Field Documentation from the Deep Energy Retrofits: <u>Before and After Photos:</u>

1. Basement:

Traditional fiberglass batt insulation on the band/rim joists is replaced with spray foam insulation to improve air tightness and insulation of the building envelope.

Unconditioned basement walls are covered in 2” Perimate insulation with drainage channels, plus 2” foil faced polyiso rigid insulation. These upgrades vastly improve the thermal envelope of the residence.

The unconditioned basement floors are covered in dimple mat to control drainage, one 2” layer of XPS rigid insulation, and finally finished with cement board.

This basement was plagued with groundwater and “no” drainage. Concrete floor is trenched, perimeter pipe installed, backfilled. Pipe drains water to sump, and then sump removes moisture to “dry tank” installed in front yard. Upon moisture mitigation resolved, basement strategy of sealing and insulating can proceed.

2. Exterior Walls

The home was stripped of its existing siding and layers were built back up starting with a vapor barrier in the form of 4 x8 sheets of Thermoply, followed by two layers of 2” foil faced polyiso rigid insulation, and ending with new house siding. These layers not only add insulation to the exterior of the house, they work to improve the overall air tightness and building envelope quality.

Preparations for a bottom shelf to seal the air barrier and rigid insulation assembly to the exterior of the foundation wall are made, using foam backer rod, sealed to the wall assembly. Vertical strapping applied over the 4” of added rigid polyisocyanurate foam, and is aligned with existing studs of the building to provide secure nail base for the siding.

3. Roof

The traditional asphalt roof shingles are removed and replaced with an air barrier applied to the entire roof deck followed by two 2 inch layers of rigid foil faced insulation. After the insulation is taped to shed water, strapping is installed to provide an anchor for the corrugated metal roofing sheets.

For this house, the roof needed all new decking, followed by a build-out of 2 layers of 2” foil faced polyiso insulation, sheathing, and vapor barrier. Finally, a new metal roof is installed with low solar gain and minimum 40 year manufacturer warranty. The original deck was rotted due to excessive moisture originating from poor drainage and basement conditions.

4. Windows

Several steps are taken to upgrade and improve the window frames of a retrofitted home. The window frames must be built out with “bucks” to accommodate the four inches of foam that will be applied to the exterior walls. The bucks are then flashed to provide a moisture/vapor barrier. Finally, existing sash weight cavities are filled with spray foam insulation and the window is ready for replacement.

The interior window detail is completed using wood trim to span the additional 4” of rigid insulation out to the new window.

5. Mechanical Systems

The traditional domestic hot water heaters are replaced with high efficiency, sealed combustion, tank less units that will also provide the hot water for a fan coil to distribute space heating. This combination strategy leads to drastic reductions in energy costs and enables the chimney to be retired below the thermal plane.

Original forced hot air (FHA) furnace with heating capacity of 250,000 Btu/hr vented through an unlined chimney is replaced by a fan coil (45,000 Btu/hr(supplied by a hot water loop from the tank less DHW device. The air is circulated using a 0.5 hp ECM blower motor, and automatic controls that periodically purge water from the space heating loop.

This all in one system manufactured by Nuair will provide the space heating and whole house ventilation to the retrofitted house. The house's significantly reduced 1,200 CFM 50 air leakage rate allows for this type system equipped with a fan coil that will circulate warm air provided by the tank less on-demand hot water system, representing an overall reduction in Btu/hr. of 70%.

6. Modifications and Additional Upgrades Encountered to Effectively Complete the Retrofits

This 2 family home presented structural issues, indicated by the sag in a main carrier beam on the left. This issue was corrected during the retrofit, providing stability to the porch and strength to the overall 80 year old structure.

When the electrical service was temporarily removed from the exterior to allow for rigid insulation install, it was discovered that the service line was frayed. In order to replace this line, electrical inspector required an upgrade of the electrical service panels, circuit breakers, and relocation of meters to exterior of house. In total, this was a $3,100 additional cost.

This 100 micron strainer (left) was installed upstream of the Rinnai Tank less Water Heater's own 250 micron filter (right) , to prevent inadvertent clogging. With the replacement of the Lead water line to Copper from the meter to the house, the City of Utica upgraded their Lead line from the meter to the hydrant. When the hydrant was flushed, sediment was released that clogged and damaged the 100 micron strainer, which required a third filter (below) be installed. In total, this was a $500 additional cost, plus repeated visits by maintenance staff to flush the lines, and unclog the filters.

The basement of this house was subject to significant water deposits and mold caused by poor drainage planes of adjacent rooflines, and backfill material. This required perimeter trench drainage an in-floor sump to be installed, combined with a “bathtub” liner composed of EPDM material incorporated into the basement insulation strategy to properly drain any water that is encountered. The sump collects and moves water to an outside dry well for collection and leaching. In total, this was a $2,400 additional cost.