How to Save an

A historic Cape gets a dry basement and an insulation upgrade

BY STEVE BACZEK

Located in the historic district of Wayland, Mass., this 1850 Cape was added onto several times throughout its history. When we started our work, the house was empty, was in serious disrepair, and lacked even minimal modern performance standards. The house easily could have been designated as a teardown. My client was sensitive to the house's architectural contribution to his community, though, and instead chose to breathe new life into it. It became the perfect model of an old-house renovation that establishes modern performance standards while maintaining its original charm and period detail.

Start with a reconfiguration

Because of the house's location within Wayland's historic district, we were limited in what we could change to the view from the street. The historic designation allowed a face-lift for the front of the house, but one that wouldn't alter any of its original aesthetics. (For more on historic designations, see "How It Works," pp. 18-19.)

First, we removed the house's additions, which were falling apart. We were left with a kitchen, a living room, and a dining room downstairs, and a bath and two bedrooms upstairs. The spaces were all small, and the kitchen and bath were out-of-date. Because we planned to house a new kitchen, family room, and master suite in a new addition, I could open the original house a little and improve the existing spaces. Downstairs, the two front rooms became the new dining room and a flex room that's being used as an office. The two front rooms on the second floor remained bedrooms, and we enhanced one by adding a walk-in closet.

Although the stylistic restrictions did not extend to the new addition, I still wanted it to relate closely to the original house. The addition would contain a kitchen, a family room, and a mudroom on the first

Inset photo, facing page: courtesy of the author

Old House

without losing its traditional character

The new addition's location on the back of the house (large photo above) allows the house's front elevation to remain faithful to the original (inset photo and photo facing page). The addition houses a modern kitchen and family room on the first floor and a master suite upstairs.

1850 **Bedrooms:** 3 • **Bathrooms:** 1 • **Size:** 1875 sq. ft.

2012 **Bedrooms:** 3 • **Bathrooms:** 2½ • **Size:** 2762 sq. ft.
Completed: 2012 • **Location:** Wayland, Mass.
Architect: Steve Baczek, Reading, Mass.
Builder: Michael Brussard, Reading, Mass.

floor, and a master suite on the second. The new rooms would be somewhat concealed by their location at the back of the house.

Water management in a leaky foundation

Like many old houses with a rubble foundation, this one had a wet basement. We could have tried to solve the problem by installing an exterior perimeter drain, but when we decided to remove the old basement slab, another solution became obvious. It was easier to install an interior perimeter-drain system under the new slabs. The crew hung a drain curtain of 10-mil plastic (VaporBright) that extends over the rubble walls from the sill plate to the slab. Any water that comes in through the stone foundation hits this barrier and flows down into the perimeter drain. Two sump pumps direct any water that's collected to a concrete perc tank buried in the lawn.

With the water issues resolved, we were able to insulate the basement. We chose spray foam because it could uniformly adhere to the

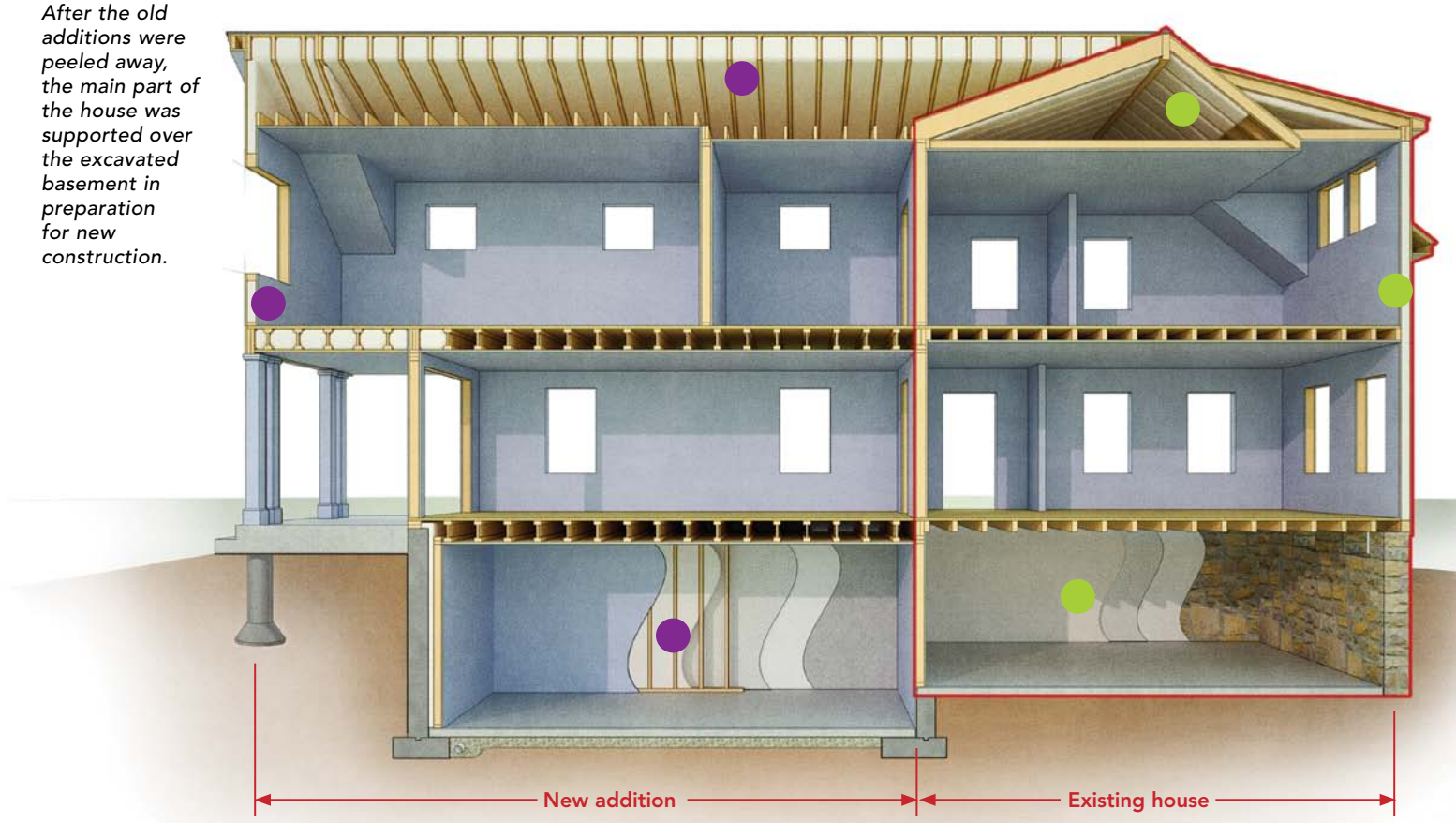
First phase: demolition. *After the old additions were peeled away, the main part of the house was supported over the excavated basement in preparation for new construction.*

STRATEGIES FOR COST-EFFECTIVE INSULATION

To balance cost and performance, the existing house and the new addition were treated differently when it came to insulation. For air-sealing, spray foam was used throughout the project, but some areas got closed-cell foam while others were sprayed with open cell. In the end, all the walls reached about R-20 or more, and the new and existing roofs reached R-40.

Closed-cell foam has a higher R-value per inch than open-cell foam, making it better for shallow framing bays, which is why it was used throughout the existing house.

Although it has a lower R-value per inch, **open-cell foam** is less expensive and can still reach a decent R-value in the deeper framing bays of the new addition.



assortment of rubble wall, old wood framing, and repairs. The insulation crew covered the barrier with chicken wire so that the foam would stick.

The new portion of the basement has more headroom and was finished into a playroom and a laundry room. A 2x4 framed wall was built 2 in. away from the foundation wall, and 4 in. of open-cell spray foam was applied to the same plastic barrier used in the old part of the basement. To keep rodents out, we closed off each joist bay with hardware cloth and spray foam.

Air-sealing and insulation

The walls above grade were a puzzle of original timber framing and new framing modifications. The existing walls' interior was sprayed with 4 in. of closed-cell foam, which has a higher R-value (6.5) per inch and helped to air-seal the board sheathing, which was in surprisingly good shape.

We insulated the new addition's 2x6 walls with R-3.5 per in. open-cell spray foam. Because these walls were deeper, though, we could spray more, get about the same performance as with the closed-cell foam on the thinner walls, and spend less.

Both old and new portions of the roof were sealed as an unvented assembly so that we could house one of the mechanical systems in a conditioned space. The lack of vents made the roof simpler to build and gave the house a cleaner look. The old roof was insulated to R-40 with closed-cell foam, and the new roof was insulated to R-40 with open-cell foam. (I've used spray foam to seal attic spaces before, and my annual checks haven't found any evidence of moisture diffusion.) In addition to relying on spray foam as the primary air-sealing strategy, we used the airtight-drywall approach. The crew applied a bead of sealant at the plates and around the perimeter of all window and door openings before hanging the drywall.

Two mechanical systems

Although we could have heated and cooled the house with a single system, distribution through the old framing would have been a challenge. Also, because of a local zoning

Photo this page: courtesy of the author. Photos facing page: Dan Thornton. Drawings: John Hartman.

clause, the new house's square footage was limited to the size of the existing house plus 20%, and the homeowner didn't want to give up any space for the mechanicals. In a new house, we might put two systems in the basement and feed the second floor up through the first floor. Here, however, the first-floor frame was not easy to maneuver around, so it seemed best to install two smaller systems: a forced-air heating and air-conditioning system in the basement, and a second system in the shallow attic to serve the second floor. This allowed us to retain the air handler and associated ductwork within the conditioned space.

Many builders and homeowners question the need for and the cost of mechanical ventilation. They feel that a house should breathe on its own, which means uncontrolled input and exhaust. For me, the choice is clear: I want dedicated ventilation control so that I know where the air comes in and where it goes out. The original house had plenty of uncontrolled ventilation, but after it was air-sealed, we had to add mechanical ventilation. We installed an ERV (energy-recovery ventilator) in the attic, which helps to avoid heat loss and its associated costs.

The new exterior looks the same, but it's better

In an effort to stay within historic-district guidelines, I kept the original dimensions for all the exterior siding and trim. After covering the entire structure in Tyvek, the crew installed new preprimed wood lap siding on the lower level and wood shingles on the second level. During demolition, the general contractor had saved a vertical section of a corner of the house as a sample so that when it came time to install the trim, we could match the new trim to the old. We replaced all the original wood trim with PVC, which looks the same but has a much longer life.

We used new windows from Marvin that had historically correct ⅝-in.-wide muntins separating the correct number of sash lites. All of the windows were installed in a sloped pan flashing, complete with an end dam to the interior.

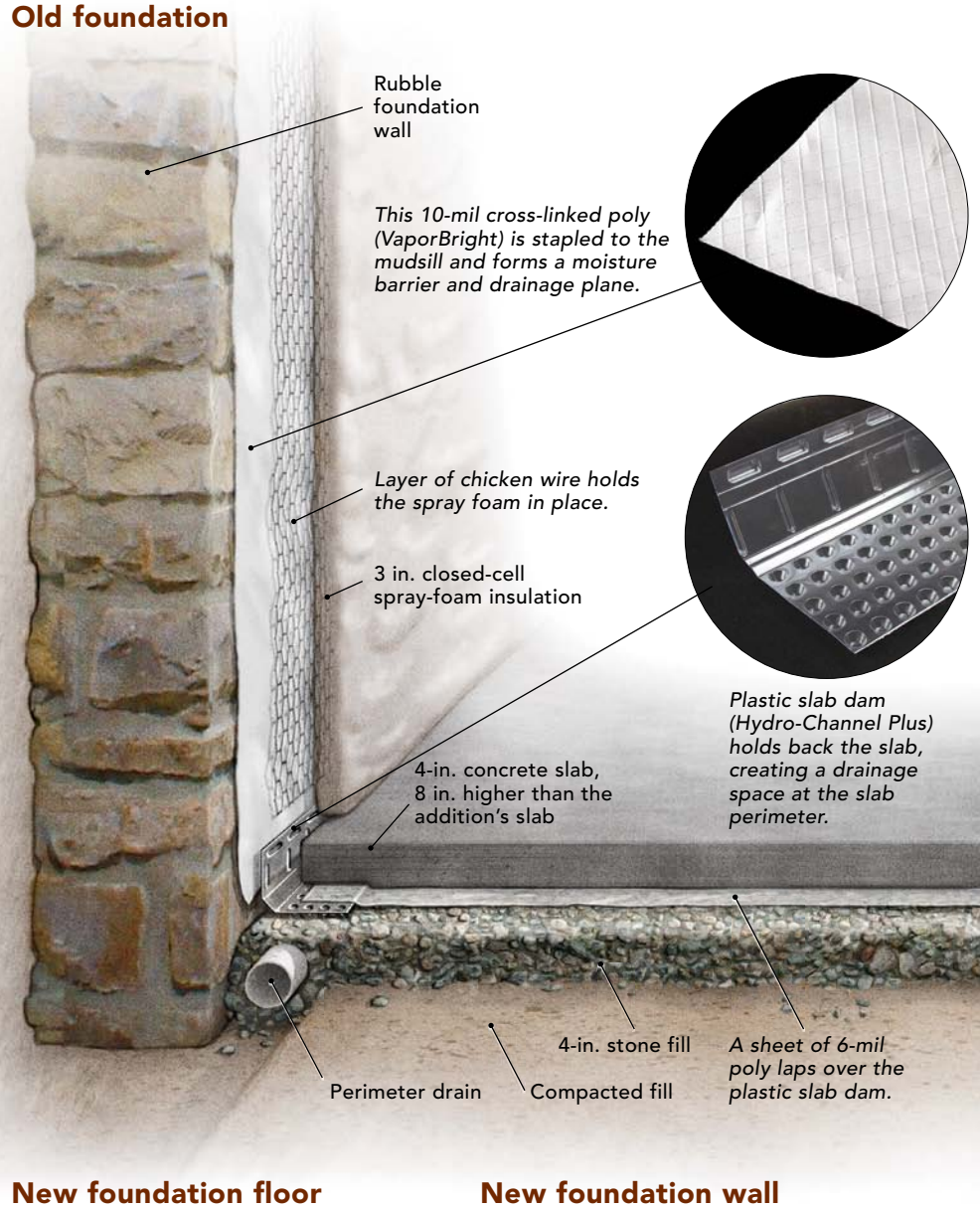
The existing chimney had to be replaced, but luckily, we were able to find a historically accurate brick for the visible portion. □

Steve Baczek is an architect in Reading, Mass. Photos by Rob Yagid, except where noted.

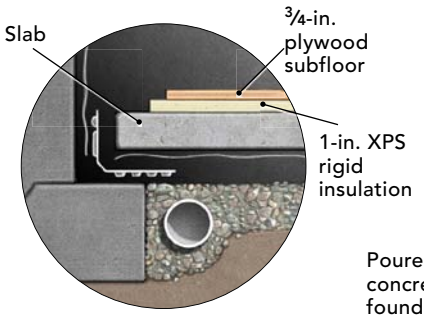
A DRY BASEMENT WAS ESSENTIAL

The old basement was to house mechanical systems, and the new basement was to be finished. In both cases, a dry basement was essential. In both old and new basements, an impermeable membrane hung over the foundation walls controls any water that might enter through the foundation, especially in the old basement. The water flows down the membrane, past the edge of the slab, and into the perimeter drain. Because the old basement is higher than the new one, 4-in.-dia. riser pipes cast into the footings connect the upper drains to those on the lower level, where two sump pumps direct the water into an underground tank.

Old foundation



New foundation floor



New foundation wall