Preserving an 1870 Tiny Home

A temporary roof bought time to save the building from collapse

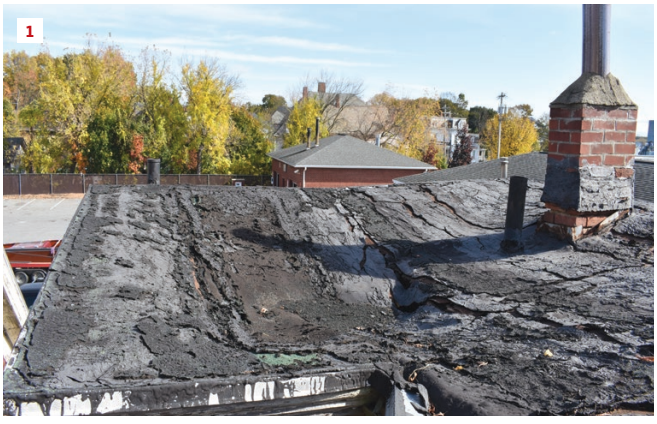
BY DARREN TRACY

In October 2017, I received an email from Adirondack Architectural Heritage (AARCH) notifying its membership of the possible demolition of a building listed on the National Register of Historic Places. That caught my attention because it is uncommon to see National Register buildings demolished. (My wife and I are longtime members of AARCH, which provided assistance to us in the 1990s when we rehabbed Hubbard Hall, then a condemned building located in Elizabethtown, N.Y., and placed it on the National Register.) Locally known as Dr. Ferguson's Office, this building was significant not only because it was on the National Register but because of its Second Empire style, interesting construction details, small scale, and overall charm. Unfortunately, it was near collapse.

There was broad community support to save the building, including a local Facebook campaign, but the hour was late and no one had stepped forward. The City of Glens Falls, which had taken possession of the property in 2014 due to unpaid taxes, had solicited and received bids for demolition because of safety concerns. If my wife, Lisa, and I were going to act, we needed to move quickly.

I learned of the building's plight on a Thursday, looked at it on Friday, and reached out to the town's mayor about purchasing the property on the following Monday. He suggested I attend the next City Council meeting and make my pitch for purchasing. It was at that point that I started to second-guess myself, inspecting the building over and over again while trying to decide about moving

Photos by Darren Tracy



The existing roof was funneling water into the building **(1)**, so the author covered it with a temporary roof framed with 2x10s, sheathed, and topped with a heavy tarp **(2)**. Temporary 2-by bracing around the perimeter helped the roof support snow loads over the winter months **(3)**.

forward with the purchase. On the one hand, it was in poor condition and needed a ton of work; on the other, it was on the National Register, small in scale, and within walking distance to downtown.

We decided to jump off the cliff and make our pitch to the council, which agreed to sell it to us for $1. This might sound like a good deal, but it was a negative asset because of its condition. Three days after our meeting, the city transferred title to us.

STABILIZING THE STRUCTURE

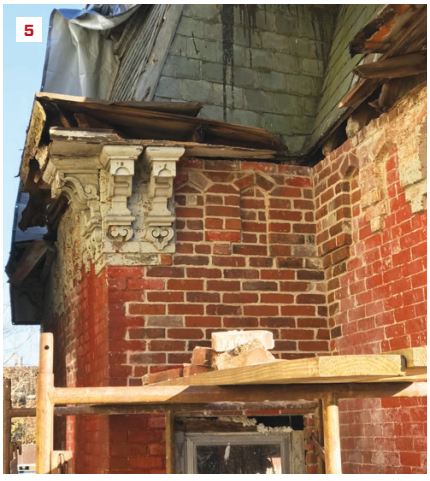
With winter fast approaching, the first order of business was to tackle the mansard roof to prevent it from collapsing and blowing out the walls. The original flat-seam metal roofing had failed, along with the built-up roofing over that, so the roof deck boards had rotted and created a funnel diverting water inside.

Temporary roof. Because repair work was needed on the exterior brick masonry walls before we could do anything about the existing roof framing, which was in worse shape than anticipated, I decided to install a temporary roof over the failing one. Even though the middle of the roof was badly deteriorated, I was able to install new temporary plates around the perimeter on top of the existing roof, then new 2x10 rafters on top of the plates. On top of the new framing and plywood roof deck, I installed a heavy-duty 16-mil tarp held in place with furring cleats secured to the fascia to keep the roof watertight over the winter. This detail worked well and was inexpensive, especially as we were able to reuse the framing materials in the permanent rebuild.

Brick masonry repairs. Then we rebuilt the exterior brick masonry walls that had caved in, salvaging and reusing existing brick as much as possible. This work needed to be completed before the roof work the following spring because the roof framing rested on the brick masonry.

The existing bricks measured a nonstandard average length of 7 3/4 inches (older bricks—called common bricks—are often a full 8 inches long; most new bricks—called modular bricks—are 7 5/8 inches long, a convenient length because with a 3/8-inch mortar joint, the combined length of one brick and one mortar joint is 8 inches).

We matched the existing light mortar color by using white Portland cement instead of regular Portland cement, which is typically gray. Our recipe was 1 part white Portland, 1 part lime, and 6 parts washed sand, which is classified as a Type N mix. This relatively low compressive strength (750 psi) mortar flexes more than a higher compressive strength mortar, such as the commonly used Type S (1,800 psi), allowing for some movement and typically failing before the brick. Mortar is the sacrificial lamb.



A combination of salvaged and new modular brick was used to rebuild the portions of the walls that had collapsed **(4, 5)**. In places, the tops of the walls supporting the roof were single wythe **(6)**, while the remainder of the walls were double wythe **(7)**.

The stone foundation walls were in good shape and a full 8 feet high, but the basement's poured concrete floor needed to be replaced **(8)**. Virtually none of the existing framing could be salvaged, so most of it was rebuilt from the first floor up **(9)**. Tension ties screwed to the second-floor joists **(10)** and through-bolted to the masonry walls **(11)** help reinforce the brickwork.

After we completed the needed exterior masonry work, we installed temporary vertical roof supports on top of the newly repaired masonry walls to stabilize the edges of the temporary roof. We anticipated a snowy winter and windy spring before we could tackle the roof repair work. As it turned out, we had above-average snowfall, but there were warm periods between the storms that melted the snow, and I only had to shovel off the roof once.

WALL FRAMING

Meanwhile, our interior work continued over the dark and cold winter months, with weeks spent removing debris, old mechanicals and finishes, and damaged framing. In many ways, it is exponentially more difficult and time consuming to restore an old building that is in tough shape than to demolish and build new. And this building was in real tough shape, partially collapsed. I liken our work to a frame-off antique car restoration.

Original construction was wood lathe and plaster over brick. Interestingly, some walls were double wythe and some were single wythe, with wood framing backup. Nails driven into the exterior of the studs and left proud served as brick ties, but these ties had corroded and weren't effective—in some cases, they had completely disintegrated. Some wood framing was rotted and had become compost. As a result, the masonry walls were bowing and looked like they were ready to come down with a strong wind gust.

We installed new interior wood framing to help stabilize the brick and provide a cavity for insulation and electrical. While framing the walls, we glued the backs of the studs to the brick masonry walls with thin beads of canned urethane foam. This detail served to stabilize the brick exterior with no negative impact on the brick itself. We left the remainder of the brick between the studs as is, resulting in remarkably sturdy walls.

Second-floor deck framing. After installing a new beam to

The author used spray foam to insulate and reinforce the single-wythe brick walls **(12)**, and rigid foam to insulate the double-wythe walls. Studs were glued to the brickwork to reinforce the walls, while an air space between the rigid foam and the brick allows for ventilation **(13)**. Joints between the foam sheets and framing were sealed with spray foam **(14)**.

support the rear mansard roof rafters, we finished framing the second-story floor system with new joists bearing on top of the new interior walls. To prevent the masonry walls from spreading any further, we installed threaded rod and turnbuckle assemblies parallel to the floor joists. These consisted of Simpson Strong-Tie DTT2Z tension ties screwed to the ends of the floor joists and fitted with threaded rods that extend out to the exterior of the wall through holes drilled through the brick. Large plates acting as washers with nuts help distribute loads across the face of the brick wall.

Insulation. We insulated the exterior-wall stud cavities with rigid polyiso foam, setting the board insulation in a bead of spray foam, then sealing the entire perimeter of the board to make an airtight seal. This helps to minimize water vapor transmission from the interior to the exterior during winter months. Vapor drive is always a concern with brick in our cold climate because the water vapor can condense, freeze, and damage the brick face.

We left an air space between the brick and the new rigid insulation, in part because the brick wall bowed out but also to create a ventilation channel between the brick and the foam. We sprayed foam insulation directly on the single-wythe wall, a unique detail that worked well to stabilize the wall.

REPAIRING THE ROOF

As the weather warmed up, we needed to make a decision to either remove and rebuild the mansard roof, or repair it. We chose to repair it because we thought it might be easier and less expensive, particularly because we would have to deal with walls that were neither plumb, level, nor square. So we dismantled our temporary roof and got to work repairing the existing one.

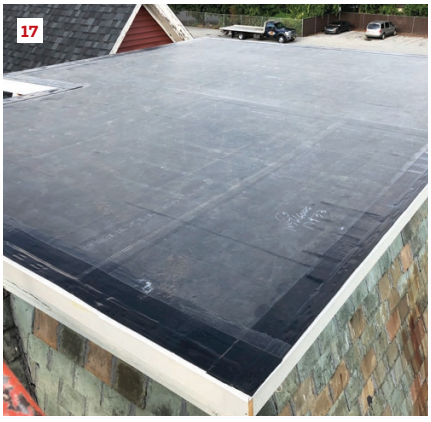
Framing fix. We shot reference elevations with a laser level and determined that portions of the roof had dropped as much as 7 inches. To correct this problem, we completely cut free the mansard roof framing from the wall top plate and jacked up the roof. We've jacked several structures over the years, including a boathouse that required diving and a three-story Victorian (which we moved one-third of a mile), but we had never separated a roof from a structure and jacked it independently. It was fun but a little nerve-wracking because the existing framing was in poor condition. We couldn't trust it, so we reinforced the roof framing as best we could while still allowing the members to move back into their original positions.

An old structure moans when it is jacked. With every sound, our heads turned and eyes darted, looking for problems. Eventually, we made most of the roof structure level and settled on gaining back 5½ inches out of the 7 inches in the worst area, deciding that jacking that area any more might be pushing our luck. (It's wise to know when to stop, no matter what task.) This strategy saved us money and preserved functional historic materials.

Then we fastened new plates to the tops of the brick walls as needed using Tapcons. In some places, we had to cut new rafters to completely replace damaged framing, while in other places, we were able to sister on new framing to reinforce the existing rafters. Where the board sheathing was too far gone, we replaced it with plywood sheathing.

After the roof was sheathed, we covered the flat portion with a .060 EPDM membrane. On the interior, we fit three layers of 2-inch polyisocyanurate rigid foam in the second-floor ceiling, sealed tightly to provide R-36, working as best we could with the space we had. Although current new-construction code for attics is R-49 in our climate zone, building rehabs are not necessarily required to comply with new-construction code. However, it is critically important to make the rehab of a historic building as energy efficient as possible. Care was taken to provide unobtrusive but adequate ventilation above the ceiling insulation, minimally affecting the building aesthetic. Holes were cored in the cornice and round, screened vents installed to provide ventilation above the rigid insulation.

Slate. Because of the proximity to nearby slate quarries in Granville and neighboring Vermont, many old homes in the Glens Falls area were built with slate roofs. On this roof, the old slate on the



The author detached the rafters from the plates, then jacked the existing roof framing back close to level **(15)**. After repairing the mansard roof framing, stripping the old roofing **(16)**, and rebuilding the roof deck, the author installed a new EPDM roof membrane on the flat roof **(17)** and intersection at the eaves **(18)**. Here it was necessary to remove and replace the lowest course of slate **(19, 20)**.

steeply-pitched portion of the roof was thin and many of the joints had been tarred, making it difficult to repair the shingles in the traditional manner without breaking the remaining slate. Fortunately, we were able to source replacement slates from a local quarry that closely matched the originals.

Typically, to repair broken or missing slate, a special tool—called a slate ripper—is slid under the old slate to hook the old nails. The ripper is then yanked or hammered downward, removing both the nails and the slate. After a new slate is slid in place, it's attached with slate hooks or by directly nailing through it in the space between the existing slates that cover the new piece. The exposed copper nail heads are subsequently flashed over, typically with small pieces (about 2 inches by 5 inches) of copper referred to by some old-timers as copper "babies." The baby is twisted slightly out of plane and shoved with the head of the ripper under the top slates and over the nail, held in place by friction. Slate work is a specialty trade and can be fun, but this job wasn't.

Because of our work to level and repair the roof framing, it was necessary to replace the bottom course of slate, which we surface-nailed. Then we caulked the nail heads with silicone and covered them with a copper flashing strip. This was a simple repair solution, effective and efficient.

EXTERIOR FINISHES

We only had to purchase two new windows, to replace two that had disintegrated. Otherwise, we were able to restore and refinish the remaining windows and doors. To maintain National Register designation and qualify for a 40% tax break, plans and proposed materials needed to be submitted and approved before work began.

We used select cedar for all of the exterior replacement trim. Before installation, we primed all six sides with a coat of oil-based primer, followed by two finish coats of 100% acrylic latex paint. We treated end cuts on the fly with a brush.

Exterior brick coating. The brick exterior needed attention because the existing coating was failing, mortar joints were soft, and the brick repairs were aesthetically unpleasing. After much research, I decided to use a silicate mineral paint—called Silacote—to coat the brick and the mortar joints. The previous coating appeared to be mineral paint, so incompatibility was not an issue; we simply pressure washed and applied.

Mineral paint is fundamentally different from latex and oil-based paint. It creates a chemical bond with masonry surfaces and has the added benefit of high vapor permeability (80 to 85 perms, compared with "permeable" latex paints that can range from 1 to 15 perms). That matters because when water vapor exits a brick building in winter, as it is prone to do according to the second law of thermodynamics (high pressure travels to low pressure in an effort to balance), it can condense as it approaches the brick exterior surface and freeze, popping off the brick face. You may have seen this happening on brick buildings that have been painted, particularly near the top of the building or on the exterior of bathroom walls where there is a high concentration of moisture inside the building.

The mineral paint coating, along with the drying channels between the foam insulation and the back face of the brick, allows water vapor to escape to the atmosphere instead of being trapped within the masonry. It's a low-VOC, noncombustible coating that can fill gaps up to 3mm wide and pass the ASTM E514 wind-driven rain test. We also applied Prosoco Siloxane WB, a water-based water-repellent penetrating sealer, to all masonry surfaces.

Basement. After spending weeks early in the project removing debris, we were pleasantly surprised to find a concrete basement floor and tall, massive stone foundation walls in incredibly good shape. We hit the jackpot with these 8-foot-tall walls.

We decided to demo the existing concrete floor because it wasn't level and was in poor condition. By doing so, we were able to add a 6-mil vapor barrier underneath the new slab, a critically important measure for controlling moisture in the building. Once we had the building envelope restored and weathertight, finishing up the project proceeded more or less conventionally.

HISTORIC PRESERVATION

Why undertake a project like this if it's more difficult than to tear down and build back? Natural resources can be conserved because of embodied energy in the existing materials. Preservation can be cost effective because of the initial low purchase price and use of sweat equity to create value, and historic tax credits can reduce project cost by 20% for residential and 40% for commercial rehabs.

A project like this also has social value. Old buildings are part of the community fabric and provide a bridge from the past to the present and on to future generations. Unlike many other material objects in our lives, they are used regularly and can last a very long time if maintained. They provide a sense of time and place, reminding us of our mortality and fleeting time on this planet.

Darren Tracy, P.E., owns West Branch Engineering, a consulting firm, and West Branch Inc., a construction firm, in Saratoga Springs, N.Y.

Select cedar prefinished with an oil-based primer and two coats of latex paint was used to replace rotted exterior trim **(21)**. The repaired brick walls were coated with Silacote mineral paint **(22)**. Now restored from its former dire condition **(23)**, Dr. Ferguson's Office has been transformed into an attractive rental property **(24)**.