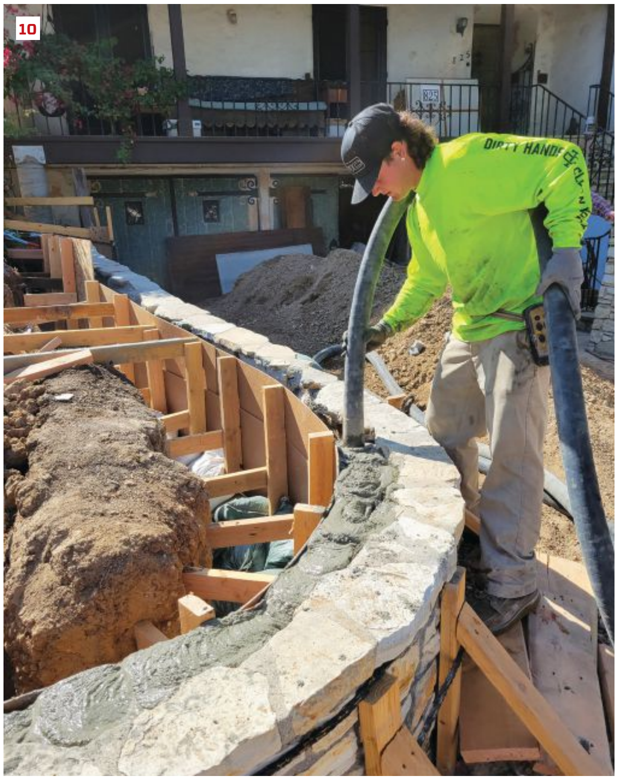
Using SketchUp (and its companion program LayOut), I drew up a set of rough plans and had an engineer size the concrete retaining wall and rebar, then tweaked my drawings to conform to the engineering calculations and submitted them to the city. Corrections ensued, due mainly to the evolution in code since the wall was originally constructed; for example, the building department wanted a guardrail on any portions of the retaining wall higher than 30 inches. Here, we had to point out that the job was in the HPOZ, and those corrections were not in compliance with HPOZ regulations (HPOZ officials have a lot of power in maintaining portions of a home visible from the street so they look original, and HPOZ regulations can trump local and state building codes).

RESTORING THE WALL

Permit in hand, my crew and I started in earnest. The first step was to brace the unreinforced stone wall. This was done by making screwed-together 2x4 angled bracing and bolting it down with large Titan concrete screws to the sidewalk and driveway on the outside of the shorter curved wall. We then braced the wall to the interior side with horizontal 2x4s to keep the wall from falling inward. With excavation complete on the short wall, we drove a steel anchor fabricated by a welder into undisturbed soil **(2)**. We used a come-along attached to the steel anchor and a 4-by wall brace to pull the wall back to plumb, then reset the 2x4 angled bracing **(3)**. Because the short wall was broken into two large sections, we forced the second one into position after moving the first.

Given the greater mass of the upper 4-foot-high wall, we braced the wall with 4-by lumber taller than the wall, then sledge-hammered two steel anchors into the soil. Next, we hooked up three come-alongs with chain wrapped around the top of the 4-by wall braces and pulled the wall gradually back to plumb. We then braced the inside of the wall against the soil embankment to keep it locked in place. The next step was to rent a pressure washer and clean the interior side of the standing wall sections of soil and debris **(4)**.

The placement of the rebar was our next priority. In general terms, we used #4 bars (which were easier to bend) horizontally on the shorter curved section and #5 bars on the taller section by the house. We increased the thickness of the concrete wall from 6 inches to 8 inches and widened the horizontal leg of our reverse L from 24 inches wide to 36 inches wide as the wall approached the higher 4-foot section (see illustration, page 25).



The walls were poured without any blow-outs **(10)**. The author's crew finished off the top of the wall, working around the irregularly shaped capstone **(11)**. The completed retaining wall **(12)**.

Because of the wall's wavy shape and the space constraints for formwork, we installed the reverse-L retaining wall in two pours. At the horizontal leg or footing, we epoxied #4 dowels into the existing footing, then ran #4 bars the length of the footing (switching to #5 bar in the straighter, higher section). Using a rebar bender, we bent #5 bars into L-shapes and tie-wired them together.

After obtaining the approval from the inspector, we poured the footing using 3,000-psi pea-gravel concrete **(5)**. I prefer this stronger mix to the standard 2,500-psi concrete minimum prescribed by the city because the additional cost is minimal compared with the benefit. But, since we were essentially rebuilding a retaining wall for a large planter with proper drainage, the additional cost of using an even stronger "big rock" concrete mix with an accompanying larger pump wasn't justified.

With the footing in place, we placed the horizontal rebar and dry-fit the drainage piping **(6)**. The hillside face of the stone was irregular and the new concrete would lock into this toothy surface fairly well. But to improve the bond, we drilled holes into the larger stones and set hex-head concrete screws **(7)** with a battery-powered impact driver.

The next step was to rebuild the fallen-down portion of the wall. I was able to buy a few hundred pounds of similar stones, and we mortared the wall back together with Spec Mix mortar, trying to match the original style as much as possible **(8)**.

Next, we worked on the wall forms. Due to the pandemic, plywood had tripled in cost, so I wanted a cost-effective alternative. This idea, Mickey Mouse as it was, worked surprisingly well: We placed 2x4 vertical ribs approximately 2 feet on-center and braced them with sandbags at the bottom and with 2x4 horizontal blocks to the side of the excavation **(9)**. This was to hold $1/4$-inch Masonite in place around the curves. In the 4-foot-tall section, we placed $7/16$-inch OSB and braced the forms similarly. We poured the walls without any blow-outs **(10)**, and our crew finished off the top of the wall, working around the irregularly shaped capstone **(11)**.

Finishing up, we installed the drainage piping in a sock, buried it in gravel, wrapped filter fabric, and backfilled. Then we loaded the rest of the soil into a dumpster and hauled it off. With the job complete **(12)**, the Los Angeles city building inspector signed off on it.

Gerret Wikoff is a builder-remodeler based in Los Angeles.

How to Determine Water Heater Age

by Peter Gray, Sensible Digs

As a home inspector, it's crucial to be able to identify the age of a water heater to prevent corrosion and unnecessary water bills. Most hot water heaters are good for no more than 10 to 15 years. But how exactly can you tell?

In this article, we'll walk you through some of the leading water heater brands and manufacturers, and give you a handy guide on how to gauge the age. So let's get started.

Determining water heater age is simple on most newer models—the installation date is generally recorded on the information sticker. On older models, however, it's likely you'll need to do some detective work. You may want to start by decoding the serial number—find the details toward the side of the heater. It's usually placed nearby the energy guide or warning labels. The serial number holds two crucial details: the month and year of construction. But this is where it gets a little tricky. Manufacturers tend to use different patterns or formats so you'll have to find your specific manufacturer or brand in order to do this.

To help you decipher your serial number, we've put together a guide plus examples from multiple brands and manufacturers.

Included brands	Examples of serial numbers
A.O. Smith	Example one: 9808****** (1998, week eight) Example two: *F06******* (June 2006) Example three: 1617******* (2016, week 17)
PermaGlas	
Glascote	

Figure 1: A. O. Smith

A.O. Smith: A.O. Smith (Figure 1) uses a very basic system which should be straightforward to figure out. For their older, pre-1997 models, they state the year and week within the first four numbers. For example, YYWWxxxxxx. Current models use the same sequence. For models pre–2008, you should see a number followed by a letter ranging from 'A' to 'M' (excluding 'I'). 'A' equals January and 'M' equals December. The two following numbers indicate the year.

Rheem: Rheem (Figure 2) also adopts a simple approach for their different brands. Their newer models, (constructed after 2000) are identified by the month, then the year of manufacture. In the first example we can see the first and second digits are the month. The third and fourth are the year. However, if you look at example two, you'll notice the numerical order has changed slightly—instead of being the first four digits it's displayed as the third to sixth. Rheem sometimes presents the key dates in this alternative way. For their older pre–1999 models, Rheem used weeks instead of months.

Included brands	Examples of serial numbers
Rheem	Example one: 1110****** (November 2010) Example two: **1298****** (week 12, 1998)
Richmond	
Vista Therm	
Aqua Therm	
Energy Master	
Lowe's	
Intertherm & Miller	
Citation	
ABS	
Mainstream	
Cimarron	
Servi-Star	
Van Guard	
True Value	
Ruud	
Coast to Coast	
Montgomery Ward	

Figure 2: Rheem

Navien: This manufacturer takes a totally different approach (Figure 3). On newer models, you'll see four numbers followed by a single letter. After this letter, there's a number indicating the year of production followed by another letter. On older models, Navien simply put the year after the first four numbers. They've also chosen not to indicate which month or week their units were built.

Included brands	Examples of serial numbers
Navien	Example one: ****C14X******* (production year is 2014) Example two: ****-2005-****-**** (production year is 2005)

Figure 3: Navien

Bradford White: Instead of using numbers, Bradford White uses two letters (Figure 4). The first indicates the year and the second signifies the month.

Included brands	Examples of serial numbers
Bradford White	Example one: DG******* (July 2007); Example two: NK******* (October 1996)
Jetglas	
Year (1st letter)	**Month (2nd letter)**
S = 2018	
P = 2017	
N = 2016	
M = 2015	
L = 2014	
K = 2013	
J = 2012	A = January
H = 2011	B = February
G = 2010	C = March
F = 2009	D = April
E = 2008	E = May
D = 2007	F = June
C = 2006	G = July
B = 2005	H = August
A = 2004	J = September
Z = 2003	K = October
Y = 2002	L = November
X = 2001	M = December
W = 2000	
T = 1999	
S = 1998	
P = 1997	
N = 1996	

Figure 4: Bradford White

American Water Heater: Because American water heaters are, as of 2001, a subsidiary of A. O. Smith, they now use an identical serial numbering system. If you look at our examples in Figure 5, is a pre–2000 and the second is pre–2008. In example one, they've referenced the year as the initial two digits. The next two figures relate to the week number. In example two, we see a system consisting of the letters 'A' to 'M', excluding 'I', to represent the month. The third and fourth numbers indicate the year.

Included brands	Examples of serial numbers
American Water Heater	Example one: 9510****** (1995, week 10) Example two: *E05******* (May 2005)
Champion	
Riviera	
Aquamatic	
Aqua Therm	
Raywall	
Best Deluxe	
King-Line	
Whirlpool	
Environtemp	
Deluxe	
Prestige	
Sentinel	
Proline	
Proline-Plus	
Aqua Temp	
Premier	
Nationaline	
King-Cleen	
Revere	
Apex	

Figure 5: American Water Heater

State Industries: For State Industries, we'll show you three examples. They have two general formats—one using only numbers, and another using letters and numbers (Figure 6). For the first example, numbers one and two represent the year, and numbers three and four indicate the week. In our second and third examples, State Industries uses the same code structure—letters to indicate the month and numbers for the year. However, the format of the third is slightly different—it has an extra non-relevant number in front of the date sequence.

Included brands	Examples of serial numbers
State	Example one: 1210******* (2012, week 10) Example two: E03******* (May 2003) Example three: *E03****** (May 2003)
Kenmore	
Freedom	
Freedom/Nipsco	
Ambassador	
Ace	
Barnett	
Crosley	
Century	
Nationaline	
President	
Energy Stretcher	
Thermo-Ki	
Regency	
Reliance	
Mission	

Figure 6: State Industries

For the letters, they use ‘A’ to ‘M’ (excluding I)—’A’ being January and ‘M’ December. Then the two following numbers indicate the year of production. For example, 06 equals 2006.

Lochinvar: Similar to Bradford White’s—Lochinvar uses letters for the month and year (Figure 7).

Included brands	Examples of serial numbers
Lochinvar Knight Golden Knight Energy Saver	Example one: PA******* (January 1997) Example two: XF******* (June 2001)
Year (1st letter)	**Month (2nd letter)**
A = 2004 B = 2005 C = 2006 D = 2007 E = 2008 F = 2009 G = 2010 H = 2011 J = 2012 K = 1993 L = 1994 M = 1995 N = 1996 P = 1997 S = 1998 T = 1999 W = 2000 X = 2001 Y = 2002 Z = 2003	A = January B = February C = March D = April E = May F = June G = July H = August J = September K = October L = November M = December

Figure 7: Lochinvar

Rinnai: Rinnai products carry two serial number pattern (Figure 8). On their newer models, they use letters to indicate both the month and year. For their older water heaters, pre–2010, Rinnai used numerical references. The first two for the year and the following two refer to the month. Their current system starts from the year 2009.

Included brands	Examples of serial numbers
Rinnai	Example one: JB. **-****** (February 2017) Example two: 04.03-****** (March 2004)
Year (1st letter)	**Month (2nd letter)**
A = 2009 B = 2010 C = 2011 D = 2012 E = 2013 F = 2014 G = 2015 H = 2016 J = 2017 K = 2018 L = 2019 M = 2020 N = 2021 P = 2022 R = 2023 S = 2024 T = 2025 W = 2026 X = 2027 Y = 2028 Z = 2029	A = January B = February C = March D = April E = May F = June G = July H = August J = September K = October L = November M = December

Figure 8: Rinnai

When Should You Replace Your Water Heater?
A water heater that is made from durable material and regularly maintained should last many years. However, no matter how good your water heater is, it won't last forever. Here are a few signs to watch for that could indicate your water heater is running out of steam.

1. Age of the Unit: The first question to ask yourself is "How old is the water heater?" The general lifespan could be in the region of 10 to 15 years. Using this guide should help you determine your water heater's age. Most experts, however, will likely suggest replacing your unit by the time it reaches its 15th birthday. Even if it's still working efficiently, its performance may soon begin to drop due to its age.

2. Less Hot Water: If you suddenly begin to notice a decline in the volume of hot water, it might be time to consider a replacement. Most people begin to notice a lack of water temperature—instead of hot water, it may flow lukewarm. Or perhaps the water heater suddenly struggles to provide enough heat for an average eight-minute hot shower.

3. Higher Heating Bills: A considerable amount of household energy is spent on heating water—18 percent. When an old water heater begins to reduce in performance, so does its efficiency. As a result, you may notice a rise in your heating bill.

4. Corrosion: Noticing corrosion on your water heater is a sure sign it's time for a replacement. This shouldn't, and rarely does, appear until the unit is significantly old. One sure way of spotting this is when you see red discoloration in the water. Red tinted water may mean rust inside the water heater.

Age Is Not Just a Number
Water heaters don't last forever—on average, most will need to be replaced within 10 to 15 years of service. However, unless you're keeping track of its birthdays, you'll have to determine your water heater's age for yourself. Fortunately, this is fairly easy as long as you know the serial number and brand name—and you have a handy guide to help you decode it.

About the Author

Peter Gray has been a homeowner for 35+ years and has always done his own repair and improvement tasks. As a retired plumber, Gray now spends his time teaching others how they can fix leaks, replace faucets, and make home improvements on a budget.

Photos by Rick Mills

Hybrid Wood/Steel Framing

Story poles and templates make it easier to integrate steel with wood framing

BY RICK MILLS

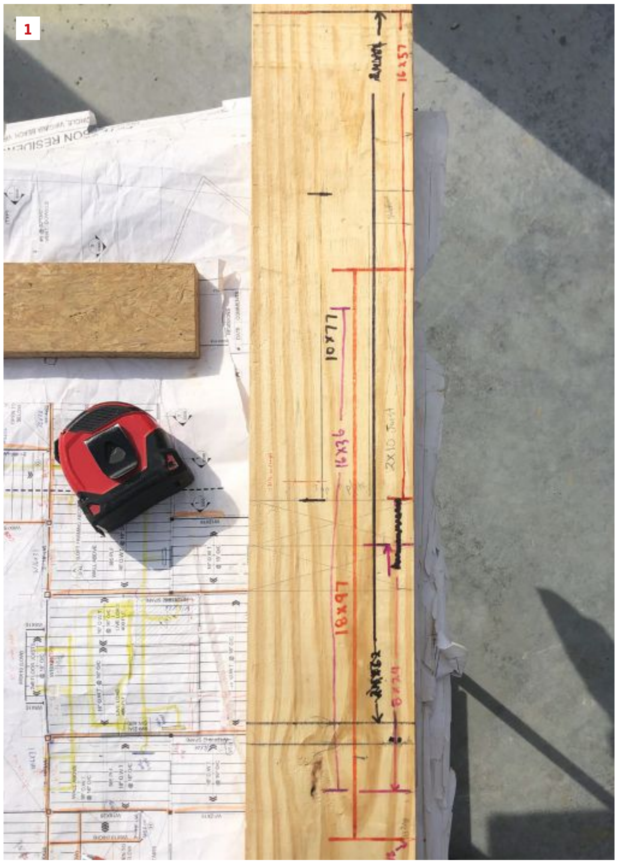
Not every job requires it, but steel has become increasingly common on our projects as engineers continue to raise the bar on their tolerances for deflection and shear strength. For anyone not familiar with the details of steel construction, it can be intimidating at first to unroll a set of structural plans with a lot of steel called out, and I remember well our first few projects that included more than just a steel beam inside a floor system. Looking at all the unfamiliar beam and post sizes and shapes, it was hard for me to transform the two-dimensional plans into a three-dimensional mental picture.

At Jackson Andrews Building + Design, where I'm a project manager, I've seen the complexity of steel and wood construction increase in recent years. Over several projects, I've deliberately familiarized myself with the different types of steel profiles and sizes so that now when I look at structural plans with both wood-framed and steel-framed details, I am able to focus on how everything will fit together.

WORKING WITH A STEEL FABRICATOR

Because a small, local shop supplied us with the steel for the large project featured in this article, we were able to assemble the steel as we installed the wood framing. This helped with scheduling, as we didn't have to wait for all the steel to be ready at once. Another benefit was that this gave us an opportunity to make adjustments to ensure better alignment with the framing members. By framing and installing steel simultaneously, we were able to complete the framing in one area while measuring for the next round of steel.

1



2

WIDE FLANGE BEAM

W-SHAPES
ASTM A-36

DESIGNATION DEPTH in Inches x WEIGHT Per Ft. Lbs.(Nominal Size)	WEIGHT Per Foot Lbs.	DEPTH Section in Inches	WIDTH Flange in Inches	FLANGE Thickness (Average) in Inches	WEB Thickness in Inches	Area of Section In.²	Section Modulus Sx In.³	**Surface Area Foot of Length.²
W4 x (4x4)	13	*4-1/8	4	3/8	1/4	3.83	5.46	1.96
W5 x	16	5	5	3/8	1/4	4.68	8.51	2.42
(5x5)	19	5-1/8	5	7/16	1/4	5.54	10.20	2.45
W6 x	9	5-7/8	4	3/16	3/16	2.68	5.56	2.23
(6x4)	12	6	4	1/4	1/4	3.55	7.31	2.26
	16	6-1/4	4	3/8	1/4	4.74	10.20	2.31
W6 x	15	6	6	1/4	1/4	4.43	9.72	2.92
(6x6)	20	6-1/4	6	3/8	1/4	5.87	13.40	2.96
	25	6-3/8	6-1/8	7/16	5/16	7.34	16.70	3.00
W8 x	10	7-7/8	4	3/16	3/16	2.96	7.81	2.56
(8x4)	13	8	4	1/4	1/4	3.84	9.91	2.58
	15	8-1/8	4	5/16	1/4	4.44	11.80	2.61
W8 x	18	8-1/8	5-1/4	5/16	1/4	5.26	15.20	3.03
(8x5-1/4)	21	8-1/4	5-1/4	3/8	1/4	6.16	18.20	3.05
W8 x	24	7-7/8	6-1/2	3/8	1/4	7.08	20.90	3.39
(8x6-1/2)	28	8	6-1/2	7/16	5/16	8.25	24.30	3.42
W8 x	31	8	8	7/16	5/16	9.13	27.50	3.89
(8x8)	35	8-1/8	8	1/2	5/16	10.30	31.20	3.92
	40	8-1/4	8-1/8	9/16	3/8	11.70	35.50	3.95
	48	8-1/2	8-1/8	11/16	3/8	14.10	43.30	4.00
	58	8-3/4	8-1/4	13/16	1/2	17.10	52.00	4.06
	67	9	8-1/4	15/16	9/16	19.70	60.40	4.11
W10 x	12	9-7/8	4	3/16	3/16	3.54	10.90	2.89
(10x4)	15	10	4	1/4	1/4	4.41	13.80	2.92
	17	10-1/8	4	5/16	1/4	4.99	16.20	2.94
	19	10-1/4	4	3/8	1/4	5.62	18.80	2.96
W10 x	22	10-1/8	5-3/4	3/8	1/4	6.49	23.20	3.53
(10x5-3/4)	26	10-3/8	5-3/4	7/16	1/4	7.61	27.90	3.56
	30	10-1/2	5-3/4	1/2	5/16	8.84	32.40	3.59
W10 x	33	9-3/4	8	7/16	5/16	9.71	35.00	4.16
(10x8)	39	9-7/8	8	1/2	5/16	11.50	42.10	4.19

Working from his marked-up plans, the author lays out the steel work for each location in full scale on a story pole **(1)**. The author refers to a printed list of steel sizes with actual dimensions when working with steel framing; the one above (from Coyote Steel) is a particularly useful resource **(2)**.

Depending on the steel fabricator and the scale of the project, you can elect to have the fabricator erect all the steel for the job at once. If you choose this approach, you need to have confidence in your layout and be willing to possibly make adjustments in the field later. Our approach is probably slower, because we rely on templates to communicate tricky details to the fabricator, but the back-and-forth process ultimately allows us to avoid making costly mistakes.

LABELS AND STORY POLES

To keep track of all the details and ultimately ensure a successful execution, we make extensive use of story poles in the layout process. Everything from elevations to the sizes of posts and beams and how they connect with the wood framing can be accurately tracked on a story pole.

Labeling system. When I first receive a set of plans, I like to go through each page with a highlighter and mark all the vertical and horizontal steel. This kick-starts the process of visualizing where things are located and where foundation and framing members intersect with beams and columns.

Once everything has been located and marked on the plans, I use a labeling system to differentiate between the various steel members, if one is not already included in the plans. I label all verticals with the letter C followed by a number, and all horizontals with an H and their corresponding number. For example, a W12x26 beam, which has a 12-inch-deep section and weighs 26 pounds per foot, might be identified with the label H23.

Next, I make a note next to the call numbers on the plans with the actual dimensions of the steel. This way, we know what size beam or column we're dealing with when we look at the plans and can transfer the actual steel sizes to our story poles or layout locations in the field. This step is necessary because there are sometimes slight variations in beam sizes from manufacturer to manufacturer and—because of the nature of the casting process—sometimes even from the same manufacturer, though most of the time those variations are less than 1/8 inch. When the steel arrives on-site, I always confirm dimensions and adjust as necessary.

Story poles. In the field, the marked-up plans make it easier to accurately lay out where everything goes, whether I'm marking up the foundation or the top of a framed wall. The project shown in this article included a poured concrete slab in a crawlspace foundation





The steel columns were shimmed to final elevation with steel shims and grouted later with non-shrinking grout **(3)** and locked in place with 2-by braces fastened to 2-by collars clamped around each column **(4, 5)**. Then framers began installing the sawn-lumber floor system in the first location, notching the framing as needed around the steel **(6, 7)**.

(see "High-Performance Crawlspace Foundation," Sept/20) and numerous steel columns located on either the foundation wall or the slab floor, with several columns extending to the roofline.

Rather than attach the steel columns directly to the footings and bury them between block work, or attach them to footing pads below the concrete slab, we decided to elevate the steel attachment points. We did this by reinforcing the CMU walls with additional rebar and grout wherever there was an attachment point and by forming a reinforced concrete "pedestal" above slab height on the interior of the foundation for each interior column. This way, if any of the steel columns needed adjustment later for plumb, they wouldn't be buried under the concrete.

Knowing how critical it was to have all the steel placements work out with the framing, we brought our framer on-site shortly after footings were poured and the CMU work was just underway. Working together on the layout gave us confidence that our steel column locations were accurate.

Using the top of the CMU wall as our benchmark elevation, I created story poles for each location with all the framing elements laid out to scale. On this project, we started with the house's main steel columns, which were located in the great room. To match the overall height of the house, which was about 30 feet, we scabbed together several long 2x8s to create the story poles.

While we waited for the first batch of steel columns to be fabricated and delivered, our team set the rebar and formed and poured the interior pedestals. Meanwhile, I began working on the vertical layout for the steel. There were enough details to keep track of in specific areas that we didn't want to lay out more than one area on a single pole if they didn't coordinate with each other.

For example, the two-story great room would have three layers of windows with steel between each window unit and a "U" shaped steel beam welded to the top of the columns to support a large roof overhang. Starting from the top of the CMU wall, our benchmark elevation, we laid out all the wood framing elements it would take to determine the top of the rafter bearing height at the roof. Then we shot grades with a transit across the top of our foundation wall and measured down to the top of each concrete pedestal location. This was the best way to ensure that each column would be level with the others. We took this measurement and added it to the story pole.

With all the wood framing elements marked on the story pole, the next step was to incorporate the steel into the layout. The first horizontal beams were in the first-floor ceiling joist system, which was being framed with 18-inch open web truss joists. All the steel that was called out in this area was +/-16 inches, depending on the exact callout; with a 2-by plate added to the top of the beam, the height works out to just under 18 inches, which is the height we would set all the second-floor steel to. The steel being slightly higher than the bottoms of the joists is actually good, because if anything deflected with load later, it would not drop into the ceiling plane.

The plans called for the second-floor ceiling to be framed with dimensional 2x10 joists, and all the steel we'd be using was around 8 inches—typically W8x24 wide-flange beams, which have a 7 1/8-inch depth and 6 1/2-inch flange width—so the same concept applied. As we added the steel locations to our story pole, we followed the same approach anywhere it would work, so that all the horizontal steel beams would be set 1 1/2 inches below the tops of the joists.

Topping off the great room was a pair of large W18x40 steel beams that spanned the entire space. As we worked through the details, it became clear that at one end of the room, the W18x40 beams would bear on HSS8x8 columns, while at the other end, each beam would need to be welded to the back of the corresponding 8x8 column, because those columns needed to be slightly taller to receive the steel for a large roof overhang. Laying out all of these details on the story pole was necessary to make it extremely clear how all the different elements would come together and to get the steel height right on the first shot.

STEEL COLUMNS

We had provided the steel fabricator with plywood templates for each column location that indicated the exact positions of the threaded bolts that hold the columns in place, so there were no surprises when erecting the steel. But we still needed to fine-tune their height and make sure they were plumb. One way to do this is by using a pair of nuts on each bolt with the flange sandwiched between them and tightening or loosening the lower nuts at each corner of the mounting flange to adjust the position of the column. In our case, the fabricator supplied us with bars of steel stock in different thicknesses to be used as shims as needed between the flange and the pier. In both methods, after the column is locked into place, the gap between the flange and the pier is filled with non-shrinking grout.

Once the first round of columns was erected, our framer devised a simple solution for bracing the free-standing steel. While the fabricator assured us that the base plate bolts would hold the 30-foot-tall columns in place while we worked on the framing, we didn't want to end up with a bunch of fallen steel if a coastal storm swooped through. To connect the tall columns to each other with simple 2-by bracing, he assembled slightly undersized sawn-lumber "clamps" that snugged up tightly around the steel when the screws holding them together were tightened. Then the braces could be fastened to the wood clamps with structural screws, tying the assembly together.

In the main part of the house, we commenced with framing the traditional "box" floor system, though at each column location, the mudsill and rim joists were interrupted. After setting all the sawn-lumber joists and laying down the subfloor, we were able to mark out the first-floor walls, which confirmed that our meticulous foundation layout was correct.

The framing crew erected an extensive temporary scaffolding system over a future outdoor living pavilion to install the complex steel framing for the master suite **(8)**.

BEAMS

The next step was to take the measurements for the horizontal beams that were part of the second-floor joist system. We took all the measurements at floor level because that was the most accurate place to measure from. Despite popular belief, steel is not always straight, and any measurements taken higher up on the columns had the potential to be off.

Scaffolding. In some parts of the house, we would be installing horizontal steel more than 16 feet above ground level. To safely and efficiently install the beams for the master suite, which was located partly over a future crawlspace for the outdoor living area, we assembled extensive temporary scaffolding. Where we had a level first-floor system in place, we assembled staging, with wheels on the lowest sections so we could move the staging around as needed. Not only did this allow us to be at the proper height to take accurate measurements and make templates for some of the more complicated steel intersections, it also allowed us to install all the steel and truss joists comfortably and safely from the same scaffold.

Openings for mechanicals. While putting together the order for our steel beams, I was also working on the order for truss joists. Complicating matters, duct work for the HVAC system was going to be located within the joist system, which meant that the openings in the trusses and beams had to be coordinated. This may have been the most challenging part of the entire job.

The good news was that the client saw the value in a set of plans

Rather than attempting to cut and fit complex beam connections in the field, the framing crew mocked up plywood templates that recorded lengths, notch sizes, and other critical dimensions **(9, 10)**. These templates were supplied to the steel fabricator, which could then accurately prefabricate beams that could be welded into place with few modifications **(11)**.

for a well-designed HVAC system. For this, we partnered with Positive Energy, of Austin, Texas, which provided detailed plans for every element of the HVAC system, including all the duct paths. This facilitated determining where ducts would need to pass through the steel beams.

I provided the duct path locations to our open web truss designer, which then incorporated appropriate duct chases inside the trusses. Then I sent the designer's detailed schematic of the trusses with dimensions to our structural engineer, who calculated the opening sizes that we could put in the steel. In some areas, a round hole worked fine, but in several other locations, the round hole was too large, and we had to make equivalent size holes in rectangular form to make it through the steel beams. We were now ready to order and install the first round of horizontal beams that connected the columns.

Templates. As this area came together, there were several locations where we needed to make templates for the steel fabricator because of how certain beams intersected with other beams. Some had flanges notched into webs, while others had some 45 degree angles notching over other beams. Some of these adjustments could be made in the field, but some of the beam intersections were so complex that our framer carefully assembled plywood templates for the fabricator's reference.

As we progressed to the rooflines, we needed to keep several more beams at the top of this space under rafter-bearing height and above soffit height. The clearances were tight, but our careful planning paid off and everything came together nicely.

Packing out. Almost all the beams needed to be packed out with sawn lumber to connect to the wood-framed joist systems. The process of packing out a steel beam is—not surprisingly—time consuming. On this job, the structural plans called for using 5/8-inch-diameter carriage bolts 16 inches on-center at staggered locations to fasten the sawn lumber to the steel. While the steel fabricator had drilled the necessary 11/16-inch-diameter holes in the beams, it's still challenging to hold a 2x10 or 2x12 in place against the web of a beam while someone else safely drills the holes out for the bolts from the other side.

To quickly clamp the 2-by material to a beam for safe, hands-free drilling, our framers cut some 3-inch-square scraps of plywood to make what they called screw blocks. They drove wood screws through these screw blocks and through three or four holes in the steel beam into the back of the 2-by to hold it in place, then the remaining holes were drilled out with an 11/16-inch-diameter bit to match the holes in the steel. Once the holes are drilled, we can then push a few bolts through some of them and thread on nuts to hold the 2-by in place while the screw blocks are removed and the remaining holes drilled out.

Most of the time, both sides of a beam needed to be packed out, and the process is basically the same—run screw blocks through to hold the new 2-by in place, then drill it out. After both sides are prepped, the through bolts can be installed and tightened as the screw blocks are removed.

Sometimes, we were able to pack out the beam with only one 2-by member on each side of the web, because the sawn or engineered joists were narrower than the distance between the upper and lower flanges. However, any time we were attaching truss joists, the beam had to be packed out flush, which required some creativity to achieve the desired thickness. We realized quickly we would need numerous sizes of CDX plywood on-site and made sure to have four or five sheets each of 1/4-inch through 3/4-inch plywood to be able to rip up what we needed.

Where the beams needed plates, we drove 1 1/2-inch-long by 1/2-inch-diameter lag screws through holes that the steel fabricator had made in the flanges into the bottom of 2-by stock sized to match the width of the flange. On vertical posts, we fastened wood members

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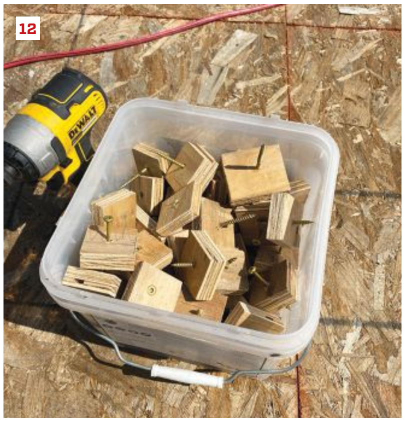
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To pack out the beams to adapt them to conventional wood framing, the framing crew drove screws through 3-inch-square blocks **(12)** and through bolt holes in the web into the back of 2-by stock sized to fit the flange **(13)**. With the beam held in place, holes for bolts and other penetrations could accurately be drilled out **(14)**, so that the wood members could be fastened to the beam **(15, 16)**. After fastening 2-by plates to the tops of the beams with structural screws driven up through holes in the flange provided by the fabricator, workers wrapped the assembly with Zip tape **(17)**.

to the steel using Reamer Tek self-tapping wood-to-steel screws.

Because this job would be exposed to weather for a long time before dry-in, we opted to wrap the tops of the packed-out beams with Zip tape to help keep water out of the assembly and prevent the lumber from swelling and thus shifting any joists around.

DETAILING THE BUILDING ENVELOPE

Because of the size of the project, we worked in sections, erecting the steel and framing in one location while ordering the materials for the next. Once the steel framing was packed out, framing and sheathing the structure was straightforward.

Going into this project, we knew getting the air-sealing right and meeting the performance standards that we like to build to was going to be a challenge. In Virginia Beach, where we work, a blower door score is not yet required for code but is in the process of being adopted. Once that's in place, we will need to hit a blower door score of 3.0 ACH50 to pass code. So from day one, even though we realized that we would not reach passive house standards, we have taken as many steps as possible to ensure good air-sealing details, with a goal of scoring below 2.0 ACH50 (as of the writing of this article, we have not tested the house.)

Starting at the sill-plate connection to the CMU foundation wall, we used two heavy beads of ProClima's Contega HF, a highly elastic adhesive caulk, below a foam sill sealer, and another two heavy beads between the sill sealer and our 2x8 mud sill (we borrowed these details from Jake Bruton, a Missouri builder who has written about air-sealing for *JLC*; see "Air Sealing That Works," Apr/18).

After our floor system box was framed, we sealed the gaps

Large gaps between the wood framing were filled with fluid-applied flashing membrane **(18)**. After the steel was packed out, the structure was framed **(19)** and sheathed conventionally. To air-seal the joint at the wall-to-roof connection, workers cut blocks of sheathing to fit snugly between the rafter tails **(20)**, installed blocking in the rafter bays, and sealed the roof sheathing to the blocking with Contega sealant **(21)**. All joints and penetrations through the sheathing of the large home were sealed with either Zip tape or liquid flashing **(22)**.

between the framing and steel columns with Zip System liquid-applied flashing. While this step is probably redundant, since the Zip R6 sheathing that we used to sheathe the house is the air-sealing layer, we figured the gaps were big enough that it couldn't hurt to take care of them while we had access to these locations.

We like to use Zip System sheathing on our projects because it offers a straightforward air-sealing approach that's easy for our trades to execute. We followed standard Zip System installation practices until we got to the roofline, where in a perfect world we would have connected the wall plywood to the roof plywood in a continuous layer. But this project featured a large overhang and built-in gutters hanging on the ends of the rafters, so it wasn't feasible or cost-effective to frame the overhang after boxing in the building envelope with sheathing. Our solution was to cut pieces of the Zip-R sheathing and a 2-by to go between each rafter bay to continue the Zip layer up to the roofline. From there we laid a bead of the Contega sealant on top of the blocking prior to the roof sheathing being installed to air-seal the wall-to-roof connection.

Once the roof sheathing was completed, our painting crew came in and sealed all the blocking between the rafters with Zip liquid-applied flashing. Later, they'll seal around every pipe and wire that passes through the air barrier as well. We're confident that the methods we've used will result in blower door scores that meet our goals when we are ready to test later this year.

Rick Mills is a senior project manager for Jackson Andrews Building + Design, in Virginia Beach, Va. Follow Rick and his company on Instagram: @rick.jacksonandrewsbuilding and @jacksonandrewsbuilding.

If You Use DIY Air Cleaners, Use Them Safely During Wildfire Smoke Events

If portable air cleaners are not available or affordable, you may decide to use do-it-yourself (DIY) air cleaners as a temporary alternative to commercial air cleaners. DIY air cleaners are made by attaching a furnace filter to a box fan with tape, brackets, or a bungee cord.

There may be drawbacks to using a DIY air cleaner as compared to a commercial air cleaner such as:

- Increased noise and heat generation from the fan motor.
- Limited data on how well DIY air cleaners filter smoke particles.

If you use a DIY air cleaner, it is probably most effective in a small room where you spend a significant amount of time, such as a bedroom. For better filtration, choose a high-efficiency filter, preferably rated MERV 13 or higher, and align the arrows on the filter with the direction of the air flow through the fan. Try to get a good seal between the fan and the filter.

Important Safety Tips

If you use a DIY air cleaner, follow these safety tips that EPA developed based on recent testing conducted by Underwriter's Laboratories (UL):

1. If you build a DIY air cleaner, use a newer model box fan (2012 or newer). The newer models have added safety features. Fans built prior to 2012 were not tested, and pose known fire risks.
2. Use fans that have been verified by an accredited third party to meet the UL 507 safety standard for electric fans or equivalent. To find a verified fan, look for one with a UL or ETL safety marking.
3. EPA does not recommend using DIY air cleaners built with older model box fans (before 2012), but if they are used, they should not be used unattended or while sleeping.
4. Anyone who uses a DIY air cleaner should follow the box fan manufacturer's instructions, which can include: Don't leave children unattended when the fan is in use; don't use an extension cord, and don't use a damaged or malfunctioning fan.
5. Always ensure that there are working smoke detectors throughout the home.
6. During smoke events filters will need to be replaced more often and at the end of a smoke event. Not changing the filter regularly may reduce how well the filter works and may release smoke particles into the air. Make sure to keep extra filters on hand and change the filter when it starts to look dirty or release smoke odors.

Fire Hazard Safety Testing Results from Underwriters Laboratories

Concerns have been raised about the potential for the box fans to overheat when operated with a filter attached, which could pose a fire or burn risk. To determine a possible fire hazard from their use, the Chemical Insights Institute of UL, with support from EPA, has conducted a safety evaluation of a small sample of DIY air cleaners. The results of the testing have been released in the report, Wildfire Safety Research: An Evaluation of DIY Air Filtration.

Testing was conducted with several filter scenarios (clean, smoke, and dust laden filters and both sides blocked) to assess the fire and burn risks from these homemade air cleaners. UL's results show that temperatures of all fan components remained safely below recognized temperature safety standards. Furthermore, none of the scenarios posed any observable fire hazards.

Please note, however, that EPA cannot assure the results of the safety testing are representative of all DIY air cleaners in all scenarios because there is a wide range of variability in the materials used and how the cleaners can be built or operated.

Fan with clean filter

Fan with smoke filter

Fan with dust laden filter

Resources

For more information on the testing and research by EPA, visit Research on DIY Air Cleaners to Reduce Wildfire Smoke Indoors. The web page includes frequently asked questions and safety tips for using DIY air cleaners and other resources to protect public health from wildfire smoke.

For more information on how to reduce exposure to wildfire smoke inside the home, visit Wildfires and Indoor Air Quality

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A Radical Approach to Protecting Finished Floors

Applying finish to the floor at the start of a job is unconventional, but it saves time when you need it most

BY MICHAEL PURSER

Photos by Michael Purser

For a wood flooring-refinishing contractor, one of the biggest drawbacks is coming in dead last in the sequence of building trades on a work site. We come behind everyone else when there is little time, patience, or money to go around. At the core of the problem are turf wars, since the areas we need to work on are the same areas others need to tread on to do their job. In an effort to create harmony on the jobsite and reduce friction, contractors and homeowners will delay work on the floors until the very end of a project. That concept may be good in theory, but in reality, it often deprives us, the wood flooring contractors, the time needed to do our work and creates even greater chaos for everyone when we are finally allowed on-site.

About 15 years ago, a contractor friend of mine and I asked some “what if” questions about the sequencing of various trades and how this impacted the continuity of the work, especially the last 10%—that infamous finish stage. We decided to move floor refinishing work in the schedule so that instead of its being the last task on-site, it would happen just after the drywall went up and was mudded. We experimented with this variation on kitchen remodels because those gave us the most accurate overview of how this might impact a project. Instead of working around cabinets, appliances, islands, toe-kick space, and many corners, nooks, and crannies, my helper and I walked into a rectangular room with four corners and sanded and refinished the entire room.

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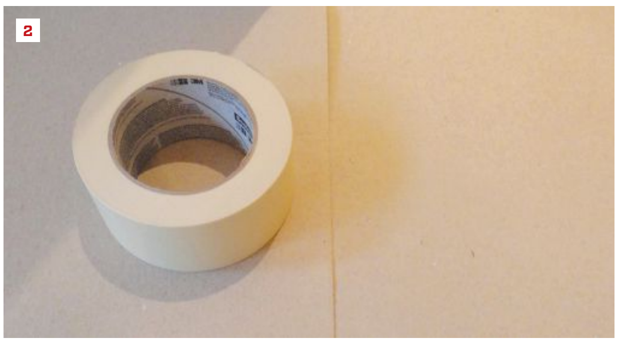

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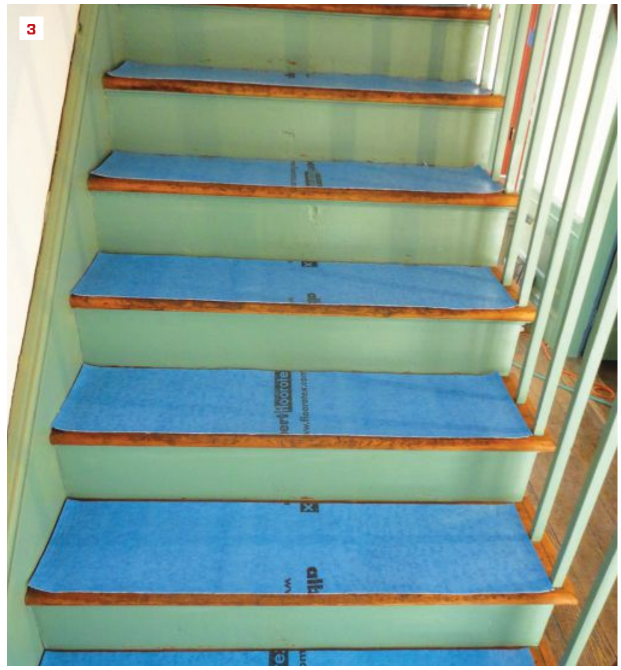


The author often wraps finished floors with a dense paper product such as Ram Board **(1)**. One trick is to flip the paper over so the curl faces down. Courses then butt easily and can be taped **(2)**. For stairs, the author prefers cushioned foam products, such as Albert Floorotex **(3)**, which sticks without leaving residue or damaging fine finishes.

Aside from the work going more quickly, this also resulted in a stained and protected surface under everything. My typical finish process always called for two seal coats over the stain followed by two topcoat applications, or four applications total. We then put down floor protection, leaving spaces for the placement of cabinets and appliances, and let the other trades do their thing.

I held off on the final application until everything else was installed and all the finish work completed. At that point, I walked into the room, removed the floor protection (which we saved for the next job), prepped the floor, and made the final application. To say this was a success would be an understatement. The difference it made coordinating the other trades and installations left us gobsmacked, and we've never looked back.

I have carried this approach into the bulk of my business, which centers on historic restoration and preservation of old wood floors. Some of these projects have been massive in nature and work was often done in phases over years. Like on other remodeling jobs, the scheduling of trades was often an issue. Once again, conventional wisdom put all wood floor work at the end of the schedule, so implementing my new approach was not an easy sell until I was able to show the principals photos and the positive impact and flexibility that rearranging the wood floor work can have on scheduling the other artisans and craftspeople involved in the project. Finish work with new construction, remodeling, or restoration all produced the same challenges: lack of time and options when you needed them most. By repositioning wood-floor restoration much earlier in the process, the painstaking restoration of other surfaces and objects could proceed over a fully protected and restored wood floor. We proved that some things written in stone can be erased.

NEXT-GENERATION FLOOR PROTECTION

For those of you who've scratched a bald spot on your head trying to figure out how we accomplished this, the answer is easy—there's been a quantum leap made in options for protecting floors. A new generation of products for protecting floors started coming on the market around 15 years ago. Since then, the offerings have expanded. Not only do these products address our needs, but most of them are also produced from recycled materials, which only sweetens the pot. They vary in composition, but all have the same goal: to protect what they cover from most materials, liquids, and activities taking place on the surface.

Heavy-duty, dense paper products. These were some of the earliest protective materials to come on the market. The two most well-known products that I'm aware of are Ram Board and Flex-Board by Protective Products.

Ram Board is sold through retail outlets, and FlexBoard is available

To allow other trades access to work on baseboards, the author may cut the cushioned film products into strips **(4)** and use them to cover a gap in the dense paper products covering the field of a room. A fabric runner, such Dura Runner **(5)**, works well for walk-on and walk-off mats at entrances to minimize the tracking in of debris and moisture.

online through the Protective Products website. Both are in the same thickness category, 45 mils, and come in rolls. For contractors, they offer different widths—38 inches for Ram Board and 32 inches for FlexBoard—that both come 100 feet in length. Ram Board offers a "home version" that's 36 inches wide by 50 feet long and around 38 mils thick, but I've always used the beefier option. These are my go-to products, as they lay down easily and are quick to install.

I typically roll the paper out and then flip it over so the curled ends face down, enabling it to flatten more quickly. The side edges of the paper are precision cut, making it easy to abut the next piece. To avoid movement, I tape the long parallel edge seams for stability, running the tape continuously to keep fine particles from getting under the paper. A wide seam tape offers excellent protection from premature damage from foot traffic you find on work sites. Both Ram Board and FlexBoard provide protection from spills and contact with various types of liquids.

Lightweight, flexible, and cushioned polyester film. Products in this category offer some options that the dense paper products don't. I'm familiar with two: Albert's Floorotex and Protective Products' Econo Runner, both available online. They come in rolls that vary in widths (40 inches for the Floorotex and 32 inches for the Econo Runner) and generous lengths. Both are flexible and have a thin polyester film on top attached to a thin cushioned material. Most important for me is the light tacky material on the bottom that allows the products to grip a surface without removing the finish or leaving a sticky residue. They both have excellent resistance to moisture, while allowing what's beneath them to continue curing. I've made good use of them on freshly refinished stair treads and landings where slipping would be a hazard with a paper product. I often cut this material into 3- to 5-inch strips. When I put down the dense paper products in the field of a room, I leave a gap at the perimeter to cover with the flexible film. The film can then be pulled back to allow other trades to work on baseboards, molding, and curved surfaces.

Soft fabric runners with non-slip backing. This material has multiple uses for me and all are good. The brand I am most familiar with is Dura Runner by Protective Products and I order it online. It has a felt-like surface on top of a waterproof backing that helps prevent slippage but doesn't have adhesion.

I love to use this for walk-off mats at the main exterior entrance. I cut it into 6-foot lengths and place one outside and often another inside to minimize the amount of debris and moisture that is tracked in. In a fully furnished home, I like to use the same length outside areas where I'm working, so I don't track anything from that area onto antique rugs, carpeting, or other hard surface materials. Since the strips are lightweight and easily portable, I place two to three next to each other to create a protected surface of about

The author restored the floors in Henry and Clara Ford's billiard room at the start of an extensive renovation to the Ford's home, Fair Lane. After the floor was wrapped with paper and fully taped hardboard, the room became the staging site for the other trades.

12 square feet for placing equipment and materials. I have had several of these walk-off mats for a long time, as you can easily clean them with a broom and take them to the next project.

Hardboard. This one is an oldie but goodie. I've been around so long I call it Masonite; the younger generations call it hardboard. It typically comes in 4x8 sheets, usually in 1/4- and 3/8-inch thicknesses. As with the dense paper, I abut sheets and continuously tape over the seams to help prevent anything getting underneath them. It's the ultimate in protection and well worth the price when a lot of rough work will be done on the job, or when something heavy shows up on the project site. More than once, I have put some under a grand piano and been able to push that sucker wherever I needed to without leaving any indentations on the floor. I don't use it often, but when I do, I'm grateful I did.

A FEW PRECAUTIONS

If you adopt my approach to doing the floor refinishing at the beginning of or during a project, instead of waiting to go in last, here are some things to keep in mind:

Curing. As with all products, make sure you read the technical specs. Finishes should be well into the curing process before being covered. It's best to check with the finish manufacturer about timing as it can vary from product to product.

Sunlight. If you have areas of intense sunlight and UV exposure, avoid putting down partial strips of flooring protection, as you may get some color variations due to fading. Cover the entire floor, or don't cover it at all, to avoid differential fading.

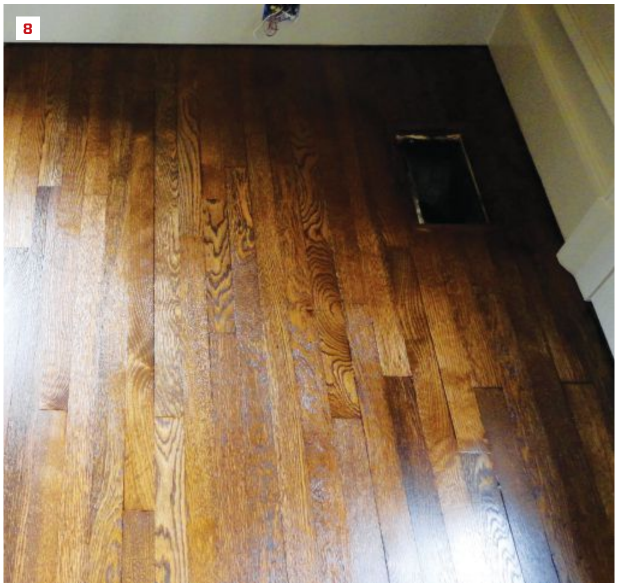
Tape. Never under any circumstances apply any masking tape of any color to the edges of these protective products to keep them in place. It makes no difference if the finishes beneath are old or new. I would extend this warning to other hard flooring materials such as marble, terrazzo, hard tiles, and terracotta, as they may have sealers, waxes, finishes, or acrylics on them that will pull off. In general, putting tape on any hard flooring material is a bad idea.

No one size fits all. I do not rely on any one product for all my protective needs. I use products from all the categories I listed above based on the needs and demands of an area.

WEIGHING THE ECONOMICS

The first time I wrote an article on the pluses of protecting wood floors, I made a mistake. The article was for *Wood Floor Business*, whose readers are primarily wood flooring contractors, manufacturers, and distributors. In the article, I used photos taken from some projects where I had completed my work and then wrapped it to protect it from the building trades that would be following me. The mistake I made was in the examples I used: One of the projects was a $2.3 million project and the other was my restoration work in Dearborn, Mich., on Henry Ford's home, Fair Lane.

Pushback from the contractors was swift. Whereas I saw the protective products as a means for enhancing the workflow for everyone, they saw it as a perk only for high-profile jobs that would increase what they charged for their clientele, thereby making them less competitive. It was a good point, and I spent a fair amount of time answering their comments in the online version of the article.



After the author sanded, stained, and finished the floor in this master bedroom **(8)**, the room was used as a spray booth for cabinet doors during the course of the renovation **(9)**. Fully taped hardboard over paper protected the flooring.

I was careful to point out that protecting my work was a collaborative effort, and I didn't bear the price alone. I also made it clear that much of my work was in houses in older, inner-city neighborhoods, and the projects were much more modest in scale and price tag. These are the old neighborhoods where there are 100- to 150-year-old houses. My business partner and I work on what I refer to as high-risk floors that cannot be sanded any more, so we are often the only building trade on-site and we make excellent use of protective products. Rarely would any of these projects have a budget of over $20,000, so I don't consider the cost of the project to be the determining factor in using protective products.

When my contractor friend and I decided to go down the road of rearranging the work of the finish trades, we had a specific goal in mind: to help make the final 10% of the work more fluid and less chaotic. Certainly, there was the additional cost of the protective products, but we learned the real value in creating time when he would need it the most. If you can minimize the potential conflicts wood floor work brings to the end of a project—when punch list items are looming, certificates of occupancy need to be issued, or delays in kitchen cabinets and their hardware are the cause of sleepless nights and ulcers—then there's another metric for measuring the extra costs. We had not anticipated how big a dividend this change would pay out until we tried it. We took a "what if" question and put it into practice, and we've never looked back. When others express skepticism, all I do is point to the pictures and provide them with proof.

One byproduct of this approach is the goodwill it generates. Aside from the fact you are virtually eliminating the turf wars at the end of a job, homeowners also see the efforts being made to protect their property. Having to explain to homeowners how damage was done to a brand-new surface isn't the way you want to spend your time at any stage of the project, but especially not at the end. You are creating the positive narrative that the homeowner will use in describing your work style to other potential clients, and as the credit-card company says about their service, that's priceless.

FLEXIBILITY IN PLANNING AND EXECUTION

I want readers, especially general contractors, project managers, and job supervisors, to walk away from this article knowing that not everything is written in stone. What I want them to understand is that innovations in materials and products in our world might achieve goals that aren't readily apparent. Temporary protection products give flexibility in planning and executing a project. They open doors you never thought existed and provide options that can exceed everybody's expectations. There is a modest cost for the protection, but the payback in increased options simply makes it a wise investment. On every project where we've flipped the sequence, everyone involved has said they would never go back to the older, outdated method of putting our trade last.

Michael Purser is a second-generation floor finisher based in Atlanta, Ga. He owns The Rosebud Company (rosebudfloors.com), which specializes in the restoration of historic wood floors. You can follow his company projects on Facebook at The Rosebud Company.

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Editor's Questions: is this device needed to conduct a visual inspection? Is filling a shower pan with over 1 ½" of water increasing liability by over stressing a component and causing leakage? Are shower pans designed to handle standing water? Check out the video, was that staged? Comments are always welcome from members and if anyone has a plumber willing to install a gas log for me in Wallingford, call Al Dingfelder at 203 284-1278.

Restoring Structural Concrete

BY JAKE LEWANDOWSKI

On a recent job, we needed to restore a section of structural concrete. This particular job was a repair to an overhead section in a lighting niche in the mechanic's well at a garage that services school buses. Though it's not the most usual example, it provided a textbook case on concrete restoration.

Surface prep. The first step was to remove the damaged concrete, using a rotary hammer to chip away the bulk of the loose material and a grinder to take the concrete down to solid material. The goal was to work back to a solid base and to fully expose the existing rebar so we could fully encase it in repair mortar. In addition, we used a grinder to remove the old paint around the repair area. This would help blend in the repair so when the final work is painted, you won't see where the new concrete meets the existing surface.

Some surface corrosion of the rebar had occurred but not enough to decrease the dimension of the steel to any significant extent. We used a wire brush to clean up the rebar and then painted it with Rust-oleum Green Rebar epoxy paint. It's important not to get any paint on the surrounding concrete; otherwise, it can interrupt the bond of the new concrete with the old material.

Repair mortar. For the mortar, we used Sika's VOH (which stands for "vertical and overhead")—a fast-setting repair mortar. We used this to first mix up a loose "slurry mix," which we painted on with a mason's brush after spraying the surfaces with water to achieve what is described in the engineer's spec as "SSD," or saturated surface dry.

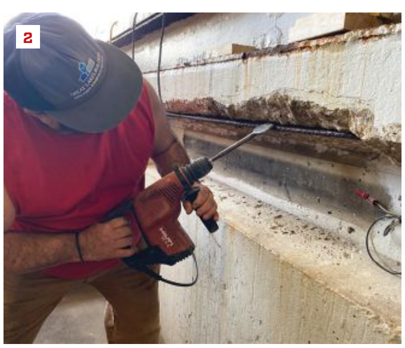
As the slurry mix cured, we set the form. For a small form like this, we simply used WD-40 as a release agent, being careful to spray down the form away from the repair area. We then mixed up a new batch of VOH to a stiffer spec and packed this material in small lifts, working it in to make sure we wouldn't have any voids when we stripped the form. There was also one small overhead section at the back of the niche, outside of the form area, that we would need to fill by hand after the form was stripped.

Jake Lewandowski is a construction manager with Great Lakes Builders, which specializes in structural repairs in Elk Grove Village, Ill.

1

The outside corner of this lighting niche in a mechanic's well had become unstable **(1)**. Repair work began by chipping out the corner **(2)** and removing enough material that new mortar could fully encase the existing rebar **(3)**. In addition, the crew used a grinder to remove the old paint in the area where the new concrete meets the existing surface **(4)**. This way, when the new concrete work is painted, you won't see where the new concrete meets the old.

2



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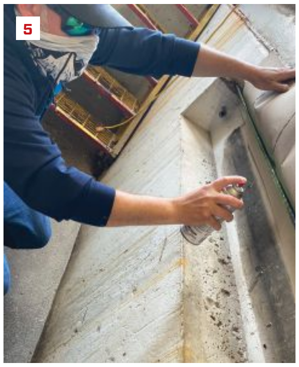
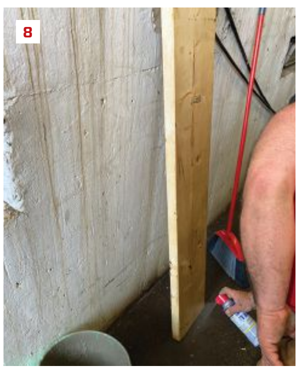
Photos by Jake Lewandowski



After masking off the concrete and wire brushing the steel, the author painted the rebar with an epoxy paint **(5)**. The next day, the crew wet down all the surfaces **(6)** and brushed on a slurry mix, working it into the rough surface of the concrete and rebar with a mason's brush **(7)**.



Before setting the form, a crew member sprays the form board with WD-40, which, on a small job like this one, works well as release oil **(8)**. The form in this case is simple—a single 2x8 braced against the top edge of the concrete lighting niche **(9)**. This closeup shows the fully prepped repair surface and form, ready for packing in the repair mortar **(10)**.

A crew member packs the repair mortar in short lifts **(11)**, working it behind the rebar to eliminate any voids **(12)**. The repair mortar sets up to a strength of 1,500 psi within three hours **(13)**, allowing the crew to strip the form by the afternoon **(14)**. Within one day, the mortar sets to a compressive strength of 3,000 psi and in 28 days, to 5,500 psi.

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