REBUILDING A LAKE HOUSE COTTAGE IN NEW HAMPSHIRE

Chris Pinkham[1]

INTRODUCTION

I built my first "green" structure when I was ten years old—a multilevel tree house with views of my backyard and the woods beyond. The whole thing was built from lumber cast off (with permission, honestly) from a construction site down the road and hauled in by kids with wagons. Old nails straightened with hammers, a rusty handsaw for the cuts and a rickety ladder borrowed from some kid's father got us that fort in the sky—and my first experience in recycling and reuse. Actually, I had the privilege of growing up around talented people with solid skills. My grandfather worked on the Old Ironsides renovations at the shipyard in Boston. My father taught me his renovation skills. I worked on a house build when I was fourteen with a man who was a natural at creating beautifully engineered trusses and carriers. When I was a twenty-year-old UConn student, I spent my weekends in New Hampshire helping friends build their summer home out of salvaged materials. Did the experience stick? Who knows? But this dyed-in-the-wool Yankee has always considered material reuse and recycling to be an important part of any build or renovation project.

Today, I can look back on thirty-five years as a careful renovator, a thirty-year career as a DHW solar designer and installer, a solar thermal educator for the New Hampshire community college system, and a green builder long before it became fashionable. I belong to that group of "pioneers" that back in the seventies began pushing alternatives to our enormous energy appetites, despite the frustrating knowledge that what we were so right about was falling on deaf ears. Practical alternative solutions to our old ways have always been intriguing and have influenced my philosophy about building, renovating, and solar work over the years. Practical is where I start with anyone . . .

KEYWORDS

Icynene insulation, tankless hot water heater, pellet stove, engineered wood products, mandatory site recycling

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In early 2008, my small company had just completed a two-year restoration project bringing back to usable life a 120-year-old lake house that had been in our friend's family for 58 years. The renovation was all-encompassing: reengineered support structures (the old house had sat on granite footings for over a century); windows; insulation; kitchen; bath renovations; interior finishes; its first real heating system other than a fireplace; roof (to replace the three older roofs no one had bother to remove first); and finally, an architectural vinyl siding and decorative shutters completed the newly landscaped natural setting of native plants and flowers.

The results were beautiful: a pretty, modified saltbox with bedroom wing on a sharply-sloped lakeside site with views of water, the surrounding forests, and our small but nicely centered Lovell Mountain in the distance. With its "back" to the street, and its "front" facing the lake, this was the perfect vacation spot for peaceful relaxation and family fun. With my friends only a few years from retirement, they greatly looked forward to spending as much warm weather time here as possible. In its current state however, this was still a two-season home with water drawn from the lake, thereby negating any use of the home before April 15th and after Columbus Day.

On May 15th, 2009, this great old lake home burned flat to the ground in under an hour. I arrived just after the fire department fought a losing battle to save it. Despite the proximity of the lake and due to the strong slope of the lot, water had to be trucked in from down the road, making for a nearly impossible fight. It was a cruel blow to watch my work go up in flames and harder still to call my friends, who were literally in the car coming from Maryland to begin their summer season in the recently renovated "Hillside Cottage." The tragedy was severe for them, as they knew that decades of memories evaporated with nothing to salvage. As the shock wore off for all of us, a brighter side was emerging. The decision to rebuild was prompt and well-defined: a new house would follow in the ashes of the old, and in doing so, presented us with the opportunity to build the way I wanted to, with the systems that over the years had proven most practical to me, and with some newer systems that I knew would work for the long term.

To build new on this site presented us with a number of problems. The overall problem, and one that we kept close eye over the entire project, was that our lake is also our town water supply. With that comes a host of rules and regulations about what you can and cannot do close to drinking water. The next environmental issue to deal with was New Hampshire's Shoreline Protection Act. This is a system designed to protect our lake, river, and ocean shorelines from overenthusiastic developers. The end result for small homeowners is that you now need permits to even cut a tree, let alone build a house on your property. To receive this shoreline permit, calculations are made to determine trees to be removed, what constitutes "permeable and non-permeable surfaces," exacting measurements from all points on the house to the waterline, and how much shoreline down to the foot that will be left untouched by human hands. With the legal stuff to one side, the slope of the land created its own set of problems as the land drops over sharply from the street to the lake with not much more than a wide pathway to the house.

The goals for me and the homeowners were clear from the start. As we were progressing through the cleanup and rebuild, we had to take care of the lake. The second was to apply the most practical and greenest techniques available to build the house itself. Third, to reduce to the smallest fraction any further impact possible to the land itself by keeping machinery onsite to a minimum both in size and duration. And finally, to impose a mandatory policy of

recycling trash and jobsite waste with careful scrutinization of anything destined to leave as "scrap." This applied to our crew and any subcontractors on the job. I do not allow dumpsters on my jobsites. Dumpsters invite you to throw anything out with little regard for proper recycling or reuse. Marked barrels significantly reduce waste on jobsite: cans & bottles, nails and metal, etc. More than once I have visited sites that were working toward LEED certification for the house or building and the builders were tossing enough materials into dumpsters to build a small barn. These materials were not going to the recycler's. Ultimately, our tipping fees at the local recycling center amounted to .0005% of the cost of the house. Green building starts and ends here!

Immediately after the fire zone was declared safe, double erosion barriers went up along the shoreline to prevent any further surface wash-down from the fire. Then, after supervising and working the cleanup—which lasted about four weeks using a small tractor and lots of manual labor, ending with small sifters to separate particulates to ensure our water commissioners of a totally clean site—I attended meetings with every committee in town. The planning board, the water commissioners, the conservation committee, the town manager, the building inspector, the designer . . . ultimately even the state group that oversees our Shoreline Protection Act. Being restricted to the footprint of the original house (part of the rebuild statute) gave us a design that was reminiscent of the previous house, but not a replica. With all approvals and permits in hand we started construction at the end of October.

From the outset, this was not a good site for a poured foundation, as we would have needed to excavate extensively and haul out a number of boulders in the middle of the site. With no place to put to put the excavation soils, the choice was simple: the house would stand on columns over concrete footings. In a way this worked well, as we eliminated that bomb site look that goes hand-in-hand with new construction. The site was left in its natural state with only fire damaged trees removed by a true arborist. These were hauled out by hand and with a small tractor. The wood was then processed into firewood for the woodstove set up in the undamaged garage. All firewood left over in the spring went to a local campground for summer campfires. A medium-sized excavator was brought in to dig the twenty six footings on the slanted site. This was the last piece of machinery allowed on site from that point on. All large items were dropped from the street by crane over two short visits. Careful scrutiny of construction waste, with proper reuse and cycling back materials that were still useful, ensured a spotless worksite from that point on.

During the design process, I had happened to attend a builder's seminar dealing with engineered construction for residential use. I knew immediately that here was the base/foundation system perfect for the house to be built on: 6″ × 14″ laminated, treated carriers with matching laminated columns manufactured by the Roseboro Company. A post-and-beam style base was designed that became our foundation. Due to the crazy elevations on the site, the shortest column measured to a little less than 6 inches, while the longest was a touch over 7.5 feet. The entire frame and column system was bolted together using 1/4″ steel plate cut, punched, and corner formed with welded gussets. Posts and carriers were joined by keystone style plates while all corners received the incredibly strong gusseted corner units. These were primed with two coats and triple-coated with a beautiful forest green. These fittings are functional, beautiful, locally sourced, and far stronger than the nationally known maker of galvanized hardware. Welding of these plates was done by a welder living about 1/4 of a mile from the site. The use of this engineered system had some great benefits: only a small amount of waste was generated

Steel gussets bolted at frame intersections, creating our base frame.

Base frame with continuous joists being placed.

from squaring up our columns and beams; concrete was pumped from the road above; and the crane made its first visit to drop the nearly forty foot long carriers. There was literally no further impact to the site from machinery after this point. Overall, this greatly affected recovery of plantings and access pathways.

Having used engineered products in the past, I decided to take full advantage of them for as much of the project as possible: roof and floor joist trusses, standard roof trusses, sheet goods for subfloors, and the exterior wall sheathing. These products ultimately left behind far less waste than some stick-built systems, and with fewer pieces there was less handling of materials and more time on the build. These strong, lightweight materials are formed from smaller pieces of wood that in the past would have been deemed unusable, making them a good decision in a green build. The balance of construction materials would come from our active New England timber industry. All exterior wall framing would be 2″ × 6″ lumber set on 16″ centers. The choice for insulation was dictated by another goal for the house: we would not be burning any imported oils or gases for heating and hot water. The entire house is sprayed in a combination of closed and open cell Icynene foams (www.icynene.com)—a softer open cell in walls with firmer heavier foam applied under the house and under the cool roof over the master bedroom and second floor. The cool roof, where the insulation is sprayed to the underside of the rafters and roof sheathing, is superb at regulating temperatures in the summer and keeping severe cold out in winter. All cutoff waste from the insulation process was cycled out by the contractor, who in turn shredded the waste to be used for attic fills. While the construction process always generates cutoff waste, whatever did not make it into our winter woodstove was bagged or barreled out every few days to anyone—from neighbors to some local seniors—who needed kindling or firewood. Right through the finish

"Cool" roof over master suite.

process we were able to find people who put to the cutoffs to use. We bagged them in the stove pellet bags from the house once we had heat inside the main house. As a side note, there was no fiberglass insulation used in the house allowing us to maximize R values. Check current research on fiberglass vs. foam and the expense of the foam can easily be justified with a tighter, drier, and much improved envelope.

The house is sheathed with one of the newer OSB/vapor barrier/tape systems that allow the builder to carefully seal seams and any small openings, as well as around all windows to ensure a tight building. This system combined with the urethane insulation has led to a house that is cool and quiet in the summer and warm and dry in the winter. The other seasons are just plain easy. Flooring and roof sheathing systems are 3/4″ T&G OSB and 5/8″ T&G OSB (the 5/8″ and 3/4″ are thicknesses while "OSB" is oriented strand board—sheet goods made literally from chips and slices of wood) products that were planned down to the last inch to reduce scrap or returns. The 3/4″ × 4′ × 8′ and 5/8″ T&G are products of Georgia Pacific and was sourced through Lowes. The wall sheath and tape system is by the Zip Wall group—easy to use, but the tip here is to apply the tape when the walls are on the deck, not when they're standing. The deck for the first and second floors was laid in winter so construction adhesive was kept warm in a cooler lined with bricks heated on the woodstove. No a/c is needed as the lake breezes and cooler NH nights keep this place breathing in the summer. In the winter, an energy recovery system placed in the attic does the breathing and heat exchange. This unit was put on a simple programmable timer for maximum control and energy efficiency.

Due to the goal of no imported oils or gasses burned in the house, for heat we selected an Avalon pellet stove sized for the 2400 sq. ft. home. This is thermostatically connected and regulated. While this is regarded as a "backup" heating system, the house is useable year round but only sees part-time winter use. The house is designed to be quickly shut down, systems drained, and just as quickly reopened when needed. We were onsite for an entire heating season while we were finishing. The house was heated full time from mid-October through the end of January, then part time through early April. With daytime settings at 65 degrees and nights to 62, we burned a steady 40 pound bag a day for about 2.5 tons sourced in New Hampshire at a cost of $625.00 for the period. Homeowners stayed several times during the winter and were warm and comfy with little effort. The stove does great but needs monitoring and filling AM and PM. Heat circulates through the house well due to the active nature of the pellet stove, the layout of the floor plan, and the stairwell which pumps heat to the bedrooms upstairs. Cold spots in the house are pretty much non-existent. It is true that if a power failure happens (an extremely rare event in New Hampshire), a backup generator might be necessary. But it has not been needed to date. Future plans are to use enough PV to charge a set of running batteries to provide power to the stove if needed in the winter. We met our goal of no imported fuels and got a system that is clean in its use and literally smokeless in its operation.

The pellet stove is the sole source of heat, meeting one of our goals of no imported fuels burned.

I have installed hundreds of active solar hot water systems in New England and teach a solar thermal program at a great community college. As much as I would have liked to have placed one of my evacuated tube solar hot water systems in the house, I knew that solar wasn't going to happen here. East faces the street, west faces the lake for the view, and south faces the woods. Part time, four-season use dictated the use of a tankless hot water heater. Remember the goal of no imported fuels burned? Here I chose a tankless electric hot water heater appropriately sized for the 3 bedroom, 2 bath, and full-size kitchen house. I've used a tankless in my home for 25 years because, alas, my southern exposure is a maple grove. This unit has paid for itself several times with good maintenance and zero standby losses. We use tankless heaters in conjunction with our solar hot water systems as the perfect backup to deliver spot-on year-round temperatures. The tankless electric water heater, a Bosch-built "Power Star," met our goal of no imported fuels burned in the house, without the standby losses experienced with traditional water heaters, no matter how efficient they are designed to be. It is a responsive and constant source for hot water, taking up less room mounted on the utility room wall than a good-sized briefcase. All piping was done with cross linked poly, a.k.a. PEX. This was a great choice for the house, as the final layout for the master bath was rather convoluted for copper, resulting in greatly reduced install time. Another advantage was there was no copper ever for thieves to help themselves to. Strange footprints that came and went at night after rough-in showed there was nothing worth taking from the bottom of the house. The use of PEX also resulted in very little waste, with one-piece runs ensuring us that we could permanently bury them with confidence. Our conscientious plumber left nothing behind on request.

When considering lighting needs for the house, we looked at what makes for a bright house, where an aging eye can read and perform tasks comfortably. My approach has always been how the house will treat you as you age. Our kitchen uses three Velux skylights with matching windows and a nine-light entry door, giving us plenty of natural light from early morning until early afternoon. Little daytime lighting is ever needed. Night or gray-time light is managed with stringed mini halogen track lights wrapped around the skylights, providing excellent white light for cooking and gathering. The rest of the house is dense with CFLs.

The kitchen is bright, airy, and cool in the summer and warm in the winter.

From the parking lot up at street level to the closets, bathrooms, and reading lamps, CFLs fill the bill. LED lighting is used in some spots with solar-powered floods around the property for both useable and accent lighting. A dimmable dining area chandelier is the only nod to incandescent lighting in the house. Using CFL lighting in my own house dropped our kilowatt use by an immediate 33%. This house will never be an expensive house to light, heat, or cool. Electricians recycled all of their copper and left a barrel of romex sheathing behind amounting to about 25 gallons.

When considering windows we looked at general usage: the house would be used quite a bit in the summer; off and on in the spring and fall; and vacations for skiing and Christmas during the winter. For any north-facing window in a full-time house I would always recommend triple glazed sashes first, fewer windows second, or smaller windows last. Half-time living and a design with only four windows facing north allowed the use of the same double-glazed units used throughout the house. Our American Classic windows were purchased from Home Depot, and were made by a subsidiary of a top name-brand manufacturer. Quality is excellent, with solid numbers for Low-E, Argon- filled systems, and "Clear View" glass (a feature that keeps exterior glass surfaces cleaner). A combination of casements in the kitchen, awnings for bath and utility room, and divided light double hung units give us a great New England lake house look. As these windows were installed, all nailing flanges were sealed with the same Zip Wall taping system as the sheathing. This gave us draft-free, dry windows. During the finish phase, all windows were foamed from the inside with low-expansion foam. Nothing beats a totally draft-free window when you're watching a blizzard rip across the lake in mid-January.

The summer living room is the largest room in the house facing to the west and overlooking the lake and mountains beyond. Referred to as a "three season" room, this room replaces a summer-only screened porch and is the only unconditioned room in the house. The original porch had a wide open floor-to-ceiling view of the lake and was open to the weather on the sides. This room would have to be annually emptied of furniture and closed. The new room now supports a bedroom overhead, using doubled double-hung divided light windows on the end walls and a unique window system for the lakefront view. Made by EZ Breeze, these are essentially quadruple-hung track style windows that allow the homeowner to push

3-season room with EZ Breeze window system.

the sashes all the way up or down to the 25% position to gain full control over weather and lake breezes. The glazing is a form of memory plastic that is rated for winds up to 60mph and will take hits from stones to flying debris or sticks without shattering. The first winter with these windows showed that they could stand up to blizzard conditions without caving. As of this rewrite, they have stood up strongly to the remnants of Hurricane Irene without buckling or leaking. Simple to slide up and down with minimal effort, they work well for three-season situations and areas where windy conditions are more prevalent. Entry to the summer living room is from the smaller, cozier, winter living room, through a top name, sealed 6′ Andersen sliding door, that provides great venting in the summer and solid protection in the off seasons. As a note, this "three season" room was insulated with foam in the walls and floors. The ceiling is also the floor for a second-story bedroom and was fully foamed to protect the conditioned space above. Additionally the floor utilizes a radiant barrier in the subfloor and to the weather under the house. In the offseason, homeowners can quickly and cheaply heat this room with a small quartz heater. With plenty of cool, sunny days in the spring and fall, this room expands the usefulness with comfort and views for dining or relaxing. During cooler weather, with all windows closed, afternoon solar gain keeps the room comfortable on its own.

Radiant barrier under 3-season room floor.

The original lake house pumped its water from the lake. While just fine for summer and a short time in the spring and fall, cold weather use was out. With no allowable spot to drill on the lake site, and a septic leach field up at street level, a well on this part of the property was pretty much out of the question. Fortunately, an unusable family-owned lot across the road provided a spot for an artesian well. Getting the water under the road and the leach field was a job for a company that did directional drilling, using ground-penetrating radar to guide the drilling attachment. Without disturbing the landscaping, digging up the road, tying up road traffic in the least, and staying well under the leach field, this company popped its drill bit up within 8″ of my target under the utility room. No impact on the lot helped meet the goal of no further machinery onsite and the house now has a permanent connection to crystal clear well water.

As construction progressed and the second floor deck and walls went up, the crane made its second and last visit to place and drop in the massive 6″ × 16″ × 26′, 800-pound laminated ridge beam. Similar to the system of our base, this beam was untreated. Doing the job of supporting the I-beam trusses that became our rafters, this hefty unit brought the computer on the crane to within 85% of its limits, but allowed us to keep any further machinery off the lot and away from the lake. The beam was posted to doubled columns on our largest footings. From this point on, anything for the house was carried up and down by hand. While this may sound a little extreme to some, we never suffered from construction site turmoil and the general mess prevalent on build sites. This allowed natural plants to come back to life and fill in areas that had recently been scorched to dust. Looking at the site less than two years after the fire it is impossible to tell that there was ever a fire here at all.

View from street side.

Using native crushed granite from a stone quarry about ten miles away, we established pathways and wide drip edges around the entire perimeter of the cottage. The crushed stone looks beautiful, and keeps the rain from splashing back any dirt on the siding or latticework. A series of stairs around the building that aid in overcoming the elevation drop on the property were also back filled with the same stone, creating a terraced effect that aids in drainage and lends a clean look to the environment. A landscaper was hired to replant tree and plant species that were lost to the fire. The new willows, birches, and evergreens are growing so quickly that the neighbor's home has all but disappeared from view.

One task that I have never enjoyed is roofing. At this point in my life I am content to let others (re: younger others) come in and take on this task, while I devote time to the myriad of details involved in putting a house together. I've installed nearly all forms of residential roofing types from shingles to corrugated metal. Despite care in measuring there always seems to be waste and cut offs. This time I chose a standing seam metal system. This metal product is applied over a woven/spun base mat called Roof Top Guard II. This roof is long lasting, totally functional and just plain beautiful. This system will outlive us all and yielded a total of about 15 pounds of metal cuts which were gladly recycled by the installers. All components were extruded and cut from rolling stock leaving no mess, no nails, paper, or scraps of ice and water shield behind. If you can afford the extra cost of this form of roofing it represents a step up from the corrugated metal type. Additionally, there are several manufacturers of solar thermal and PV panel racking/mounting systems that readily adapt to the standing seam.

Our final choices for exterior siding and trim followed the low-maintenance path but yielded other benefits in the end. A low maintenance exterior was a must. Rugged terrain around the entire house nearly precludes the extensive use of ladders without a lot of set up and staging time. Staging during construction added several extra days to the project. Painting in the future would be expensive. Not wanting to use paints or stains that could run into the water supply was another factor when considering a wooden siding and trim combination. We chose an architectural vinyl siding by Certainteed in a light creamy yellow and trimmed the house in white PVC board. The vinyl is easy to clean with a power washer and bio-degradable cleaners. The PVC trim will never rot, never need painting, cuts, routs, and nails easily, and despite the fact that these are oil-based products, their permanence makes them a great choice. With the exception of unusable small scraps of PVC board, remaining lengths went to building window boxes for the front and rear decks. When I went looking for someone that recycled vinyl siding scraps, the nearest was over a hundred miles away. As a result, the vinyl scrap went into our town's system but remained less than $20 worth of our tipping fees. Toward the end of the finish phase the base of the house was framed, skirted with treated plywood, and finished with a dark green vinyl lattice. Cut offs from the lattice were scooped up by a gardener who turned usable pieces into small trellises for flower pots. While we were warm enough before the skirting went in, next winter the house will be significantly easier to heat as we now have eliminated 99% of any winds pushing under the house.

View from lake.

A house overlooking the water just doesn't feel right with a lot of finished drywall. Bathrooms, the utility room, some kitchen walls and maybe the dining room work well but after that I love a house on the water that makes good use of native pine tongue and groove board milled with a 4″ O.C. beading pattern. The bulk of the house, i.e., the bedroom walls and ceilings, the stairwell and hallways, the kitchen ceiling, and end walls are all finished with beaded pine. This Eastern White pine was a locally sourced product that gives the rooms a welcoming feel as soon as you're in the door. For blocking wall surfaces for this paneling we went to a supply of cut offs held over intentionally from the framing process. Using these cut offs yielded enough blocking for nearly the entire house, leaving very little fresh stock to purchase. T&G cut offs were bagged during the process and given away to anyone who needed small project pieces or kindling wood—but not before anything useful, from creating moldings to short stock, was put aside. As a result, no untreated wood ever went into the waste stream. All surfaces of the T&G paneling, with the exception of the three season porch which took a very decorative paint scheme instead, received three hand sanded coats of clear, water-based polyurethane by Benjamin Moore. No stain was used leaving the wood very bright and natural. This poly doesn't yellow the wood, cleans up with soap and water, and gives off no nasty odors. All trim and personally-routed moldings in the house came from locally-harvested native pine from a yard that buys from local loggers. Buying local helped us with our ecological footprint because our engineered stock traveled long distances. The limited amount of drywall in the house was finished in top quality, multi-coated latex finishes. Careful cutting and measuring ultimately yielded about two barrels of cutoffs—not a dumpster full. One good reason for this was that my crew and I did the drywall work and did not sub out the work. This gave me greater control over this phase and resulted in less unrecyclable drywall leaving the site.

This is as good a time as any to talk about cardboard. We all know that construction sites yield lots and lots of cardboard. Too often when visiting build sites to talk about our solar work I see roll offs filled with cardboard. I'm not always convinced that it is not headed into the waste stream. This is unfortunate in that cardboard is the most recyclable paper product (a lesson learned from my father who used to buy and sell railroad cars of the stuff that was used in the manufacture of other paper products) and is quite easy to break down and deliver to the compactor at our local recycling center. The town in turn sells the baled cardboard, the taxpayers benefit, and it does not end up in the waste stream. From day one, not one piece of cardboard or paperboard was tossed. Large sections went to protecting finished floors and were ultimately recycled, while the rest was bundled and stored until there was enough to justify a trip downtown. This represented about 500 pounds of cardboard and paperboard that did not end up in a landfill or being burned. Builders need to take a hard look at what is being carted from the site. Personal scrutiny and a little extra work goes a long way to reducing a final footprint that can take years to erase.

When you walk into a house you just can't be hanging out on bare plywood subfloors. Our floor finishes went in three directions. 12″ × 12″ ceramic floor tiles went into the bathrooms. Not terribly remarkable but they are durable, long lasting, and attractive to the eye. The stairwell and upstairs bedrooms are carpeted in a recycled/new fiber mix. When buying carpet, go all out on the padding and don't cheap out. Quality padding will last for years longer than the cheaper pads, meaning fewer long-term replacements, and the carpeting will stand up better and be more comfortable. This is a tiny choice that can result in less "stuff" being thrown into our rapidly closing landfills and overburdened incinerator facilities.

For the entire downstairs, as well as the three-season living room/porch, we chose bamboo. The one objection to bamboo was that it had to travel some serious distances—all the way from China. This did have an affect our footprint. The positives in the long run will at least partially wipe out those long distance charges. Bamboo is not a wood but a species of grass that can be harvested in as little as five years, so careful farming means continuing harvests without depleting forests of their hardwood. Steaming caramelizes the natural sugars in the fibers, resulting in a warm coffee color without the use of stains. Prefinished in solid engineered semi-random lengths, bamboo is attractive and works up like other hardwoods. The stuff cuts like iron and can be refinished, giving us a long useful life. Not to sound like a broken record, but here all cut offs went home with me to be used in my own workshop heater. Leftover lengths were used to create a countertop for a dining room built in. It is easy to see why bamboo becomes a reasonably priced option that fits well into the green build concept.

All appliances were sourced from Sears and were chosen for their Energy Star ratings. The dishwasher and front loading HE washer were picked for efficiency and low water use. The electric stove uses radiant technology to cook and the dryer met our standards for no fuels burned in the house. In the summer a good old-fashioned outdoor clothes dryer helps to take the edge off the use of the electric dryer. A trash compactor was not planned into the kitchen, only because part-time use meant infrequent trips to the recycling center anyway. I heartily recommend the use of trash compactors for full-time living. My recently remodeled kitchen was designed around making recycling easier. Our compactor sees only miscellaneous packaging, clean plastic wrappers, etc. A single compactor bag with just non-recyclable trash going in can last for weeks replacing many regular bags. These take up far less space due to compaction density and greatly reduce trips to the local recycling center. If all full time homes took advantage of compactors, consider what could happen with tipping and trucking fees. My trips are now every eight weeks instead of every two weeks, which reduces my personal fuel and vehicle usage. While we decided not to use a compactor here, designers and architects would be doing their customers a favor by including this practical, sensible appliance in every kitchen.

Even though all design and layout decisions were fully discussed with, and approved by, the homeowners, all other decisions that were factored into the house were mine. A free hand in building gave me the opportunity to fully engage in a practical, green build process. This is not a computer driven smart house with all its complexities, but a simple, easy-to-use home requiring little outside maintenance, with a comfortable, relaxed but elegant interior. I spent little time sweating over the science of the processes of the build because they were already established and readily available for use. A totally clean site from start to finish, mandatory recycling, and a small waste stream (total tipping fees are still under $175 for the entire project) were a critical part of the project. Without this component, claims of "green" building, even by those with LEED certification, are just not going to cut it. Without tying this to the performance of the building in the future, the green build package is incomplete and the overall ecological footprint spread by the project becomes enormous and more difficult to erase over the years. Thinking about the damage I might be doing elsewhere if we were to send off thirty yard rolls off full of everything has always been a factor in my decision making process. Combining useful, practical technology, and watching that footprint conclusively makes for a true and greener build.

Finished in July of 2011 and renamed "Sunset Cottage," the house has become an overnight success story and hub for family time. Final cleanup was done with my Subaru Outback

wagon, not my pickup truck. How many builders really need to be driving gas-hogging trucks full time when 80% of their use is just driving back and forth to work? The final bill was delivered on my motorcycle which was used extensively for commuting to the site in good weather. Although e-mail would have been greener, it was too nice a day! The final money paid out to me came "paperless" to my account. With final square foot costs of under a $165 per foot we saved lots of green and were still able to buy the products and materials that will save money and resources for the long term. If I am to conclude anything from this and other builds we have done in the past it is this: Builders need to look at more than what their building is going to do in the future, both for the residents and the surrounding environment. Managing the project's footprint, its outgoing waste and recyclable stream, and its future energy use should be a total package rather than frivolously sending all that stuff "somewhere else".

The concept of green building is wide open to interpretation. To that end we are currently in the design process to build what I would consider to be my own ultimate green build. The next build will be fully independent—making and storing all of its thermal and electrical needs without any hydrocarbon fuels (including wood pellets) burned or connection to the coal fired/nuclear grid whatsoever. Acting more like a battery than an energy drain, this house will utilize simple, proven, readily available materials and technology that will eliminate forever those rising utility costs, creating a dwelling where deciding whether to heat or eat is no longer a problem. This design, combined with our clean-site requirement, small waste stream, and recycling philosophy, will become another stepping stone in that interpretation of what is green building.

So I was going through the barn the other day and found three engineered carriers left over from the build. Started thinking that they would make a great deck base for a tree house overlooking the lake. . . .