



**Architectural Resource**

Headed by Michael Klement A.I.A., N.C.A.R.B., is a full-service, national award-winning, architectural design firm specializing exclusively in residential design of high-performance homes, cottages, additions, remodels, and renovations. "Green" since the firm's inception in 1991, creating healthy and energy efficient buildings is a fundamental aspect of its core mission.

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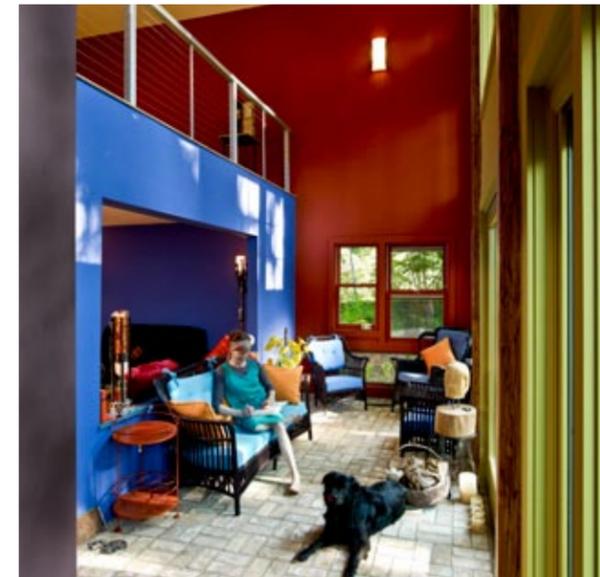
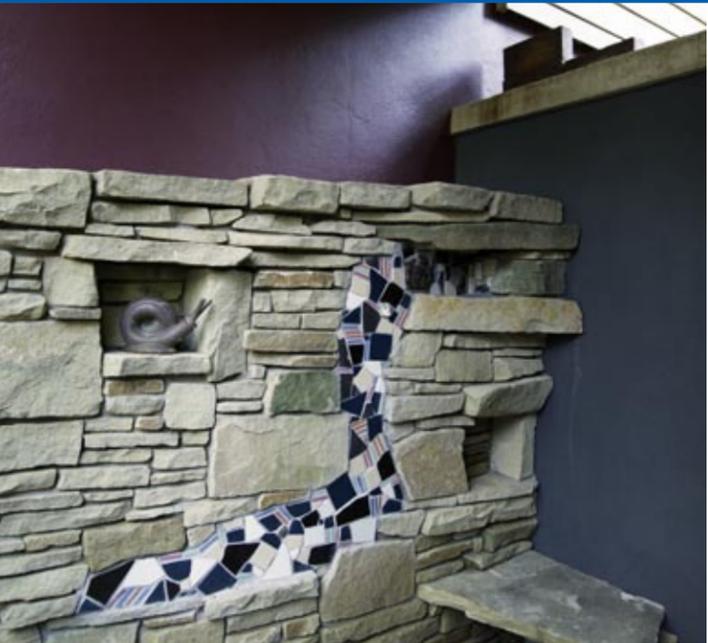


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# THE NAUTILUS HOUSE

## A UNIQUE VISION, A POWERFUL TEAM, AN INSPIRING HOME

The Nautilus House sprung from a need to fix a leaky roof, and a vision for energy and water independence on a beautiful wooded building site. Form follows function in this building designed to capture sunlight, water, and air currents. Like a nautilus, it unfolds in an organic shape spiraling upward and outward on the original foundation, with existing materials and spaces re-inventing themselves within and around the structure. The owner, architect and builder worked together to create a unique vision of home that will become Michigan's second LEED Platinum residential remodel.

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# NEW RULES FOR A NEW CENTURY

## SMALL FOOTPRINT

Reorganizing the flow of the home to create flexible and open spaces allowed the home to keep its original small cottage footprint and let the outdoors in. Smaller, well-organized homes can be intimate and friendly while keeping resource use to a minimum.

The Nautilus House also utilizes small footprint drilling technology to install geothermal heating and cooling on a hilly site. The Earthlinked Technologies® direct exchange geothermal system is not only the most efficient on the market, it also permits the installation of geothermal energy on small or difficult sites. The Earthlinked Technologies® direct exchange geothermal system is not only the most efficient on the market, it also permits the installation of geothermal energy on small and difficult sites.

## FILLING THE GAPS

Well-insulated and tight buildings are another crucial step in producing extremely energy efficient homes. The Nautilus House uses several techniques to achieve that goal, including Advanced Framing Techniques (AFT) that replaced about 30% of the lumber used with insulation, Structural Insulated Panels (SIPs) for an extremely efficient and strong roof system, and Spray Polyurethane Foam (SPF) to expand into all the nooks and crannies of the existing framed exterior walls and make them air-tight. It's a lot of acronyms that work together to produce a very comfortable and efficient home.

## HARVESTING THE SUN

The form of this home arose from the goal of making solar energy on a heavily wooded lot, a challenging trick. The owner has trimmed limbs on a large black walnut tree for years to prepare for solar energy as part of her careful stewardship of the lot. As the roof curves back to expose a thin window of solar opportunity, it also creates a new large loft over the first floor. In addition to another multi-use space in the home, it also gives the house a great flow and natural light. The house recycles the heated air radiantly through an advanced duct system. The form and openness of the home also take advantage of another product of solar energy - wind - to create convective currents that cool the home passively.

## LET IT RAIN

Water conservation and re-use are one of the main goals of this project. The standing seam metal roof will last far longer than a standard roof and will deliver clean water to rain-saving catchment containers. The front half of the roof structure sends its harvest to a sand-filtered water storage tank in the front, while the rear half goes to rain barrels for use in irrigation of landscaping. Ultra low-flow water fixtures that actually work and dual-flush toilets are used throughout the home.

The exterior of this home is also clad in a rain screen siding detail, that holds the cladding material off the surface of the exterior framing. A high-performance vapor shield protects the home from wind and water while allow interior moisture to pass through. The rain screen allows the cladding material to dry to both sides, greatly increasing its longevity.



### SIP ROOF

12-inch Structural Insulated Panels (SIPs) create an R-48 roof assembly that is very energy efficient & tight. The existing roofline was upgraded to R-48 through the use of polystyrene foam and blown-in foam insulation.

### SOLAR PANELS

The form of this house follows its function of harvesting sunlight to generate electricity. A four kilowatt system provides nearly all of this home's non-heating electrical requirements.

### PASSIVE COOLING

The layout of the home & placement of windows create a pressure differential which we cause to draw warm air out of the house in the summertime. Motorized windows provide a method for opening the highest windows.

### REDUCED WASTE GENERATION

This framing approach uses up to 30% less lumber than conventional framing and provides for more insulation in the exterior walls.

### IMPROVED EXISTING SHELL

Advanced Framing Techniques & low-density open cell polyurethane foam fill the nooks and crannies with an adhesive, expanding foam that creates a much more airtight building shell. This saves a great deal of energy while providing a more comfortable home.

### LOOSE-FIT, LONG-LIFE DESIGN STRATEGIES

With this design strategy, homes are made to be easily change-able for many different types of uses over time. Long diagonal views and areas of multiple functionality make a home with a small footprint seem larger than it is.

### ADVANCED FRAMING TECHNIQUES

This framing approach uses up to 30% less lumber than conventional framing and provides for more insulation in the exterior walls.

### ENERGY RECOVERY VENTILATOR

ERV's recover the heat & moisture content of stale interior air to condition incoming fresh air. Large amounts of energy are saved by this exchange, while HEPA filtration further optimizes interior air quality.

### GEOTHERMAL HOT WATER

Domestic hot water capability with this geothermal system provides reliable year-round hot water. Backed up by an on-demand hot water heater, this system provides consistent, unending hot water with a low energy cost.

### GEOTHERMAL HEATING AND COOLING

The Earthlinked Technologies® direct exchange geothermal system uses the stable 52° temperature of the earth as a heat sink in the summer and a heat source in the winter. This geothermal system is more than 4 times more efficient than a fossil fuel source furnace.

### WATER CONSERVATION

This home is designed to collect & store the water on site. The 1000 gallon corgal tank becomes part of the architecture of the home.