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Adding Green to Older Structures

By Joe Constantine

Recently I was asked by a group of building inspectors how they can assess whether a renovation project is green. With new construction, there is any number of programs out there that can guide, or force you, into green compliance. But so far there is little to do with remodeling.

So to help them, and maybe some readers, I'll take a project I completed 17 years ago to use as a model. The project is a renovation and reuse of a 100-year-old firehouse. It is my own home, office and workshop. The reuse of such a building is in itself a green concept.

There are three principles that apply: To be green is to be energy responsible, even when remodeling. Resource efficiency still counts. And to achieve a healthy environment for the inhabitants is a must.

The first thing I do after evaluating whether a building is worth saving is to stabilize the structure. Long-term neglect usually means water damage. So I address the outside looking at the roof and foundation. On this project a new roof was in order. Following my own need to be green, I knew of a source of a quantity of very good roof shingles that had been sitting in a warehouse for 10 years, waiting for a project that never came around. I looked at them with my roofer, they looked good, and so up they went. This kept 4,000 sq. ft. of shingles out of the landfill.

I had a friend that installed metal roofs. He traded me a standing seam steel roof job on my large porch for a jobsite trailer I no longer needed. All of the pieces used on my roof were cut-offs of long pieces from one of his commercial jobs, also destined for long-term storage or recycling. Although it takes a lot of energy to make the steel, this roof will last a few lifetimes, and then it can be recycled again.

The roof is dry, so on to the basement. Water is a building's enemy due to the mold that inevitably comes with it. Mold will not only deteriorate a structure, it will make the building's inhabitants sick. With the stone foundation that I have, the best I could do is to manage the water. On the outside, I sealed all penetrations with the proper sealant, and re-graded the slope away from the building as much as possible. On the inside I added a sump pit and pump, and a dehumidifier for the warm months. Then a thorough cleaning was in order. All the debris had to be cleaned and removed from the floor. No food, no water, no mold.

Once the building was dry, we had to get it tight. Where water leaks are the exterior enemy, air

leaks are the interior enemy. Old buildings have lots of leaks. I buy lots of caulk and canned spray foam insulation. I'll start with the windows. For money's sake, at first we added storm windows to the existing units. We removed the sash weights and insulated and air sealed the voids. When replacement window prices and qualities improved, we changed the units in the living space. I personally don't like the hollow frame vinyl replacement units because they're too difficult (or impossible) to properly air seal. A few are better than most, so look around before you buy. We used an aluminum clad wood replacement unit. For glazing I get low-e glass with argon gas between the double panes. The low-e keeps the sun's ultraviolet rays reflected out to lessen the need for cooling. The argon gas is heavier than air so it resists heat loss in the winter. And after there was lots of minimal expanding spray foam around the unit and caulk on the trim inside and out, we were ready for paint and to move on to other big leaks.

Next, we come to insulation. My house had none, zero, 'nadda'. The old firehouse was literally heated with taxpayer dollars. I recycled the radiators, metal piping and old boiler parts. We got rid of the oil tanks in the basement and switched to a natural gas boiler, as high efficient of a system as I could find at the time. I wanted the heat to stay in the building, so I had dense pack insulation blown in. It's made from recycled newspaper. We've been recycling all paper products as long as I remember, so I like to think that some of the insulation is from us. We put 12 inches in the attic floor, and filled the window weight voids, too.

Our walls are three-brick thick with plaster on the interior. The plaster was bad, so down it came. We added 2 layers of foam sheathing to the brick, and then rewired the place. All of the voids for the wires were filled with spray foam. Then we sheetrocked the shell before the new interior walls went up. We taped the sheetrock in the normal way, but also caulked it to the floor to stop any heat loss. We caulked around any penetrations, like those for outlets, plumbing pipes, etc. A small hole can allow a lot of human-produced moisture into the wall cavities and create a home for mold. So caulk, caulk and caulk some more.

You can assume, because the state does, that any pre-1979 home has lead paint in it. (Lead paint abatement is too big an issue for this article, but lead safe practices are a must in renovations. Go to http://www.epa.gov/lead/pubs/regulation.htm for more info.) I like to use paints that are healthy alternatives. Low or zero VOC paints are finally readily available. I used to have to order them from California or Colorado. As many of the older paints dry, including some still available today, they off-gas harmful chemicals to speed drying. They also contain anti-mildew agents, heavy metals for coloring, etc. So ask your supplier for the healthy alternative.

Now, I hate recessed lights, but my wife doesn't. So we have recessed lights (I'm a green builder, but not a eunuch). Find airtight units that really are air tight, and then seal them well. Otherwise, they let so much expensive moist heated air into the attic you again have mold. (By the way, if you have an attic hatch or a pull down stairway, you really need to seal it. It's tricky, but it can be done.)

Again, our goal is to keep as much heated air or air-conditioned air as possible inside the living space. This saves money, saves on the use of fossil fuels, and keeps the house mold free. Because we have 10 ft. ceilings, we also added Energy Star ceiling fans in every room except the bath to circulate the air and reduce the need for air conditioning. To reduce our dependence on fossil fuels, we added two pellet stoves and one wood-burning fireplace.

The fireplace is a free standing Franklin type with an airtight glass door. With this unit I get some free BTU's splitting the wood and carrying it upstairs. Firewood and pellets are both environmentally friendly. They're renewable, abundant and relatively reasonably priced and green in many ways. For combustion burning appliances, we only use sealed combustion. No flue gases to be pulled back inside. A good bath vent fan will exhaust moisture and get us needed air exchanges. We also use an air cleaner to remove pollen in allergy season.

Now we need to decorate and furnish the place. For green, that means reusing any existing products whenever possible. My kitchen cabinets and sink came out of a kitchen remodeling job I was doing. My wife painted the cabinets and then stenciled them. I reorganized them into a configuration that worked for us. Leftover units went into my workshop. I made the countertops with extra laminate from a large commercial project. For the bathroom, my wife found two antiques at garage sales that we converted into a vanity and a linen closet. All of the bathroom tiles were leftovers from various jobs. There is debate about how green marble and granite are because of the "embodied" energy (energy it takes to produce the end product), but I love it because it's natural, right from the earth. And the pieces we used fit resource efficiency because they were remnants from other jobs.

If you're creative, you can keep a lot of stuff out of the dump. It's estimated that anywhere from 10-15 percent of our country's landfills are

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made up of new items from new construction job sites, a problem poorer countries don't have. If you have extra materials, a Habitat for Humanity Restore is a good place to take them. If you need things, they may have them as well. I've given a few truckloads of stuff over the years. Speaking of recycling, every jobsite and every home should have a recycling center. A little extra thought will help keep a lot of reusable/recyclable material out of landfills. Water filters are a great way to lessen the impact of our water bottle fad. (The EPA figures that less than 1/3 of these plastic water bottles end up recycled. That's a waste of a lot of foreign oil used to make them.)

Plumbing is next on the list. Both toilets in the house were changed to 1.6-gallon toilets, not the lowest flow available, but any less and multiple flushes are needed and that seems to defeat the purpose. To save energy, we switched to a tankless hot water heater. It only uses fuel when hot water is drawn. This saves a lot of money and also reduces use of fossil fuels. We added a filter to our showerhead to remove contaminates from the lead based city water supply lines, and cut down on exposure to chlorine.

We painted our old wood floors in the living room and kitchen, and then added low VOC polyurethane to seal them. They still look nice after 17 years with minor 'character' imperfections and all. Our hallway and a room-size closet are the only areas we carpeted, and we clean them with a HEPA filtered vacuum. We splurged in our bedroom and used glue-down engineered flooring with a veneer-top layer of reclaimed chestnut planking — worth every penny.

There are more areas we could address but can't because of space limitations. I hope you can see how you can turn your renovation green. Green can be attractive as well as energy efficient, resource efficient in our reuse, and healthy for the people living in these buildings. And that is what green is all about.