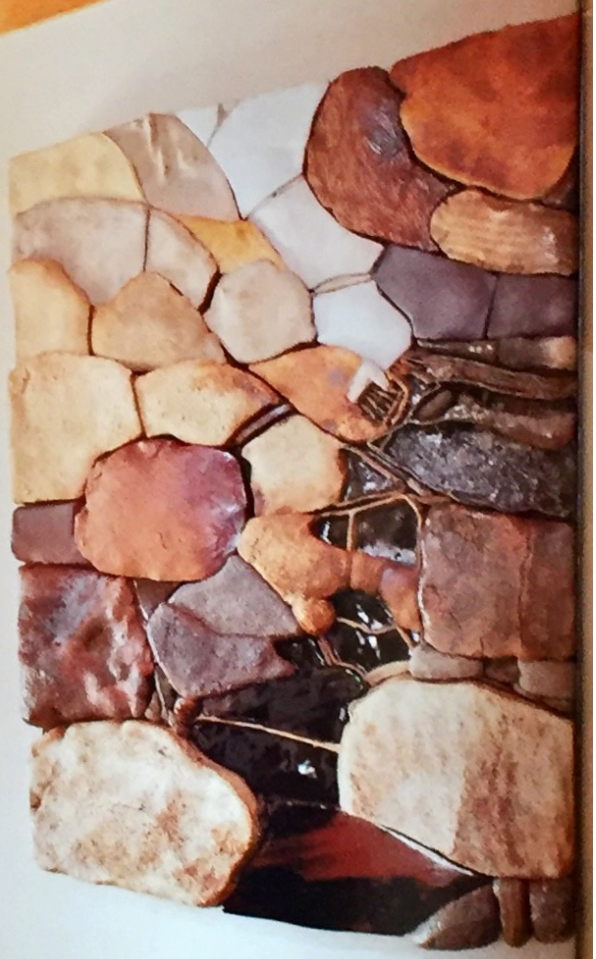
Home, Sweet, Off-the-Grid

BY DENISE HART | INTERIOR PHOTOGRAPHY BY JOHN HESSION



Ceramic artist Al Jaeger custom-designed this mural for homeowners Bruce Adami (left in photo on facing page) and Bob Cote.

Home

A DEERFIELD COUPLE'S SOLAR HOME COMBINES TWENTY-FIRST-CENTURY TECHNOLOGY WITH AN INSPIRED AND ENVIRONMENTALLY FRIENDLY DESIGN.

Bruce Adami and Bob Cote had a ten-year plan for building the house of their dreams—one that would make use of native materials, incorporate passive-solar elements of design (such as the house's orientation to the sun and its extra insulation), sit gracefully on the land, have a woodshop for Cote to create furniture projects and annual holiday ornaments, and room for Adami's grand piano in the living room. Most of all, the house had to be a beautiful place with custom features and all the modern conveniences. And, the pair wanted to have a major role in the construction of it.

"It's interesting that we weren't more anxious to get it done," says Cote, relaxing in sofa near the Russian masonry woodstove. He's right—not many owner-builders envision such a patient timeline that allows for getting to know a site and working out the construction details. And, amazingly, the project went only about seven months beyond the ten-year goal.

The living room is oriented to the south with large, triple-paned Thermotech® casement windows inviting in the views of the surrounding hills, light and solar heat. The roof overhang is designed to shade the summer sun. Bob Cote and Bruce Adami built the coffee tables. The basket garden is courtesy of Cobblestone Design. The pillows and throw are courtesy of Company C. The ceramic vases and wall plaque are by Al Jaeger.

CHOOSING THE SITE

In June 1994, Cote and Adami purchased twenty-four acres of land in Deerfield. At the time, they were living in Auburn, where "we did a kitchen remodel, bath tiling, installed windows there—it gave us a chance to improve our construction skills," notes Cote, an environmental engineer whose father was a contractor.

Cote and Adami had been inspired by homes they had visited for several years on the annual green buildings tour, sponsored by the New Hampshire Sustainable Energy Association, and were thinking of using some of these concepts themselves. Today they live in a post-and-beam-framed, passive-solar house with 2,800 square feet of living space that's independent of the public-utility electrical grid as a result of a sustainable design and innovative energy systems.

The driveway to the house snakes through the woods for about one-third of a mile, a factor that eventually led Cote and Adami to install photovoltaic panels for electricity rather than pay the costs of running a line from the main road. The house rises from the hilltop, and two solar panels greet visitors at the top of the driveway.

For the first five years of their ten-year process, Cote and Adami focused their efforts on clearing the house site, patiently cutting trees, milling and air-drying planks for a year or more as the two worked the land. Paul Smith, a Deerfield excavator, helped with site work and installing the driveway. Pete Mahoney, of Mahoney Timber Framing in Deerfield, helped with milling the timber and framing the house.

Bruce Adami and Bob Cote live in a post-and-beam-framed, passive-solar house with 2,800 square feet of living space that's independent of the public-utility electrical grid as a result of a sustainable design and innovative energy systems.

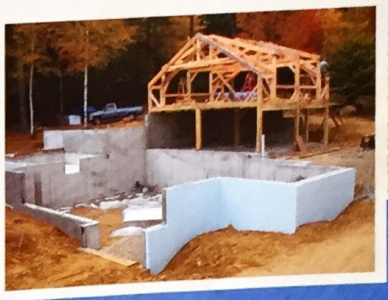
"We had an idea of what type of house we wanted for the site," says Adami, a church musician. "We spent five to six years preparing the road and the site, and didn't really talk to anyone. Then we met [residential architectural designer] Michael Greene, and he encouraged us to nestle the house into the hill and not place it at the very top."

"The house incorporates basic energy-efficient design: a south-facing slope, building the house into the hill for earth buffering on the north," says Cote, who takes great pleasure in mapping out the details. "We had done sketches, floor plans and even built models from Styrofoam board. Michael Greene brought new ideas into our thinking, both as a designer and as a contractor. For example, by raising the outside walls four feet, it gave us enough room for a second-floor living space that was much more practical than our original ranch-style design."

THE DESIGN PROCESS

"It was a very elaborate process," says Greene, who is based in Deerfield. His interest in sculpture led him into designing and building homes in the 1970s, with an emphasis on solar architecture. He's a follower of Frank Lloyd Wright's principles of organic architecture, which emphasizes paying attention to the geography of the site, seeking to create a house that mirrors the landscape, and reducing barriers between the inside and outside through design and material choices.

"I began to see a set of principles that would work in this climate where we need heat," Greene adds. "I'm a big believer that you not only have to get heat but you have to store that heat."



PHOTOGRAPHY THIS PAGE BY BOB COTE

Bruce Adami and Bob Cote work on their house (top) as the foundation is built (middle). The two 1,200-watt stationary photovoltaic panels at the right of the house (bottom) provide all electricity.

The dining area features a custom-built table by Bob Cote and Bruce Adami graced overhead by a Hubbardton Forge chandelier with dimmable compact fluorescent lighting. The oil painting of geraniums is by Adami's great-great-aunt Etta Voss. Cote also built the weight-driven pendulum clock on the wall. The posts that support the house rise from the tiled floor like trees, joining the beams with handmade wooden pegs. The floral arrangement is courtesy of Cobblestone Design.

Cote and Adami added landscape architect Joe Hochrein of Blackwater Design in Webster to their design team early in the process. "They wanted to go with more sustainable design, what we used to call naturalized," Hochrein says, "with minimal lawn area—really more pathways around the house—and native, indigenous plants like low-bush blueberries. I considered flower, fragrance and fruits—edible or for wildlife."

"We wanted very little formal lawn, more erosion-control grasses," says Cote. Both men had spent many hours mowing a suburban lawn and wanted their summer hours free from that chore.

THE COMPLETED HOUSE

All of Cote and Adami's hard work and careful planning over ten years has paid off in a big way. As you walk up the stone steps into the entry hallway, a ceramic mural custom-designed for this space by Al Jaeger, a noted Deerfield artist, welcomes you. Jaeger is a personal friend of both men—Cote and Adami met at a dinner party he had hosted—and his ceramic work is displayed throughout the house. The warm earthtones of the clay and curvilinear shapes calls to mind the stone walls of the nearby terrace and New Hampshire's rugged mountains. On the left-facing wall is a coat rack that was made by Adami and Cote from red-oak remnants and oak pegs left over from the timber framing.

A short step up and you're in the first-level living space, a light-filled, open-concept space that includes a kitchen, dining area and living room. A hallway leads to the bathroom and what was originally intended to be the master bedroom (the space became the guest room). A stairway off the hall leads to the second level.

The house is oriented with the largest windows facing south, to take advantage of the sun's rays. Beautiful, custom triple-paned, Fiberglas®-casement Thermotech® windows line the south-facing wall along the dining and living areas, framing views of the Pawtuckaway hills. Casement-style windows make a tighter seal and save energy, and the coatings on these keep heat in and cold out. The windows are set deep into walls that feature vapor barriers and blown-in Fiberglas insulation, all part of creating a home with a smaller energy "footprint" than most. Cote and Adami solved the problem of how to finish the extra-deep sills by tiling them, which created an ideal shelf for interior plantscaping.

"The wall system is wrapped so as to keep all available water vapor in the house instead of going out, because our bodies are more comfortable with some humidity."

ne notes. "The house walls are twelve es thick," which is nearly double that of cal walls.

The large roof overhang allows the low ination of the winter sun's rays to pene- e inside the home and the hotter, higher mer sun to pass above the roofline to p the house cool. There are also eighteen hes of insulation in the roof, which makes uper-insulated."

"In the winter, you want to allow for as ch sun as you can get. It's not rocket sci- ce, just common sense," says Greene, who e spent a year measuring angles of the at each of the solstices in Deerfield. "It's t basic geometry once you have the an- s done."

"If we had to do it over again and if global rming continues, we would have planned a central air-conditioning system," says e. "The casement windows don't really al- w for room air-conditioners."

"Keeping the integrity of the walls and por barriers make a through-the-wall air- nditioning system not that attractive for for the few days it's needed each year," ds Adami.

RUSSIAN MASONRY HEATER DDS THERMAL MASS

ne of the key concepts in high-efficiency ssive solar building is creating "thermal ass"—to store the available heat and ra- ate it throughout the house in the cooler onths, and to maintain a constant indoor mperature during the warmer months. pe and Adami's house features several pes of thermal mass storage: a poured ncrete foundation, 1½ inches of concrete us Italian ceramic tile on the first floor and e fieldstone-faced Russian masonry heater stem that ascends to the roof independent f the wood structure.

The heat-storing fireplace dominates he living room and also contributes to the rank Lloyd Wright–concept of bringing the utside in with the stones harvested from the site by Adami and Cote. The system was designed in collaboration with Thermal Mass, Inc., a Dalton firm specializing in the European tradition of thermal-storage fireplaces. Thermal Mass provided and installed the modular concrete core and base, and mason Fred Cole of Raymond built the stones into the facework.

The efficient heat-storing fireplace of the Russian masonry heater system is a focal point of the living room. The fireplace provides a warmth so gentle that any part of the stone can be touched. The wood is loaded vertically for a fast burn that heats the concrete core and fieldstone structure. The basket garden is courtesy of Cobblestone Design.

INSET A large ceramic bowl made by Al Jaeger is filled with citrus and sits on a kitchen counter.

The guest bedroom offers panoramic, south-facing mountain views with windows that wrap around the corner and provide cross-ventilation. The distinctive floor is natural tumbled slate. Bob Cote built the wood-frame bed.

"He was wonderful," Adami says about Cole. "He eye-balled everything and would know what stone to place next. We kept piling up the stones, and Fred would just keep asking for more."

"The way it works is that you stack the wood vertically until you fill the firebox, light it and leave the damper open three [or] four hours, then you close it down and the rocks radiate the heat," says Adami. "There's almost no creosote; it's a fast, clean burn."

This efficient system provides a gentle, uniform heat for twelve hours or more after the fire goes out. The rocks get warm, but not hot to the touch, so the fireplace is safe in a high-traffic area. The open-concept design for the first floor and loft-like design for the second level allows the warm air to circulate. In a typical heating season, Cote and Adami use just two cords of wood to heat their home.

"The house heats best when it heats from the ground up and rises, warming your feet as it goes up," says Greene.

AN ENERGY-EFFICIENT CUSTOM KITCHEN

The kitchen features granite counters and windowsills from Stone Creations in Northwood, a Bosch® electric dishwasher and a Viking Professional® six-burner propane stove. Adami and Cote had to search for a range model that would have spark ignition for lighting the oven (not the usual glow plug that draws current all the time), but that was the only concession to their power system. "The stove was our reward for doing the tiling ourselves," says Cote. "Because of our electric budget, this is a propane stove."

Adami and Cote made all the kitchen cabinetry with wood from their land, dovetailing the joints and using red oak for the faces with interior woods of maple, beech or black birch. There are forty-eight pull-out drawers and shelves. "We put the entire house into a 3-D CAD [computer] program so we had all the dimensions," says Cote. "It was not much additional effort to lay out the cabinets; we had done the same process in our old home."

"When you design your own space, we could make things whatever size we needed," adds Adami, proudly pulling out a storage shelf for cookie sheets.

OTHER ROOMS IN THE HOUSE

A full bath just down the hall from the kitchen features a Swanstone® counter and sink, Hubbardton Forge® light fixtures and tumbled marble flooring. A handcrafted red-oak grab bar near the toilet cleverly incorporates a leftover wooden peg from the framing. "The wood vanity and mirror are made from white birch from the property," Adami says.

"We wanted the bathroom to have its own, more instant, source of heat," says Cote, pointing to the Veha® hot-water towel warm-

e radiant-floor heating system at left converges in the ground level, joining the electric water heater and Munchkin® high-efficiency pane boiler. Circuit breaker panels and charge controllers are on the black board. Engineered beams overhead support the house d first-level concrete floors. At far right, Bob Cote shows the twelve batteries that store the electricity for household functions.

SOURCES

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EDUCATION
B.S., 1974, Environmental Engineering, Rensselaer Polytechnic Institute

PROFESSIONAL REGISTRATION
1996, Professional Engineer, New Hampshire, #9182

WORK EXPERIENCE

TeTon Environmental, PLLC, January 2005 - present
- *Principal*

TeTon Environmental, PLLC is a small-scale business entity that focuses on several specialty markets in which the principals possess extensive experience. In order of importance, these markets are governmental (municipal) programs regulating industrial wastewater discharges to sewer systems, industrial wastewater compliance management services, stormwater pollution prevention planning, oil spill prevention planning, environmental management systems, and environmental data management – primarily Microsoft Access®-based databases.

Industrial Pretreatment Program (IPP) General Services, Towns of Londonderry, Milford, Bedford and Exeter, New Hampshire

Responsible for providing technical support in all aspects of the Town's IPP. Specific assignments and responsibilities include revising and reissuing Industrial Wastewater Discharge Permits (IDPs) including fact sheet attachments; reviewing IDP applications; enforcement response; conducting facility inspections; reviewing semiannual periodic compliance reports and completing appropriate follow-up correspondence; managing Town's Industrial User (IU) sampling program; drafting correspondence to IUs on behalf of the Town; communicating and coordinating with other regulatory agencies; reviewing Town's sewer use ordinance; organizing IPP-related files; and preparation of annual IPP report.

Local Limits Redevelopment, Towns of Londonderry, Exeter, Hanover and Jaffrey, City of Keene, New Hampshire

The local limits redevelopment efforts include developing maximum allowable headworks loading (MAHL) values for each municipality's wastewater treatment facility and determining allowable concentrations for industrial user discharges. A Microsoft® Excel-based spreadsheet local limits model is prepared to reflect site-specific conditions within the municipalities. This spreadsheet assists in the identification of pollutants of concern and calculation of MAHLs. The following tasks are completed as part of these calculations: developing future flows (*e.g.,* domestic, industrial, host community, septage) to the wastewater treatment facility; coordinating a representative collection system sampling and analysis program; forwarding Industrial Waste Survey Questionnaires to obtain updated data; evaluating and compiling influent, effluent, and sludge sampling analytical data; updating pollutant removal efficiencies used to calculate MAHLs; and determining the MAHL capacity of the treatment facility based on water quality criteria, process inhibition, and biosolids criteria. Subsequent to these project tasks, recommendations are made regarding updated pollutant discharge controls, including an administrative structure to implement each municipality's controls.

ISO 14001 Environmental Management System (EMS) Implementation Assistance, (Velcro), Manchester and Somersworth, New Hampshire

Completed the annual aspect/impact updates from 2006 through 2015 as part of ongoing EMS maintenance activities. To support the EMS requirement for completing internal audits, have served as lead internal auditor from 2007 through 2016.

Storm Water Pollution Prevention Plans (SWPPPs) and Spill Prevention Control and Countermeasure (SPCC) Plans, Various Clients

Preparation of SWPPPs to address the federal storm water permit requirements and SPCC federal regulatory requirement for multiple industrial and municipal facilities. Project work included development of proposals and budgets, site reconnaissance visits to identify potential sources of pollutants to storm water and surface water, interpretation and application of the regulatory requirements and SPCC regulations, and identification of applicable best management practices to minimize adverse environmental impacts. Other duties included interacting with regulatory and other governmental agency representatives to define requirements and obtain required information, converting earlier version SWPPPs and SPCC Plans from multiple electronic formats to an innovative Microsoft Access® -based database format, filing of Notice of Intent forms on behalf of clients, and completing permit eligibility assessments with respect to endangered/threatened species and historic places. Project assignments preparing SWPPPs and SPCC Plans have included work for the following clients (with their applicable industrial sector):

- Henkel Locktite Corporation, Seabrook, NH (chemical manufacturing)
- Velcro USA, Manchester & Somersworth, NH (textiles)
- Milford NH Wastewater Treatment Facility
- Hitachi Cable USA, Manchester, NH (electrical components)

Sewer Use Ordinance Development, Towns of Londonderry, Milford, Exeter and Keene, New Hampshire

For each municipality, developed comprehensive Sewer Use Ordinance language, with emphasis on providing authority for implementing, controlling and enforcing industrial wastewater regulatory control programs known as Industrial Pretreatment Programs (IPPs). IPPs must comply with numerous state and federal requirements and are intended to ensure that industrial wastewater discharges to sanitary sewers do not cause problems.

Intermunicipal Agreement Development, Londonderry/Manchester, Milford/Wilton, New Hampshire

Provided development and review services for the project efforts between these municipalities to develop a comprehensive agreement outlining the conditions under which wastewater treatment services would be provided by the host community and the corresponding responsibilities of the contributing community. Developed draft language, attended meetings with representatives of both communities to review and discuss issues and concerns, and developed revised text to meet the needs of the parties.

Other Environmental Compliance Services

TeTon has provided environmental consulting services for a number of smaller scale projects. These are primarily wastewater or stormwater-related projects for regulatory compliance purposes.

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GZA GeoEnvironmental, Inc., December 1993 – January 2005

- *Project Manager, December 1993 – March 1998*
- *Senior Project Manager, March 1998 – January 2005*

In my position at GZA GeoEnvironmental, Inc., I solicited project opportunities from prospective clients, developed proposals, prepared budgets, assigned and directed work, and provided technical input and oversight for environmental engineering projects. These projects were generally water-program related including environmental compliance, storm water permitting, industrial wastewater permit writing and compliance, oil spill prevention and control, environmental software development, ISO 14001 Environment Management Systems implementation assistance, and environmental sampling.

City of Manchester – Environmental Protection Division, September 1975 – December 1993

- *Pretreatment Supervisor, September 1983 – December 1993*

During this 10-year period, I implemented the City of Manchester's (City's) Industrial Pretreatment Program (IPP). Working under the direction of the Chief Sanitary Engineer, the responsibilities of this position increased significantly during this term of employment, primarily as a result of the increasingly comprehensive Environmental Protection Agency IPP requirements that were phased in over this time period. As a result of this change in work task responsibilities, I was promoted to the newly created Pretreatment Supervisor position, which I held for the final 3 years of this period.

City of Manchester – Environmental Protection Division

- *Wastewater Treatment Facility Foreman, September 1975 – September 1983*

As wastewater treatment facility foreman, I supervised the operation of the City of Manchester's 26 million gallon per day wastewater treatment facility during on-duty shifts. During this term of employment, I satisfied the applicable licensing requirements to earn a State of New Hampshire Grade IV Water Pollution Control Plant Operator license.

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State of New Hampshire – New Hampshire Department of Environmental Services (then the Water Supply & Pollution Control Commission), July 1974 – September 1975

- *Environmental Technician*

During this period of employment, I performed field evaluations and administrative tasks related to the design, inspection and approval of subsurface wastewater disposal system installations.

	A	B
1	1,090	Megawatts of capacity for NP transmission line
2	1,090,000	Kilowatt equivalent
3	Assume 40-year period (life expectancy of the NP line), 83% delivery rate - how many kilowatt-hours are delivered?	
4	1,090,000	Kilowatts
5	x 40	Years
6	x 365	Days/year
7	x 24	Hours/Day
8	x 83%	Assumed percent utilization of the NP line
9	= 3.17007E+11	Kilowatt-hours over 40 years
10	= 7,925	Gigawatt-hours / year
11		
12	$1,000,000,000	Assumed increase in NP project cost for underground alternative
13		
14		
15	$0.0032	Estimated incremental $/KwHr at 83% delivery rate over a 40-year period (A12÷A9)
16		
17	143,171	Gigawatt-hours / year (estimated 2019 NE annual energy from CELT Report - May 2016 attached)
18	6%	Estimated percentage of NE power from NP (A10÷A20)
19	0.02¢	Estimated incremental NE regional impact (in cents) on wholesale energy cost from burial of NP transmission line (A18xA15x100)