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

CAHI MONTHLY NEWS

April 2017 Volume 10, Issue 4

Presidents Corner

I had the opportunity to watch state politics in action last month when board committee member John McKenzie and I went to Hartford to testify against the radon bill proposed by the state department of public health. As required we were there at 9:00 am to register to testify. The hearing was to start at 10:30 am. So we had some time to kill so we retreated to the cafeteria. Lots of suits and ties and pants suits running around. The cafeteria was filled with them, some shoveling down the cafe food, others meeting, scheming, politicking. John and I had a cup of what they called coffee and then headed to the hearing room. As we walked the halls we saw little meetings going on outside the hearing rooms here and there as well.

Our bill was scheduled as number 6 of 8 or 10 on the docket. So we grabbed some seats and watched the proceedings. First I noticed that not all the committee members were in attendance. Actually, it was less than half. Some came; some left and came back with food. Some paid attention, others texted, worked on their computers. Never 100% full attention to those who were testifying.

So let's cut to the chase. It was about 12:30 pm when John Barbero, the President of the State Realtors Board came into the room and signaled to us and to Representative Nicole Klarides-Ditria to meet him outside. Earlier in the month I had reached out to John Barbero, who refers me, and meet with him regarding this bill. And John McKenzie had reached out to Nicole Klarides-Detria who represents

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INSIDE THIS ISSUE

Next Meetings!

April 26, 2017

Topic is

"Attic Ventilation"

presented by GAF Roofing

May 24, 2017

Topic is **TBA**

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 free to members. 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 his town. Outside we conferred with them and two other members of the State Realtors Board, one of whom was to testify. We were all on the same page and were ready to get in on. Well, 2 pm rolled around and they were still on bill number two. Our written testimony being submitted, we left.

So, while it may have appeared on the surface to be a waste of time, it was productive in several ways. We strengthened our connection with state rep Klarides-Detria and the realtor's association. We now know that pre submitted written testimony will be read. We have started to form a network that can alert us to bills that may be submitted that can affect our profession. We as a board will continue to forge these relationships that will allow CAHI to have a voice that represents our profession.

In a related matter, The Connecticut REALTORS® is hosting a Rally in Bushnell Park, Hartford on May 9, 2017. Their goal is to show a large presence in the park to encourage elected officials to improve Connecticut and entice people and business to come to, not leave this great state and to begin to progressively rebuild our state. Mike Barbero has invited CAHI and its members and many other organizations to join us on May 9th to work together to promote the growth of Connecticut through collaboration.

The event is free and includes morning refreshments, a catered barbecue lunch and food truck items to all who are registered. Let's help encourage our elected officials to make a better Connecticut.

Stan

TILE

Photo: Gil Potts

Working With Glass Tile

Getting the most from this amazing material

BY TOM MEEHAN

There is an old saying: Fools rush in where angels fear to tread. In other words, an inexperienced person often jumps into situations that a wiser, more experienced person might avoid or at least approach more cautiously. This concept is fitting for the tile industry—especially when it comes to glass tile. While glass is probably the fastest-growing segment of the tile market, it is also probably the least understood when it comes to using the right materials and techniques to create a long-lasting installation. However, with a little familiarity and a good grasp of the nuances of this amazing material, your chances of success can be greatly improved.

Glass tile has been around for millennia, and over the last hundred or so years, it has been mass produced for installation in homes. Twenty-five years ago, most of glass-tile installations that I did with my dad were straightforward, paper-faced 1x1 mosaics. And while that type of glass tile is still available, today glass tile is made in a staggering assortment of styles, colors, and sizes—each with its own specific requirements. The result is an explosion of creative and beautiful installations that could not have been conceived of just a short while ago.

I do hundreds of tile installations every year and a lot of them incorporate glass tile, used either as an accent or for all the tile in the project. I've worked with many varieties of glass tile, but even so, when I come across a new type or a different manufacturer for the first time, I always do my homework beforehand to make sure that the installation will be successful and that my clients will be happy with the end results.

Tom Meehan, co-author of Working with Tile*, is a second-generation tile installer who lives and works in Harwich, Mass.*

START WITH THE RIGHT THINSET

In the February 2017 issue of *JLC*, I answered a question about when to use latex-modified thinset mortar for installing tile. Choosing the proper thinset is never more important than with glass tile. Because of the resiliency of glass (its inability to absorb moisture) and because of the different configurations of glass tile, manufacturers usually require a specific glass-tile mortar for their particular tile **(1)**. To ensure good adhesion and to maintain the warranty for the tile, always follow the tile manufacturer's recommendations. If no specific glass-tile mortar is called for, check with the thinset manufacturer before using its product to be sure there are no issues.

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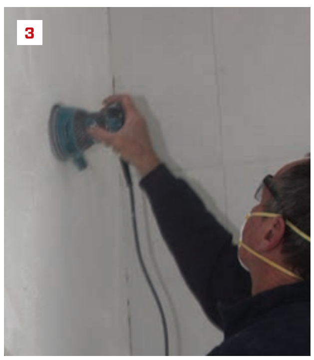

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PREPPING THE WALLS FOR GOOD ADHESION

Wall prep for a glass-tile installation begins with a coating of a liquid stress-crack membrane (the dark area in the photo), such as Hydro Ban **(2)**. Tile can slip when installed on the membrane, so I add a skim coat of glass-tile mortar or latex-modified mortar. Then I sand down any high spots before proceeding with the installation **(3)**.

INSTALLING PAPER-FACED TRANSLUCENT MOSAICS

Sheets of small mosaics mounted on a paper face are one of the most common forms of glass tile. The tile is usually translucent, with no type of back layer applied. For this accent wall, the layout started with a vertical line in the center of the wall.

To complete the initial layout, set a level on the shower floor and measure up the distance of two full sheets of mosaics from the top of the level **(4)**. A tile baseboard will fill in the space below the mosaic tiles after they are installed.

Using the flat edge of a trowel, coat the entire layout surface with glass-tile mortar before combing it with a $^{3}/_{16}$-inch square-notched trowel **(5)**. A $^{3}/_{16}$-inch V-notched trowel would also work for this step. After combing the surface evenly, knock down the ridges left from the trowel using a flat-bladed taping knife **(6)**.

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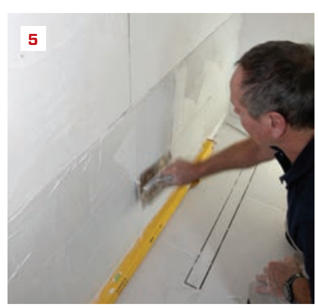

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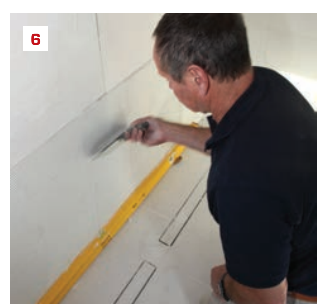

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Photos: Roe Osborn

INSTALLING PAPER-FACED TRANSLUCENT MOSAICS (CONTINUED)

Knocking down the ridges made by the notched trowel ensures nearly 100% surface-area adhesion, which is crucial for most types of glass tile. Starting at the horizontal layout line, press sheets of the mosaic tile into the mortar, applying pressure to all parts of each sheet for good adhesion **(7)**.

Sheets of mosaic glass tiles are often uneven or out of square, so after each section is pressed into the wet thinset, place a straightedge (in this case, a level) on the top edge of the tiles to make sure that they are aligned. If any tiles need adjusting, slit the paper with a razor knife **(8)** and then either push the misaligned tiles up by hand or insert a flat-bladed taping knife into the slit to slide the row of tiles in unison. If the discrepancy is more than $^1/_{16}$ inch, slit more than one row and spread the adjustment out evenly.

After lining up the top edge of a section, lay out the next section of tiles. In this case, the layout extended up to the edge of a decorative band, so the layout line landed two complete sheet courses plus four rows of mosaics above the finished courses below.

Spread the glass-tile mortar up to the line as before, combing it with a notched trowel and then knocking the ridges flat. Then press the next courses into the thinset **(9)**. Note that staggering the seams of the sheets is not necessary but can be done. After each section is placed, go over it with a rubber grout float, gently tapping it flat against the tiles to completely embed them into the thinset **(10)**.

When the mortar starts to set (15 to 20 minutes after the initial installation), dampen, but do not drench, the paper face with a wrung-out sponge **(11)**. Wait one to two minutes for the water to dissolve the glue, then peel off the paper. Peeling technique is critical. Start at one corner and slowly pull off the paper diagonally, keeping your hands close to the wall **(12)**. Expect some tiles to come off with the paper. Butter the backs of those tiles and push them back into place.

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Photos: Roe Osborn

INSTALLING MESH-BACKED OPAQUE MOSAICS

The description "opaque" is a bit misleading for this type of glass tile. The tile itself is transparent—it's the applied coating on the back of the tile that's opaque. That coating also gives the tile its color.

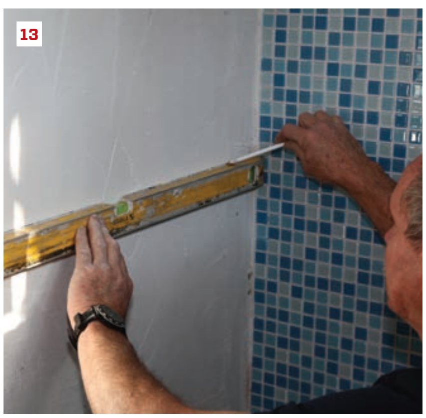
The tile shown below comes in sets of eight vertical tile sheets; the bottom sheet of each set contains the most dark tiles while the top sheet has the most light ones. The color gradates slowly and randomly from dark to light from the bottom of the wall to the top, so it's important to keep the numbered sheets in order during the installation.

Because the adjacent wall had the same tile, layout for this wall could be taken directly from the installed tile. The top of the third sheet from the bottom was used as the first layout line **(13)**.

Apply the glass-tile mortar up to the layout line, spreading a thin layer and combing it with a $^{3}/_{16}$-inch square-notch trowel. Because of the opaque backing and small size of the tile, I didn't knock down the ridges, although doing so is fine.

Instead of paper, a lightweight plastic mesh holds these sheets together **(14)**. Press each sheet into the thinset and move it side to side slightly to adhere it to the surface of the wall. As with paper-faced tile, check to be sure that the top edge of the tile is in a straight line **(15)**. When all the tile for a section is finished, go over the entire surface, tapping with a rubber trowel **(16)**. This maximizes adhesion and helps to eliminate lippage where some tiles stick out farther than others.

To avoid cutting tiny glass slivers to fill in along a corner, adjust the tile spacing instead. First slice through the mesh backing with a razor knife **(17)**. Then slide a row (or rows) of tiles over with a flat taping knife until an acceptable grout space is left along the corner **(18)**. By slitting and adjusting several rows in this manner, it's possible to make up for gaps as wide as $^{3}/_{16}$ inch.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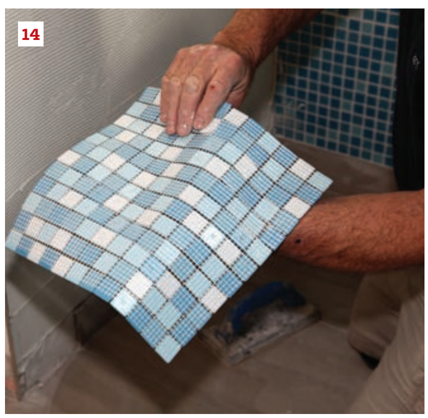
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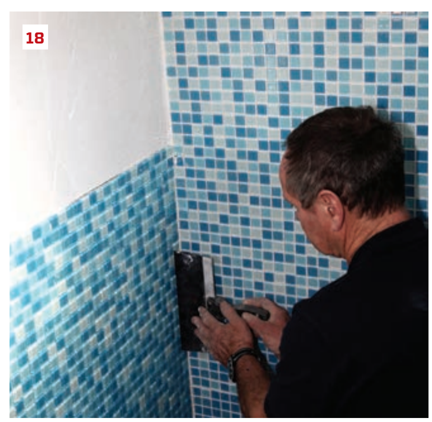
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Photos: Roe Osborn

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CUTTING MOSAICS

The best way to cut glass mosaic tile is with a wet saw. But using a glass-tile cutting blade is a must. These specialty blades can cost twice as much as a standard wet-saw blade but will give you the smoothest cuts.

To support both sides of the cut and hold the tiles stationary, a site-built cutting jig can be helpful **(19)**. Cut a saw kerf about two-thirds of the way through a porcelain tile. Use a factory corner from another tile to hold the mosaics parallel to the blade at the desired width. Hold the mosaics stationary with a second tile.

Tip: Don't try to cut too many mosaic tiles at once. Cutting tile for a ceiling strip, for instance, is best done a few tiles at a time **(20)**.

WORKING WITH LARGE-FORMAT GLASS TILE

When porcelain or ceramic tile is discussed, the term "large format" indicates tile that has one dimension of at least 15 inches. But with glass, because of its fragile nature, any tile with a dimension of 3 inches or more is considered large format. The tile for this shower project measured 3 inches by 12 inches and was installed in subway-tile fashion. A decorative band of smaller glass tile that mimicked green marble wrapped around the shower at chest height. The band's location was determined by the layout of the tile below.

A story pole is the quickest way to check a layout. To make a story pole, line up and trace the edges of the tiles on a thin, straight piece of wood, leaving space for the desired grout line between the tiles. Set the bottom of the story pole at the starting point of the layout (a level straightedge) and mark the bottom position of the decorative band to break on a whole tile layout **(21)**. Then set a sheet of the band tile in place and mark the top and bottom of the band **(22)**.

Next check the distance from the band to the ceiling to be sure that the tiles along the ceiling will be close to the width of a full tile. Narrow slivers are undesirable from a visual standpoint as well as being problematic to cut and install. Before finalizing the layout, check the ceiling to make sure that it's close to being level and that there aren't any major discrepancies on the adjacent wall.

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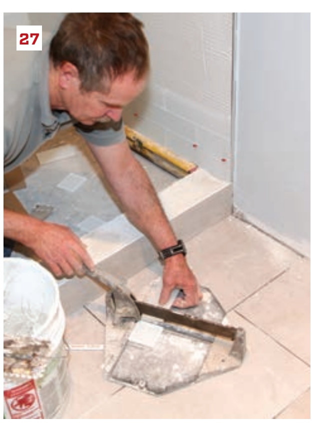
Photos: Roe Osborn

LARGE-FORMAT GLASS TILE (CONTINUED)

This large-format glass has a translucent applied backing, so any voids left in the mortar might show through as shadows after the mortar has set up. For this tile, spread an even layer of glass-tile mortar on the wall and comb it with a 1/4-inch square-notch trowel. As before, knock down the ridges with a taping knife **(23)**. Butter the back of each tile with a thin layer of mortar **(24)**, then press the tile into place, sliding it side to side slightly to embed it fully **(25)**. The mortar on the back of the tile helps to fill any small voids in the mortar layer.

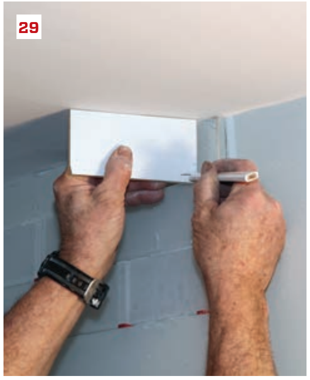
Only spread mortar for the number of courses you can install comfortably without the mortar beginning to set up. After setting the tile on a couple of courses, wipe off any excess mortar with a sponge, then insert tapered spacers to separate the tiles and leave the proper grout joint **(26)**.



CUTTING LARGE-FORMAT GLASS TILE

Though not suited to glass mosaics, a score-and-snap tile cutter works well for cutting many large-format glass tiles **(27)**. For a subway-tile format, it's efficient and convenient to set up the cutter next to the shower for cutting the half tiles that begin every other course and for cutting the tiles at the inside corners. A wet saw equipped with a glass-cutting blade also does a great job of cutting tile without chipping the applied backing **(28)**.

Photos: Roe Osborn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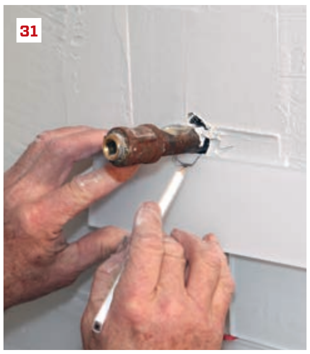
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Photos: Roe Osborn

OTHER CUTS IN LARGE-FORMAT TILE

The layout of the large-format glass tile in this shower left a partial-width tile at the ceiling. That width varied slightly because the ceiling was slightly out of level. To cut each tile to the proper width, place the tile against the ceiling in the area where it's to be installed, and mark the amount that needs to be removed **(29)**.

The best, and maybe the only, way to make a clean and straight cut down the length of a large-format glass tile is to use a wet saw equipped with a specialized glass-cutting blade. These blades have finer and more numerous diamonds and make a smooth cut through the glass and any backing without chipping or tear-out that can be visible once the tile is installed. After marking the width of the tile, carefully cut with the specialized blade. Thin rips in large-format glass tile such as this become fairly routine **(30)**.

CUTOUTS FOR PLUMBING

To make plumbing cuts for the shower controls and for the piping that supplies the shower head, the process is similar to that with ceramic or porcelain. The difference is that extra care must be taken so that the glass breaks out evenly without the applied coating chipping out beyond the cut. These cuts don't have to be a perfect scribe to the pipe, but don't assume that the plumbing flange will hide a bad cut.

When the cut falls on a seam between tiles, set the tile roughly in position and mark out the cut **(31)**. At the wet saw, make several cuts to the cut lines **(32)**. Using glass-tile nippers, carefully break out the glass over to the line, "nibbling" a little at a time until the cut is big enough for the pipe **(33)**. Then back-butter the tile and set it in place **(34)**.

If the pipe falls in the middle of a tile, drill the hole with a hollow-core diamond-coated bit with a water feed **(35)**. Be sure to do the drilling on a solid surface that supports the tile evenly, and cut the hole slowly and carefully, letting the weight of the drill apply the pressure for the cut.

BUILD-OUT FOR THINNER-PROFILE TILE

When a decorative band is used on a glass-tile project, the tile for the band is often thinner than the field tile. The best strategy for building out the band is applying either 1/4-inch backerboard or a layer of membrane, depending on the amount of build-out needed. For a band like this one, comb out an even layer of mortar over the band area **(36)**. Embed a piece of thick membrane (Kerdi was used here), smoothing the membrane with a taping knife **(37)**. Apply a layer of glass-tile mortar over the membrane, comb it out with a notched trowel, and knock down the ridges with a taping knife **(38)**. Press the band tile into place **(39)** and tap it with a rubber trowel to embed it completely in the mortar **(40)**. When the mortar has had 15 to 20 minutes to set up, dampen and remove the paper as with paper-faced glass mosaics.


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GROUTING GLASS

Grouting glass tile is much like grouting other tile, with no special materials required. However, because of the resilient (non–moisture absorbing) nature of glass, use a grout mixture that is much stiffer, with less water than usual **(41)**. Float the grout with a rubber trowel, using diagonal strokes to fill the grout joints completely. Remove excess grout with a clean sponge **(42)**, and wipe off the grout haze with a terry-cloth towel after it dries.

Photos: 36–40, Roe Osborn; 41 & 42, Gil Potts

VA Center For Medication Safety (VA MedSAFE)

Medication Disposal Safety Tips

To keep you and your family safe, get unwanted/unneeded medications out of your home!

VA can help you safely dispose of expired or unwanted prescriptions and over-the-counter drugs.

Why should I remove unwanted medications from my home?
If you remove these medications from your home, you reduce the chance of taking them by accident and poisoning, especially for children. Removing them also reduces the risk of taking the wrong drug by mistake.

How should I safely dispose of my unwanted medications?
Don't flush unwanted, unneeded drugs down toilets or drains or throw them out in the trash. This can harm the water supply and wildlife. Your VA now has envelopes that you can use to mail your unwanted medications for disposal that is safe for the environment. These envelopes are free and do not require postage. Remember to read the directions and never place syringes in the envelope or receptacle.

Your VA may also have a receptacle where you can deposit your unwanted medications. If you accidentally place drugs in the receptacle, VA cannot retrieve them or return them to you.

Check with your VA Pharmacist on which option is available at your VA facility.

Who can I talk to if I am unsure about how to properly dispose of medications that I don't need or want?

Ask your VA pharmacist how to safely dispose of your medications. If you are unsure of what drugs to dispose of, you can review your medications with your VA pharmacist to find out which medications you should no longer take.

You can prevent drug misuse, abuse, and accidental poisonings.

Make a difference by following these safety tips

- KEEP medications out of the sight and reach of children and pets
- AVOID taking medications in front of children, since they tend to mimic adults
- NEVER give your medications to anyone else or take someone else's medications
- STORE your medications in a secure area
- CHECK the date on everything in your medicine cabinet and dispose of anything that has passed the expiration date
- DISPOSE of any medication that you have not used in the past 12 months
- DISPOSE of any prescription medications you no longer need
- ASK your pharmacist about the proper way to store you medications
- KEEP medications in the original container
- NEVER combine different medications into one bottle
- DO NOT store medications in places that are hot and humid

Photos by Matt Bowers/Airtight Services Inc.

Fixing the Bonus Room

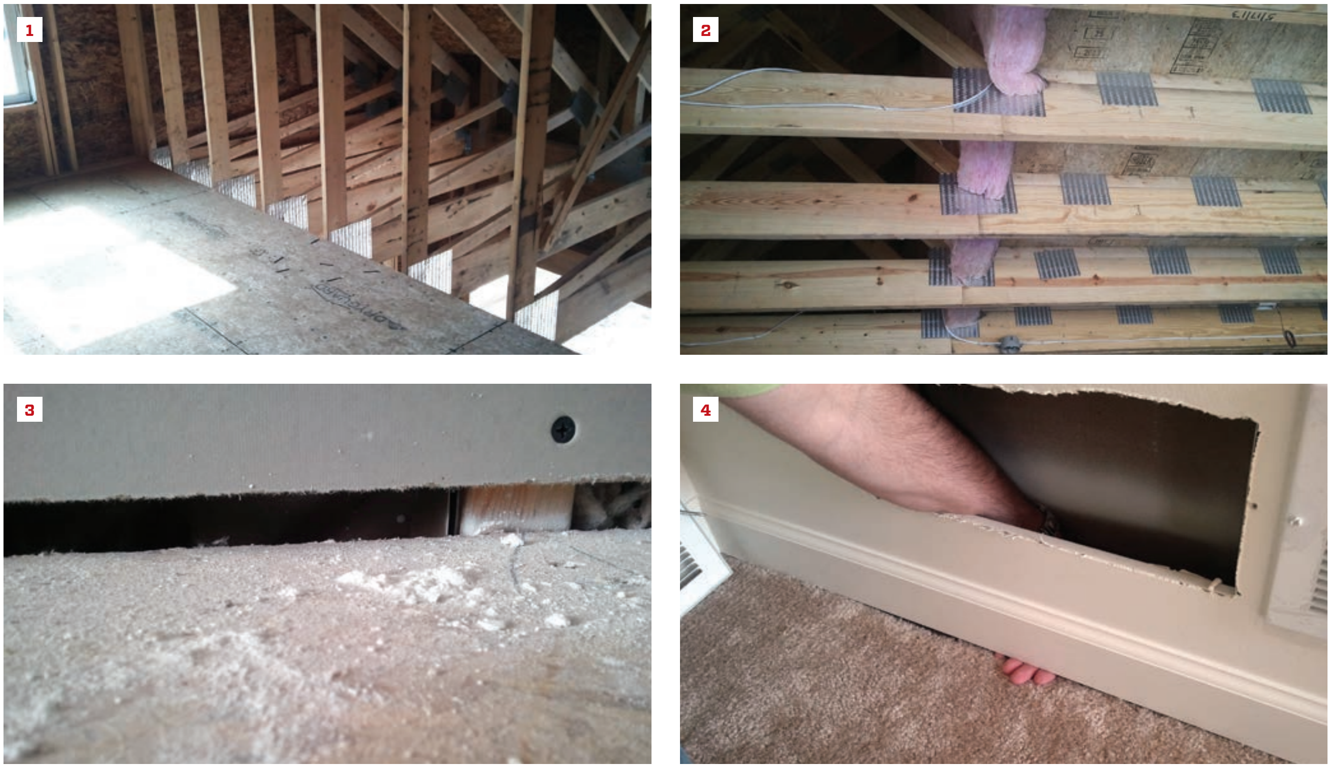
A room over the garage shouldn't always be a warranty issue

BY MATT BOWERS

I'm a HERS rater and project manager for Airtight Services, a home-performance contractor in upstate New York. In the photo above, one of our carpenters is cutting open the gable-end wall over a garage on a brand-new house. He's starting one of the jobs that have become part of our bread and butter: an energy upgrade performed as warranty service for a home builder on a cold, leaky "bonus room" over the garage.

In our area, bonus rooms have been a common feature of new construction since the 1970s. That's because builders here have optimized their plans to fit more houses on a development, and one way they create inexpensive square footage is to build a second-story room over an attached garage, framing the roof and the bonus room in one quick step using an attic truss. The bottom chords of the trusses form the garage ceiling as well as the bonus-room floor. Vertical webs of the trusses form the sidewalls of the room.

It's a frugal way to build what could be usable space, but the result is often uncomfortable space. Time after time, we are called because a homeowner has just moved into a house, and the room over the garage is 20°F colder than the rest of the house in the winter—the main house is a cozy 68°F, but the bonus room is in the 40s or 50s. We find this condition not only in older homes built under obsolete codes, but in brand-new houses built to comply with the 2009 International Energy Conservation Code (IECC) and even in homes built under the recently adopted 2015 IECC. The example shown in this story—a typical case—is warranty work on a new house built to comply with the 2009 energy code.



To construct a typical bonus room, the builder first installs OSB subflooring on the truss chord **(1)**, then insulates the vertical sidewall truss webs with kraft-faced fiberglass batts **(2)**, stapling the facing to the sides of the 2x4 webs. Next, the builder applies drywall to the room walls—leaving space below the drywall **(3)** for the carpet installers to attach a tack strip. After carpet and trim are in place, a huge air gap remains at the base of the wall **(4)**, communicating with the cold vented attic.

Now that the 2015 IECC has been adopted in New York, rooms like this one are likely to cause new homes to flunk the building envelope airtightness standard. New York's new energy code requires homes to achieve no more than 3 air changes per hour at 50 pascals of pressure (3 ACH50) during blower-door testing.

The photos above show a typical bonus room at various stages of construction. Because the framing is basically a set of trusses, there is no wall plate at the bottom of the wall. As a result, there's a gap—typically a big gap—at the bottom of the wall. This allows air to leak freely into the room from the space behind the wall, which is connected to the outdoors via the roof eave soffit vents.

Bonus rooms have big leaks. In pressure diagnostics, if I close the door to a bonus room and isolate it, I often measure a 20- to 25-pascal difference between the bonus room and the main house—and you can feel the air pouring in under the door.

To make matters worse, the typical forced-air heat for a room like this tends to underperform. The ducts serving the room typically are insulated to only R-4.2 and run the 24-foot length of the garage through unheated space and then back to the furnace in the basement—often the longest duct run in the house. The thermostat is generally located in the family room on the first floor. So, controlled by calls for heat from the warm inside of the house, the furnace would struggle to heat the bonus room adequately even if the bonus room weren't leaky, poorly insulated, and exposed on five sides to outdoor temperatures.

Bonus-room conditions can get extreme. We've walked into older bonus rooms, built in the 1970s or 1980s, with built-in dresser cabinets added to the knee wall, projecting into the cold space. One occupant's main complaint was frosty underwear on winter mornings. Homeowners in these situations aren't focused on their heating and cooling bills. They don't care what it costs, or how much they will save; they just want to be comfortable.

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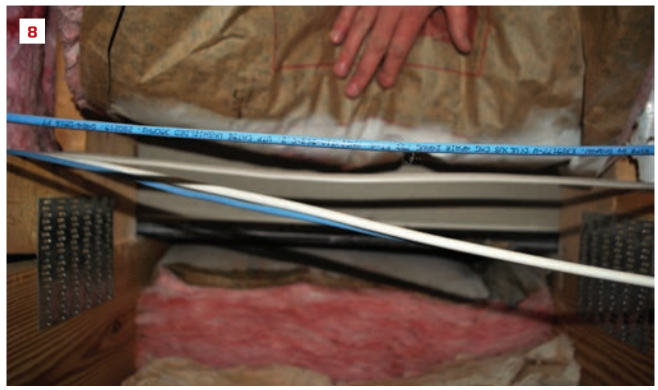

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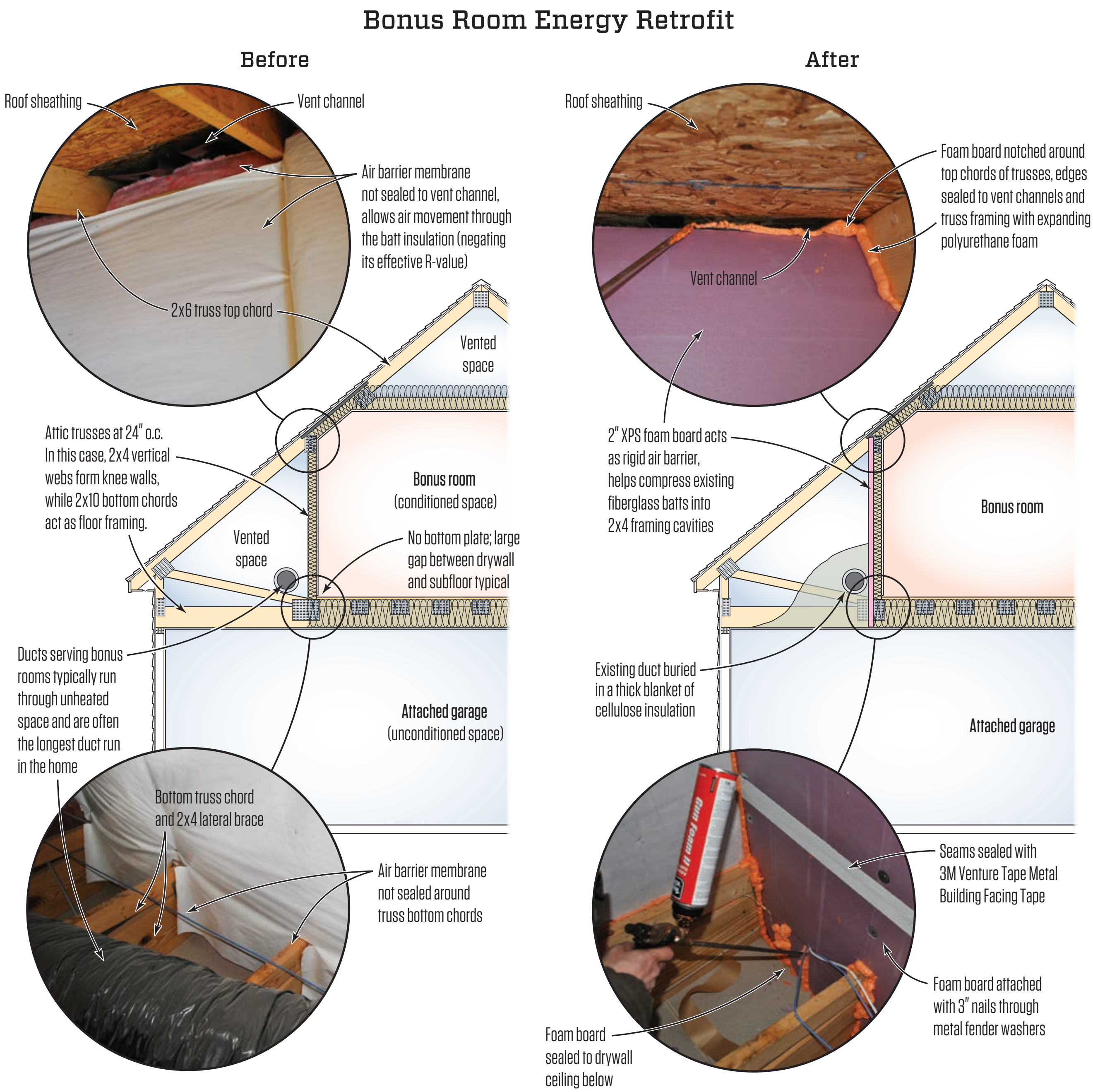
Working from outside, a carpenter cuts into unheated space above the garage next to the bonus room **(5)**. Under the low roof, he finds the back of the bonus-room wall **(6)**, with a plastic air barrier stapled to the wall over the fiberglass insulation (but not sealed at the top or the bottom). With the plastic removed, the R-19 batts bulge out beyond the 2x4 framing **(7)**. Where the wall meets the floor, nothing blocks air from flowing through fiberglass batts installed under the subfloor **(8)**.

CUTTING IN

Before we start a job like this, I look in the bonus room to make sure that there aren't valuable things hanging on the walls. We are going to be nailing up an air barrier from the other side and don't want to knock anything off the wall. I also find out where the duct registers are, so that we'll have an idea of what to expect when we open up the space behind the wall. And finally, I like to double-check the room dimensions to make sure that when we cut open the gable end of the house, we won't cut into the occupied space. I take a measurement from the window to the knee wall inside the room, and then we measure off the same window when we choose a place to cut open the gable end.

Gaining entry through the gable end is the simplest approach. We could cut through the drywall from inside the room, or we could go in through the ceiling of the garage, but then it would be hard to patch up the holes we would make. Vinyl siding just unzips; then you take a couple of nails out and peel back the housewrap, cut out a piece of sheathing, and climb in. On the way out (see photos, page 64), you replace the sheathing, tape up the housewrap, rehang the vinyl, and move along.

What we found in the space behind the bonus-room knee wall in this house is typical (see photos, above). The white plastic air barrier is not sealed at the bottom or the top. With the plastic sheeting removed, the R-19 fiberglass insulation bulges out from the 2x4 wall framing cavities. When I fold back that kraft-faced wall insulation at the bottom, we see the condition under the floor: two insulation batts stuffed up into the truss bays from below, with the lowermost batt's kraft facing stapled to the truss sides to hold the insulation in place. And it's a little hard to see in these photos, but the joint between the subfloor and the drywall is open half an inch, as in photo 3 on the facing page—and there's daylight between the baseboard and the carpet.



As originally built (above left), the bonus room's air barrier allowed free airflow through the fiberglass insulation under the floor and in the walls. The author's repair (above right) created a rigid air barrier that air-sealed the living space, protected the floor and wall insulation from air infiltration, and boosted the wall system's nominal insulation value from R-19 to R-24.

Above, carpenters notch and fit 2-inch XPS insulation board over the wall studs, fastening the board with nails and washers as they compress the R-19 batts into the wall framing cavities **(9)**. They cover the whole wall with 2-inch (R-10) XPS, notching around the upper truss chords at the top of the wall **(10)**. They seal the foam board to the framing with gun foam, sealing duct penetrations at the same time **(11)**. Finally, they tape the seams between sheets of foam board to perfect the airtight seal **(12)**.

CREATING AN AIR BARRIER

On the left side of the illustration on the facing page, you can see the deficiencies that made this room so uncomfortable; on the right are the repairs that our crew made. When the original plastic air barrier membrane was installed, somebody took time to notch it out around the bottom chords of the trusses—but it was never sealed. Our goal was to seal our air barrier all the way around the truss chords and seal it to the drywall underneath.

Fabric wraps are difficult to work with, so we like to use a beefy rigid air barrier material here. For this job, we used 2-inch XPS foam, which adds R-value and is stiff enough to compress the existing R-19 batts into the 2x4 wall cavities (note: some jurisdictions may require a fire-rated material such as Dow Thermax at this location).

We notched the XPS out carefully to fit around the trusses, making sure the board contacted the drywall at the bottom of the truss cavity, and attached the boards with 3-inch nails and washers, which we have found give a better positive attachment than ordinary cap nails.

Compressing the R-19 batts into the 2x4 cavity gives an effective R-value of R-14; in new construction, a high-density R-15 batt would cost less and perform better. But with the XPS, our retrofit still achieves a nominal R-24. And by abating the convection and thermal bridging that had reduced the effectiveness of the original R-19 batts, our upgrade substantially boosts the wall's performance.

At the top of the wall, the existing air barrier membrane was never sealed to the vent channel installed under the roof sheathing—again, exposing the fiberglass to wind-washing. So when we notch the foam board around the top chords of the trusses, we seal the edges to the vent channel as well as to the trusses.

Finally, we seal the seams between the pieces of foam board using 3M Venture Tape Metal Building Facing Tape, which clings tenaciously and is much cheaper than some specialty tapes.

With the new foam-board air barrier in place and sealed with gun foam and tape, the crew augments the insulation wrap on the flexible heating duct with an additional 10-inch blanket of blown cellulose **(13, 14)**. Then the carpenters nail the cut-out section of wall sheathing back in place, and reattach the housewrap and seal the seams with tape **(15)**. Finally, they replace the vinyl siding **(16)**, leaving no visible trace that any repair ever happened.

A BLANKET FOR THE DUCTWORK

As I mentioned earlier, the ductwork for a bonus room tends to be the longest duct run in the home, and it's usually only insulated to R-4.2. The airflow in the ducts suffers from friction losses, and the air loses heat to the cold attic space as it makes its way to the room. So after we seal up the insulated air barrier for the bonus-room knee wall, we install a thick blanket of cellulose insulation around the duct. This helps keep the supply air coming into the room nice and warm. We put about 10 inches of insulation on all sides of the duct—including below it—for a good R-30 to R-40.

With that done, all we have to do is go back out through the hole in the wall, nail the OSB sheathing back in place, staple the housewrap back onto the wall, and tape the housewrap seams. Then we reattach the vinyl siding, and we're done. It's a one-day job; start to finish, the whole job typically takes about three hours for each side of the room.

So how could a builder avoid this callback? Well, the big problem is the air barrier, and the major flaw is the floor-to-wall joint. So when the subfloor and the drywall are both installed, but before trim or carpet are installed, one good step would be to air-seal that joint with a can of gun foam—or better yet, with tape. Blocking nailed between the trusses behind the drywall at the wall base, to make up for the missing wall plate, would also help.

If you are hoping to meet an above-code standard or to surpass code-required insulation and airtightness levels in this relatively vulnerable room, there's another option: Specify a truss with a shorter knee wall, and frame a whole separate wall inboard of that for your room. That way, you'll have room for more insulation than an R-19 batt.

Certified Passive House Consultant and HERS rater Matt Bowers works for Airtight Services, in Marion, N.Y.

Preventing Silicosis

Learn more about workplace solutions for controlling exposures to Respirable Crystalline Silica in construction and hydraulic fracturing. Save lives and prevent new cases of silicosis, a severe lung disease. Understand the occupational exposure limits to keep workers safe from breathing hazardous silica dust.

Approximately 2.3 million workers are exposed to respirable crystalline silica (RCS) in the workplace, including 2 million workers in construction and 300,000 workers in general industry, maritime and hydraulic fracturing. As early as 1974, NIOSH researchers had proposed a recommended exposure limit (REL) of 50 micrograms per cubic meter (50 μg/m3) for inhalation of dust containing RCS, as a time-weighted average for up to a 10-hour workday as part of a 40-hour workweek. NIOSH research into engineering control methods to reduce RCS exposures in the workplace are ongoing, helping employers to safeguard the health of their employees.

What is Silica and Silicosis?

Silica, or silicon dioxide (SiO2) is a mineral that occurs naturally in crystalline or non-crystalline form. The most abundant crystalline form is α-quartz, which is the most common mineral on earth's continents. It is found in sand, sandstone, shale and granite. Drilling, crushing, cutting, chipping, breaking, sawing or polishing materials containing crystalline silica can create a large amount of respirable dust. These dust particles, mostly 10 microns in size and smaller, are too small to see, but can penetrate to the deepest part of the human lung when inhaled. Chronic inhalation of such respirable crystalline silica (RCS) dust can lead to severe lung disease, such as silicosis or lung cancer. Having silicosis can, in turn, increase the risk of developing tuberculosis. RCS exposure has also been linked to kidney and auto-immune diseases.

What Jobs are at Risk for Increased Exposure to RCS dust?

There are risks for inhalation of RCS in many jobs in many different industries. Some examples are:

- Construction
  - Sandblasting
  - Jack hammering
  - Rock drilling, cutting, chipping or polishing
  - Brick or tile cutting and sawing
  - Concrete drilling, sawing, grinding and polishing
  - Tunneling
  - Demolition
  - Asphalt milling
  - Tuckpointing

A worker wet-grinds a stone countertop using local exhaust ventilation by means of a drop-down arm from a ceiling-mounted dust collector.

- Stone countertop fabrication
- Diatomaceous earth processing
- Pottery production
- Foundries
- Work on linings of rotary kilns and cupola furnaces
- Mining
- Hydraulic fracturing

What is the New Occupational Exposure Limit?

The OSHA Final Rule for Occupational Exposure to Respirable Crystalline Silica, including the standard for construction, 29 CFR 1926.1153, and for general industry and maritime, 29 CFR 1910.1053, took effect on June 23, 2016. The OSHA final rule reduces the permissible exposure limit (PEL) for respirable crystalline silica (RCS) to 50 micrograms per cubic meter of air, matching the NIOSH REL. Engineering controls are now also a part of the new rule helping to reduce worker exposure. Depending on the industry, implementation dates for the new rule range from 2017 to 2021. The new occupational exposure limit is expected to save over 600 lives and prevent more than 900 new cases of silicosis annually.

How Can Employers Control Exposures to RCS dust?

Controlling exposures to occupational hazards is the fundamental method of protecting workers. Traditionally, a hierarchy of controls has been used as a means of determining how best to implement feasible and effective controls.

One application of the hierarchy of controls to RCS exposure can be summarized as follows:

- **Elimination –** eliminate job tasks with risk of exposure
- **Substitution –** substitute non-crystalline-silica materials for crystalline silica materials
- **Engineering Controls –** use a control such as local exhaust ventilation or water spray to reduce concentrations of RCS in the air
- **Administrative Controls –** limit time spent working with RCS, and/or limit worker access to areas of high RCS concentration
- **Personal Protective Equipment –** wear respirators when working with RCS

The idea behind this hierarchy is that the control methods at the top of the list are potentially more effective, protective, and economical (in the long run) than those at the bottom. Following the hierarchy normally leads to the implementation of inherently safer systems, ones where the risk of illness or injury has been substantially reduced.

RCS Exposure Control Research

CDC's National Institute for Occupational Safety and Health (NIOSH) has been studying ways to protect workers from occupational exposure to RCS for over 40 years. Laboratory research has tested the effectiveness of local exhaust ventilation in controlling RCS exposure during cutting and sawing of construction materials. In field studies, engineering controls have been tested under

real-world conditions to determine their effectiveness in protecting worker health.
Engineering controls for RCS dust are becoming increasingly available for a range of tools and equipment. Engineering controls are often based on the use of a collector such as a shroud, combined with an industrial vacuum for local exhaust ventilation. Such arrangements are commercially available for jackhammers, drills, chisels, concrete breakers, saws, sanders, concrete floor polishers, hand grinders and asphalt milling machines

Local exhaust ventilation systems using baghouse controls are available for RCS released from sand mover equipment during hydraulic fracturing. Wet methods to control RCS are commercially available for drills, saws, grinders and polishers. Wet RCS controls are not commercially available for jackhammers, but instructions for making your own water spray engineering control can be found on the website for CPWR, The Center for Construction Research and Training.

Continued Investigation on the Best Engineering Controls

NIOSH researchers continue to develop and investigate the best engineering controls for RCS. Recent research includes RCS control during concrete floor polishing, stone countertop fabrication, hydraulic fracturing (or “fracking”), asphalt milling, cutting of fiber cement siding, tuckpointing and concrete dowel drilling.

Jackhammering with a water spray control that reduces dust.

- Most walk-behind concrete floor polishers[1.26 MB] come equipped with local exhaust ventilation or water suppression systems. NIOSH research has revealed that some equipment is more efficient than others at RCS control, and has helped to point the way to better worker protection.

Filter bags of the NIOSH mini-baghouse retrofit assembly (NMBRA) have been installed on the thief hatches on top of this sand mover, used for hydraulic fracturing.

- RCS exposure during stone countertop fabrication and installation [4.62 MB] is an emerging issue. NIOSH researchers are at the forefront in evaluating the efficacy of engineering controls for protecting workers in this industry. Field studies have been performed in several workplaces to measure the effectiveness of wet grinding and polishing in reducing worker exposures. Data collected to date show that existing engineering controls may not be sufficiently protective of workers’ health. These investigations are ongoing.

Exposures of asphalt milling machine operators to RCS have been reduced by implementation of local exhaust ventilation.

- During hydraulic fracturing, more than a million pounds of sand may be delivered, handled and pumped deep underground to retrieve oil and gas. Dust from this “frac sand” contains[2.02 MB] large amounts of RCS. With the help of industry partners, NIOSH researchers have developed and evaluated an engineering control for “frac sand” dust released from thief hatches on sand moving equipment, the major source of RCS exposure to workers. This control, called the NIOSH mini-baghouse retrofit assembly (NMBRA)[3.12 MB] is an inexpensive, portable system with no moving parts, which can be installed on a sand mover in the field. The NMBRA has shown excellent efficiency in filtering RCS from the air, and is currently being tested in the field for its long-term performance characteristics.

- NIOSH research identified cutting of fiber cement siding[561 KB] as a source of worker exposure to RCS. Employing a simple and low-cost local exhaust ventilation on dust-collecting circular saws has been proven effective in reducing worker exposure.

- Workers performing tuckpointing experience some of the highest measured construction exposures to RCS. Clouds of mortar dust also make it difficult for workers to see the work surface. Application of local exhaust ventilation[303 KB] with tuckpointing grinders can improve both the health and the safety of these workers. Recently, NIOSH researchers began investigating dust controls for RCS exposures from tools other than grinders that can be used to remove mortar.

- Local exhaust ventilation has also been used in concrete dowel drilling[947 KB] operations. NIOSH research showed that some of the highest RCS exposures to workers doing these tasks came from unexpected sources, such as from RCS that had accumulated on the worker's clothing, or from cleaning of the dust collection equipment.

- An area in which NIOSH research has been very successful is in the asphalt milling industry. NIOSH participated in a Silica/Asphalt Milling Machine Partnership that was coordinated by the National Asphalt Pavement Association (NAPA) and included all U.S. and foreign manufacturers of heavy construction equipment that sold pavement-milling machines to the U.S. market. The partnership included many stakeholders from labor, industry, and government who worked together to reduce silica exposures on asphalt milling machines. As a result of the collaborative research, all manufacturers of half-lane and larger cold milling machines implemented dust controls that include local exhaust ventilation as a control for RCS exposures by January 1, 2017. A NIOSH best practices document, published in March, 2015, highlights the most successful engineering controls to reduce RCS exposures on asphalt pavement milling machines.

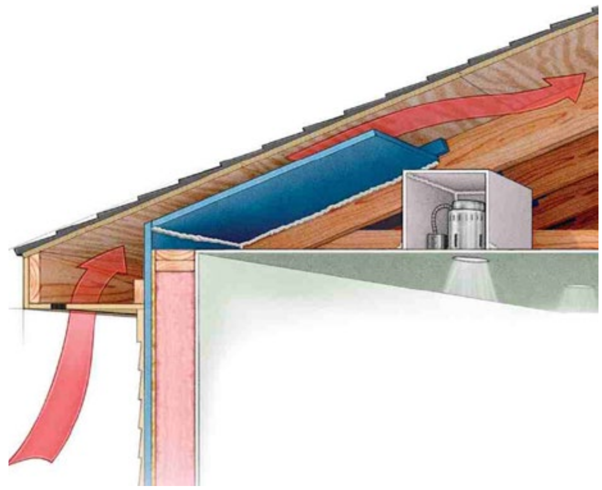
All About Attic Venting

We vent attics for four reasons, and all four goals can be better achieved by adopting measures other than attic venting

POSTED ON DEC 6 2013 BY MARTIN HOLLADAY

To read article on-line and activate links, click:
http://www.greenbuildingadvisor.com/blogs/dept/musings/all-about-attic-venting

Most homeowners and builders believe that attics should be vented. If you walk down to your local lumberyard and lean on the counter, the employees and nearby customers will offer a variety of opinions about why attics need to be vented. Unfortunately, it's highly unlikely that the statements you hear will be true.



Unless you are building a sealed, conditioned attic, the building code requires attics to be ventilated. However, air isn't always smart enough to follow the "smart arrows" shown in ventilation illustrations like this one.

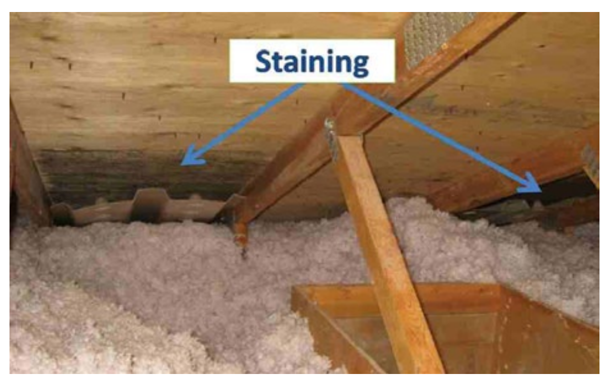
Here are the four most common reasons people suggest to explain the practice of venting attics:

- To reduce the chance of moisture build-up in the attic or condensation on the underside of the roof sheathing.
- To make roofing shingles last longer.
- To lower cooling bills during the summer.
- To reduce the chance of ice dams.

Although attic ventilation is sometimes able to contribute in a very small way to addressing the problems on this list, there are much better solutions to all four problems than ventilation.

What does the code require?

If you plan to install insulation on your attic floor, then most building codes require that your house be equipped with soffit vents.



This photo shows sheathing mold near the ventilation baffles in the attic of a well-vented, well-constructed, relatively new building in the Pacific Northwest. Note that the sheathing is most humid at the location where one might expect the sheathing to be dry (due to the presumed benefits of ventilation). The photo comes from "Highly Insulated, Ventilated, Wood-Framed Attics in Cool Marine Climates" by Patrick Roppel, Neil Norris and Mark Lawton.

The standard code formula requires 1 square foot of net free ventilation area for every 300 square feet of attic floor area, assuming that half of the ventilation openings are located in the soffit, and half along the ridge. If a roof has only soffit vents and no ridge vents, most codes require 1 square foot of net free ventilation area for every 150 square feet of attic floor area.

Manufacturers of soffit vents and ridge vents usually specify the net free vent area of their products on product packaging or in specifications available online. (Researchers have shown that the net free vent areas reported by manufacturers are exaggerated, but that is a topic for another article.)

If you plan to install insulation between your rafters, building codes require that the attic be sealed (unvented). The code allows you to install a ventilation channel between the underside of the roof sheathing and the top of the insulation installed between the rafters if you want, but this type of attic can't have any vent openings that allow outdoor air to mix with the air in the attic.

In most cases, ventilated attics require ventilation baffles near the eaves to create an air gap between the underside of the roof sheathing and the top of the insulation layer. The air gap should allow the free flow of air from the soffit vents to the attic. According to section R806.3 of the 2006 International Residential Code (IRC), "A minimum of a 1-inch space shall be provided between the insulation and the roof sheathing and at the location of the vent."

Many experts advise that 2-inch-deep vent cavities are better than 1-inch-deep cavities; if that's the route you want to go, size your baffles accordingly. (For more information on this topic, see Site-Built Ventilation Baffles for Roofs.)

More information on building code requirements for attic venting can be found in these two articles: Creating a Conditioned Attic and How to Build an Insulated Cathedral Ceiling.

Reducing moisture buildup in the attic

William Rose is a research architect at the Building Research Council at the University of Illinois. Rose has delved more deeply into the history of attic ventilation requirements than any other building scientist or historian. According to Rose, the stated aim for the first code requirements for attic venting was to reduce moisture buildup in the attic. Unfortunately, the code requirements were not based on science or research. Rose reports, "The attic ventilation ratio '1/300' is an arbitrary number selected by the writers of FHA (1942) with no citations or references."

High attic humidity usually shows up as dampness or frost on the underside of the roof sheathing. Another sign is mold (usually on the underside of the sheathing or the sides of the rafters). In almost all cases, these symptoms are due to two construction defects: a ceiling with air leaks, and a damp basement or crawl space. The way to solve this problem is to seal the air leaks and correct the moisture problems in the basement.

Rose advises, "Don't rely on ventilation alone to take care of moisture in the attic. The best protection against condensation and mildew in the attic is a dry basement or crawlspace. Also important is an airtight ceiling."

One of Rose's colleagues at the Building Research Council is Jeff Gordon, who gave a presentation on attic ventilation at the 2011 Affordable Comfort conference. According to Gordon, "The three parameters for attic condensation in cold climates [are] interior house humidity, ceiling airtightness and pressures, [and] attic ventilation. Attic ventilation will have a slight positive influence, but it is third in the list."

Extending shingle life

I installed a lot of asphalt shingles when I worked as a roofer in the 1970s. In those days, asphalt shingle manufacturers did not require attics or cathedral ceilings to be vented. "The earliest dates for shingle warranties being linked to attic ventilation requirements could not be determined…," Rose reports. "However, archival material at NRCA [National Roofing Contractors Association] indicates that the links may have first begun to appear in the late 1980s and early 1990s."

Rose co-authored an article (with Anton TenWolde, a former research physicist at the Forest Products Laboratory in Madison, Wisconsin) titled "Venting of Attics and Cathedral Ceilings"; the article appeared in the October 2002 issue of the ASHRAE Journal. Rose and Tenwolde wrote, "One published rationale [for venting requirements established by asphalt shingle manufacturers] holds that venting cools shingles, and thereby affects the rate of embrittlement by reducing the rates of oxidation and volatilization of asphalt hydrocarbons. However, ventilation is a minor factor in the determination of shingle temperature. … Venting cools shingles, but the cooling effect is not strong."

In an article titled "Roof Ventilation Update," Rose wrote, "Many factors influence the temperature on the roof. A prioritized list might include hour of day, outdoor air temperature, cloud cover, color of the roof, roof orientation, where the measurement is taken (sheathing or shingles, top or bottom), latitude, wind speed, rain or snow on the roof, heat conduction across attic insulation, roof framing type (truss or cathedral), and attic ventilation to the outdoors. As you can see, ventilation falls pretty far down the list."

The bottom line: if you care about your asphalt shingle warranty, you may need to follow the shingle manufacturer's venting requirements. But if you care about the temperature of your shingles, the most important step you can take is to choose white shingles.

Lowering cooling bills

If a house has insulation on the attic floor, there isn't any evidence to support the idea that attic ventilation will reduce your air conditioning bills.

Jeff Gordon, in his presentation on attic ventilation, wrote, "Cooling season energy savings? Well, we tried to measure energy use, but this did not work very well. … Basically, [any savings are] lost in the noise." Gordon reported that research has shown that "Attic ventilation is not an effective energy conservation procedure for houses with more than 6.5 inches of attic insulation."

Summing up, Gordon reported, "Venting will reduce the temperature in an open attic. The difference in attic temperature between a vented an unvented attic, with R-30 at the ceiling, translates into minuscule [cooling energy] savings. No savings have ever been measured. … In mixed climates, savings from delta T must be balanced by losses from delta T in the winter. In cold climates, this is clearly a net loser."

In some homes, the HVAC equipment or ductwork is located in a vented attic. This is a terrible practice, of course. Ventilating this type of attic doesn't solve the problems associated with locating equipment and ductwork outside of the home's thermal envelope. As building scientist Joseph Lstiburek explains, "In a situation where mechanical systems or ductwork has to be in the attic space or when there are lots of penetrations in the ceiling below the attic, it's best to bring the entire attic area inside the thermal envelope. This way, it's not as big a deal if the ceiling leaks air or if the ducts are leaky and uninsulated."

Reducing the chance of ice dams

It's very difficult to solve most ice dam problems by increasing attic ventilation. In my 2010 article on ice dams, I wrote, "By recommending ventilation, a builder is saying, 'I wasn't able to include enough insulation to prevent the roof sheathing from being warmed by escaping building heat. So I guess I'll use another method to cool the roof — I'll ventilate the underside of the roof with exterior air.' "

Jeff Gordon has prepared a prioritized list of the causal factors for ice dams. "The principal cause of melting is heat from mechanical equipment or ductwork in the attic. The second cause is leaky ductwork. The third cause (or first if [the attic has] no ductwork) is air leakage through openings in the ceiling. The fourth cause is inadequate insulation. The fifth cause is sun heating exposed roof. Venting cannot dilute this level of excess heat."

Once again, we see that an attempt to increase attic ventilation sidesteps the basic causes of the problem at hand and is unlikely to solve it. That said, including ventilation under your roof sheathing probably makes sense for homes in snowy climates.

What about cathedral ceilings?

When guidelines for attic ventilation were first proposed in 1942, no one anticipated that these guidelines would eventually be applied to cathedral ceilings. Rose and TenWolde note that vent channels above cathedral ceiling insulation aren't very effective. The authors wrote, "Venting rules for attics have been extended to apply to cathedral ceilings, but few studies have been made to confirm the validity of that extension."

While cathedral ceiling venting can (to a limited extent) lower the humidity level of roof sheathing, it can't really help cool roof shingles. According to Jeff Gordon, "You cannot cool the upper part of a cathedral ceiling roof with venting." Bill Rose has collected data proving this point; his findings were reported in a 2001 paper, Measured Summer Values of Sheathing and Shingle Temperatures for Residential Attics and Cathedral Ceilings. Rose found that shingles above a vented cathedral ceiling are cooler at the eaves and hotter at the ridge than shingles above a vented attic. This is due to the strong temperature gradient, especially on the south side of the roof, which exists in the ventilation channel above a cathedral ceiling. "It becomes apparent that venting can cool the lower section of a vented cathedral ceiling quite effectively, but the cooling effect is greatly reduced for the upper part of the cavity," Rose reported.

The main problem with venting a cathedral ceiling has to do with roof geometry. If the plane of the roof is interrupted by hips, valleys, chimneys, dormers, or skylights, as most roofs are, effective ventilation is impossible.

Confused thinking that needs to be debunked

Although I have listed the four most common explanations for attic ventilation requirements, it's important to mention a fifth explanation — one that is particularly muddled and confused. My nickname for this explanation is, "Your ceiling is a safety valve."

This explanation is entirely divorced from any understanding of building science. Here's how an old-time New England builder might explain the theory: "You can't put a poly vapor barrier in your ceiling because your ceiling has to breathe. If you put polyethylene up there, the moisture won't have anywhere to go. It will be trapped. You want the moisture to be able to get out."

The ceiling-is-a-safety-valve theory encompasses several misconceptions. Here are two of them:

- The purpose of attic vents is to help lower indoor humidity levels. If you encourage moisture to flow through your ceiling assembly, you will improve conditions inside your house.

- Because your attic is vented, you need to feed a continual stream of moisture towards the attic vents so that the vents have something to do.

Of course, these ideas are misguided. Ideally, your ceiling should include a thermal barrier that separates the warm, humid, interior air from the cold, dry, attic air. You don't want to encourage any moisture flow through that assembly — whether by air leakage or by diffusion.

Sometimes, attic venting can cause problems

I've shown that attic ventilation isn't very effective at solving the problems that it is supposed to address. There's more to the story, however: attic ventilation sometimes causes problems.

One obvious problem is called "wind washing": this refers to the degradation in the performance of fibrous insulation (especially fiberglass batts) due to the flow of exterior air through the insulation. This problem is especially acute in the areas of a vented attic that are nearest to the soffit vents. The problem can be mitigated by switching to a denser insulation and by installing insulation dams above the top plate of the perimeter wall.

In cold climates, attic ventilation can also increase energy bills. For example, imagine a house without a ridge vent that is getting new roofing. Trying to improve the home, the roofer cuts back the sheathing and installs a new ridge vent. What happens next?

The (relatively warm) attic air escaping through the new ridge vent depressurizes the air near the attic floor. Since most homes are leaky, the effect is to pull more warm, conditioned air through ceiling air leaks. The net result: energy bills go up.

When attic vents are installed on a house with an attic that was previously unvented, the attic can develop new moisture problems. In an article for Home Energy magazine, Tony Woods explained, "Ventilating a previously unventilated attic has the effect of making the attic colder. If nothing is done to stop warm, moist air from entering the attic space from the living space, condensation on the now-cooler surfaces is a certainty. Mold, mildew, and eventually leakage into the living space will probably follow."

One way to describe these problems is to note that air doesn't always follow the "smart arrows" you see in the diagrams created by soffit vent manufacturers. According to Rose, “Many attic assemblies are built with vents to the outdoors on the presumption that outdoor air will enter the attic and dilute moisture coming from indoors or from the foundation. The further presumption is that indoor air is wet and outdoor air is dry. Both of these assumptions are often false. If there are openings in the ceiling, then air movement in the attic can induce airflow from below, or dilute air from below, or do nothing, in ways that are just plain unpredictable no matter how much research is done. Attic air movement can also induce flow into the living space below, which is a nasty problem when the air conditioning is running.”

Hot, humid climates

Another category of problems caused by attic venting occurs in hot, humid climates. In their ASHRAE Journal article, Rose and TenWolde wrote, “No scientific claims have ever been made that attic ventilation is needed for moisture control in hot, humid climates. In these climates, the outside air tends to be much more humid than the inside air. … In such climates, attic venting tends to increase rather than reduce moisture levels in the attic.”

In a paper titled “Vented and Sealed Attics In Hot Climates,” Armin Rudd and Joseph Lstiburek explained the problem in more detail. They wrote, “Ventilation can be one of the major causes of humidity problems in southern humid climates. The problem of condensation in attics in hot-humid climates is caused by humid outdoor air coming in contact with cold surfaces in the attic. Although worse in coastal areas, this problem is not confined to them. The most offending cold surfaces are usually supply ducts, but they can be ceiling drywall and metallic penetrations through the ceiling if low interior setpoints are maintained.”

It’s safe to say that ventilating attics in a hot, humid climate is just plain stupid. Danny Parker, a researcher at the Florida Solar Energy Center, is the author of “Literature Review of the Impact and Need for Attic Ventilation in Florida Homes.” Parker wrote, “Although the rationale for attic ventilation is for moisture control, this was historically based on needs in cold climates and to prevent ice dams. The justification for attic ventilation for moisture control in hot humid climates is not scientifically defensible.”

The conclusions of Rudd and Lstiburek echo those of Parker. Rudd and Lstiburek wrote, “In the hot humid climate, the best solution to eliminate the potential for moisture condensation in attics may be to keep the moisture out of the attic altogether by sealing the attic to the outdoors.”

Powered attic ventilators

Some proponents of attic ventilation assume that if a little natural ventilation is a good thing, then powered ventilation using one or more fans has to be even better. These people are wrong; I explained why in a 2012 article, Fans in the Attic: Do They Help or Do They Hurt?

Danny Parker lists three research studies that demonstrate the folly of powered attic ventilation. Parker wrote, “Increasing attic ventilation rates in existing residential buildings is often accomplished by adding forced ventilation using attic temperature activated attic fans. However, even those who are in favor of increased attic ventilation have often warned that the energy consumption associated with the attic fan motor is likely greater than any realized energy savings from its use (Wolfert and

Hinrichs, 1974). Also, an early detailed study showed that while forced attic ventilation did reduce cooling energy use, the reduction was quite small and outweighed by the energy consumption of the fan itself (Dutt and Harrje, 1979). Another study in two instrumented side-by-side homes in Texas came to similar conclusions (Burch and Treado, 1979). … Thus, the powered ventilation does not typically result in a net energy savings unless the attic is uninsulated."

If you want to vent your attic, do it right

Some building scientists, notably Joseph Lstiburek, defend attic ventilation. If you are building a vented attic, you may want to follow Lstiburek's guidelines, which are laid out in a Fine Homebuilding article, "A Crash Course in Roof Venting."

Lstiburek's guidelines differ in several respects from code requirements. "If you choose to vent the roof deck, then be serious about it and really vent it," Lstiburek recommends. "The code calls for a minimum of 1 in. of airspace between the top of the insulation and the back of the roof sheathing. That's not enough. For best performance, the airspace in the vent chute should be a minimum of 2 in. deep."

Lstiburek advises builders to include more soffit ventilation than ridge ventilation. "Building codes suggest balancing the intake and exhaust ventilation," Lstiburek wrote. "The code, however, is wrong, and I'm working hard to get it changed. More ventilation at the eaves than at the ridge will slightly pressurize the attic. A depressurized attic can suck conditioned air out of the living space, and losing that conditioned air wastes money. For best results, provide between 50% and 75% of the ventilation space at the eaves; a 60/40 split is a good sweet spot."

William Rose is much more skeptical of the value of attic ventilation than Lstiburek. While Lstiburek implies that small changes in attic ventilation details are quite important, Rose thinks that these details hardly matter. Rose advises, "Once you've sealed all of the openings that lead from below into the attic, corrected the ductwork, and installed a nice thick blanket of insulation in the attic, then one venting strategy is about as good as any other. Gable venting and ridge venting are both fine. Soffit venting with baffles is fine. Combinations are fine. If parts of the roof have a lot of venting and other parts have little or none, most would agree that that's fine too. Power venting, however, is noisy and expensive."

Jeff Gordon leans more to the Rose than the Lstiburek side of this debate. According to Gordon, on a windy day, your attic will be ventilated; when the wind isn't blowing, don't expect much ventilation. Gordon wrote, "What pressures drive attic ventilation? Wind – and that is about it. [There is] little stack effect in the attic – they aren't very tall. [There] shouldn't be any induced pressures from mechanical systems (we don't want duct leakage in the attic). Attic ventilation provides air flow only to the extent that the wind blows."

As often happens, the code gets it backwards

For years, building codes have required cold-climate builders to include interior vapor barriers, while almost totally ignoring air leakage. Yet vapor diffusion causes very few problems, while air leakage is a huge problem. For all these years, the building code was focusing on the wrong issue.

The code's obsession with attic venting represents a similar error. While enforcing requirements for soffit vents and ridge vents, most codes have turned a blind eye to ceiling leaks. The code requirements are backwards.

My favorite quote from William Rose on the topic of attic ventilation appeared in the August 1997 issue of Energy Design Update. Rose noted, "Ventilation is like a little boy who goes around the house looking for a job. He can do some things well, but can't do anything really well."

In one of his papers, Rose laid bare the unscientific nature of code requirements for attic ventilation, concluding, "Professionals in the building industry — design, codes and construction — may view the support for the current regulations, described in this paper, as being strong or weak. In the opinion of the author the support is weak, and a strict interpretation of 1/300 compliance is not appropriate."

Elsewhere, Rose and TenWolde recommended, "The focus of regulation should be shifted away from attic ventilation. The performance consequences of other design and construction decisions should be given increased consideration."

Here's the most important detail to remember if you want your attic to perform well: build an airtight ceiling. As Rose summed up in one of his many articles on the topic ("Roof Ventilation Update"), "So you should vent where venting is appropriate and not vent where it is not appropriate. As it turns out, the worst-performing, most mold-ridden attics I have seen were vented — with a flooded crawlspace and a direct path for air movement from the crawlspace to the attic. … The father of a colleague of mine says that when the word 'ventilation' comes out, people stop using their heads. Vented assemblies often perform well, but not always. Sometimes roofs appear to be vented but actually aren't."

Rose advised, "You can mess up a vented attic … You can mess up an unvented attic as well, usually by not providing vapor protection appropriate to the climate and indoor moisture levels. Tight ceilings would be a great first step toward moisture control, summer and winter."

So when should attics be vented?

Attic ventilation is incapable of performing all of the magic tricks that some people assume it can perform. Nevertheless, it often makes sense to include ventilation channels under your roof sheathing:

- It's always easier to comply with the building code than it is to argue with your local inspector.
- Generous ventilation channels can reduce the risk of ice damming if you live in a location with deep winter snows.
- If you have cathedral ceilings, OSB roof sheathing is at more risk of rot when the roof assembly is unvented than when it is vented — especially if there is no rigid foam above the OSB to keep it warm.

Water Samples Testing for Lead and Copper

The following pages contain procedures for collecting water samples to test for the presence of copper and lead.

STATE OF CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

Raul Pino, M.D., M.P.H.
Commissioner

Dannel P. Malloy
Governor

Nancy Wyman
Lt. Governor

Drinking Water Section

DWS Circular Letter # 2016-07

To: CWS and NTNC Public Water System Owners & Certified Operators

From: Lori Mathieu, Public Health Section Chief, Drinking Water Section

Date: March 14, 2016

Subject: EPA Clarification of Recommended Tap Sampling Procedures for Purposes of the Lead and Copper Rule

Recently, the EPA Office of Groundwater & Drinking Water issued a memorandum to all Water Division Directors regarding clarification on the recommended tap sampling procedures relating to the Lead and Copper Rule (LCR). The memorandum is attached to this circular letter for your reference.

In the near future, the Department of Public Health (DPH) Drinking Water Section (DWS) will be releasing a comprehensive LCR Guidance Document with a revised sampling protocol. In the interim, however, it is recommended that any PWS conducting routine lead and copper sampling review their current sampling protocol with respect to the attached recommended procedures. Please direct any questions regarding this matter to Carissa Madonna at 860-509-7333.

cc: Ellen Blaschinski, Branch Chief – DPH Regulatory Services Branch

State-Certified Laboratories

Local Health Directors

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WSG 197
Date Signed: February 29, 2016

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB 2 9 2016

OFFICE OF
WATER

MEMORANDUM

SUBJECT: Clarification of Recommended Tap Sampling Procedures for Purposes of the Lead and Copper Rule

FROM: Peter C. Grevatt, Director
Office of Ground Water & Drinking Water

TO: Water Division Directors
Regions I - X

The Lead and Copper Rule, 40 C.F.R. Sections 141.80 to 141.91, requires monitoring at consumer taps to identify levels of lead in drinking water that may result from corrosion of lead-bearing components in a public water system's distribution system or in household plumbing. These samples help assess the need for, or the effectiveness of, corrosion control treatment. The purpose of this memorandum is to provide recommendations on how public water systems should address the removal and cleaning of aerators, pre-stagnation flushing, and bottle configuration for the purpose of Lead and Copper Rule sampling.

Removal and Cleaning of Aerators

EPA issued a memorandum on *Management of Aerators during Collection of Tap Samples to Comply with the Lead and Copper Rule* on October 20, 2006. This memorandum stated that EPA recommends that homeowners regularly clean their aerators to remove particulate matter as a general practice, but states that public water systems should not recommend the removal or cleaning of aerators prior to or during the collection of tap samples gathered for purposes of the Lead and Copper Rule. EPA continues to recommend this approach. The removal or cleaning of aerators during collection of tap samples could mask the added contribution of lead at the tap, which may potentially lead to the public water system not taking additional actions needed to reduce exposure to lead in drinking water. EPA's recommendation about the removal and cleaning of aerators during sample collection applies only to monitoring for lead and copper conducted pursuant to 40 C.F.R. 141.86.

Pre-Stagnation Flushing

EPA is aware that some sampling instructions provided to residents include recommendations to flush the tap for a specified period of time prior to starting the minimum 6-hour stagnation time required for samples collected under the Lead and Copper Rule. This practice is called pre-stagnation flushing. Pre-stagnation flushing may potentially lower the lead levels as compared to when it is not practiced.

Flushing removes water that may have been in contact with the lead service line for extended periods, which is when lead typically leaches into drinking water. Therefore, EPA recommends that sampling instructions not contain a pre-stagnation flushing step.

Bottle Configuration

EPA recommends that wide-mouth bottles be used to collect Lead and Copper compliance samples. It has become apparent that wide-mouth bottles offer advantages over narrow-necked bottles because wide-mouth bottles allow for a higher flow rate during sample collection which is more representative of the flow that a consumer may use to fill up a glass of water. In addition, a higher flow rate can result in greater release of particulate and colloidal lead and therefore is more conservative in terms of identifying lead concentrations.

Conclusion

EPA is providing these recommendations for collection of Lead and Copper Rule tap samples to better reflect the state of knowledge about the fate and transport of lead in distribution systems. The three areas discussed above may potentially lead to samples that erroneously reflect lower levels of lead concentrations. The recommendations in this memorandum are also consistent with the recommendations provided by the EPA's Flint Task Force. For more information about the Task Force please view EPA's website at: http://www.epa.gov/flint.

To provide further information on this topic, EPA included an amended "Suggested Directions for Homeowner Tap Sample Collection Procedures" in Appendix D of the 2010 revision of *Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems* (EPA 816-R-10-004). This document can be found at:
http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100DP2P.txt

Please share these recommendations with your state drinking water program directors. If you have any questions, please contact Anita Thompkins at thompkins.anita@epa.gov.

Attachment

cc: James Taft, Association of State Drinking Water Administrators

Suggested Directions for Homeowner Tap Sample Collection Procedures

Revised Version: February 2016

These samples are being collected to determine the lead and copper levels in your tap water. This sampling effort is required by the U.S. Environmental Protection Agency and your State under the Lead and Copper Rule, and is being accomplished through a collaboration between the public water system and their consumers (e.g. residents).

Collect samples from a tap that has not been used for at least 6 hours. To ensure the water has not been used for at least 6 hours, the best time to collect samples is either early in the morning or in the evening upon returning from work. Be sure to use a kitchen or bathroom cold water tap that has been used for drinking water consumption in the past few weeks. The collection procedure is described below.

1. Prior arrangements will be made with you, the customer, to coordinate the sample collection. Dates will be set for sample kit delivery and pick-up by water system staff.
2. There must be a minimum of 6 hours during which there is no water used from the tap where the sample will be collected and any taps adjacent or close to that tap. Either early mornings or evenings upon returning home are the best sampling times to ensure that the necessary stagnant water conditions exist. Do not intentionally flush the water line before the start of the 6 hour period.
3. Use a kitchen or bathroom cold-water faucet for sampling. If you have water softeners on your kitchen taps, collect your sample from the bathroom tap that is not attached to a water softener, or a point of use filter, if possible. Do not remove the aerator prior to sampling. Place the opened sample bottle below the faucet and open the cold water tap as you would do to fill a glass of water. Fill the sample bottle to the line marked "1000-mL" and turn off the water.
4. Tightly cap the sample bottle and place in the sample kit provided. Please review the sample kit label at this time to ensure that all information contained on the label is correct.
5. If any plumbing repairs or replacement has been done in the home since the previous sampling event, note this information on the label as provided. Also if your sample was collected from a tap with a water softener, note this as well.
6. Place the sample kit in the same location the kit was delivered to so that water system staff may pick up the sample kit.
7. Results from this monitoring effort and information about lead will be provided to you as soon as practical but no later than 30 days after the system learns of the tap monitoring results. However, if excessive lead and/or copper levels are found, immediate notification will be provided (usually 1-2 working days after the system learns of the tap monitoring results).

Call__________________at_______________if you have any questions regarding these instructions.

TO BE COMPLETED BY RESIDENT

Water was last used: Time________________ Date________________
Sample was collected: Time________________ Date________________

Sample Location & faucet (e.g. Bathroom sink): __________________________

I have read the above directions and have taken a tap sample in accordance with these directions.

Signature_______________________________________ Date____________________

Contact CAHI c/o

Scott Monforte
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Milford, CT. 06461

Email: info@ctinspectors.com

Web: www.ctinspectors.com

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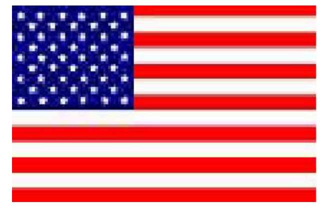

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Director Al Dingfelder 203-376-8452	Please thank them for their service when you have a chance.	***Dept of Consumer Protection 165 Capitol Avenue. Hartford***
Director ***Vacant***		**The public is always welcome.**

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