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ENVIRONMENTAL DESIGN + CONSTRUCTION
THE OFFICIAL MAGAZINE FOR THE LEED® PROFESSIONAL

A bnp PUBLICATION

Living C

A HOME IN THE OZARK MOUNTAINS PROVES THAT COMFORT, ENERGY AND EFFICIENCY CAN DWELL IN HARMONY—EVEN WITHOUT CIVILIZATION.

As Americans become more and more interconnected and dependent on technology, it may seem nearly impossible to imagine living completely "off-grid," but that is exactly how members of the Katog Choling Rit'hröd Retreat community must live. In the remote community in which standard utilities such as electricity, water, sewage and garbage collection are unavailable for miles, sustainable design becomes not only an attractive option, but a completely necessary one.

Members of this community, located in the idyllic Ozark Mountain Range, are allocated 5-acre parcels of land on which to build their individual dwellings. Among the community's members is a client of the Buddhist faith who wanted his second home, surrounded by hundreds of acres of forested terrain, to gently adapt to the area's ecosystem.

DESIGN AND INNOVATION

The project was designed to create a new housing prototype for the community, taking its inspiration from historic French trading posts, utilitarian agricultural sheds and local tin-roof vernacular architecture.

"The project is unique because it is 'off-grid' with 100 percent harvested rainwater—the client would essentially be living off the land," says Germán Brun, AIA, LEED AP BD+C, NCARB, of DEN Architecture. "This created a design challenge because we had to tap all the available natural resources to their full potential, but it also provided an opportunity to showcase a project that thrives independently without the modern-day conveniences that we take for granted."

Designers tried to strike a balance of seclusion and kinship. To avoid any disturbance to the ecosystem, builders placed the building within an existing clearing in the forest and elevated the structure on tree-like columns, allowing nature to eventually reclaim the site with native flora and fauna.

STRIKING A BALANCE

Since all energy had to be produced onsite, another challenge involved balance. "The biggest challenge was to moderate the equation between energy loads and onsite energy production," says Brun. He explains that large energy loads would disrupt the balance even if the entire property were covered in solar panels. The solution, he says, was to limit energy loads. "You really start to question everything in order to use the absolute minimum energy possible within the parameters of the project. That balance is hardest when the success of the entire project depends on it."

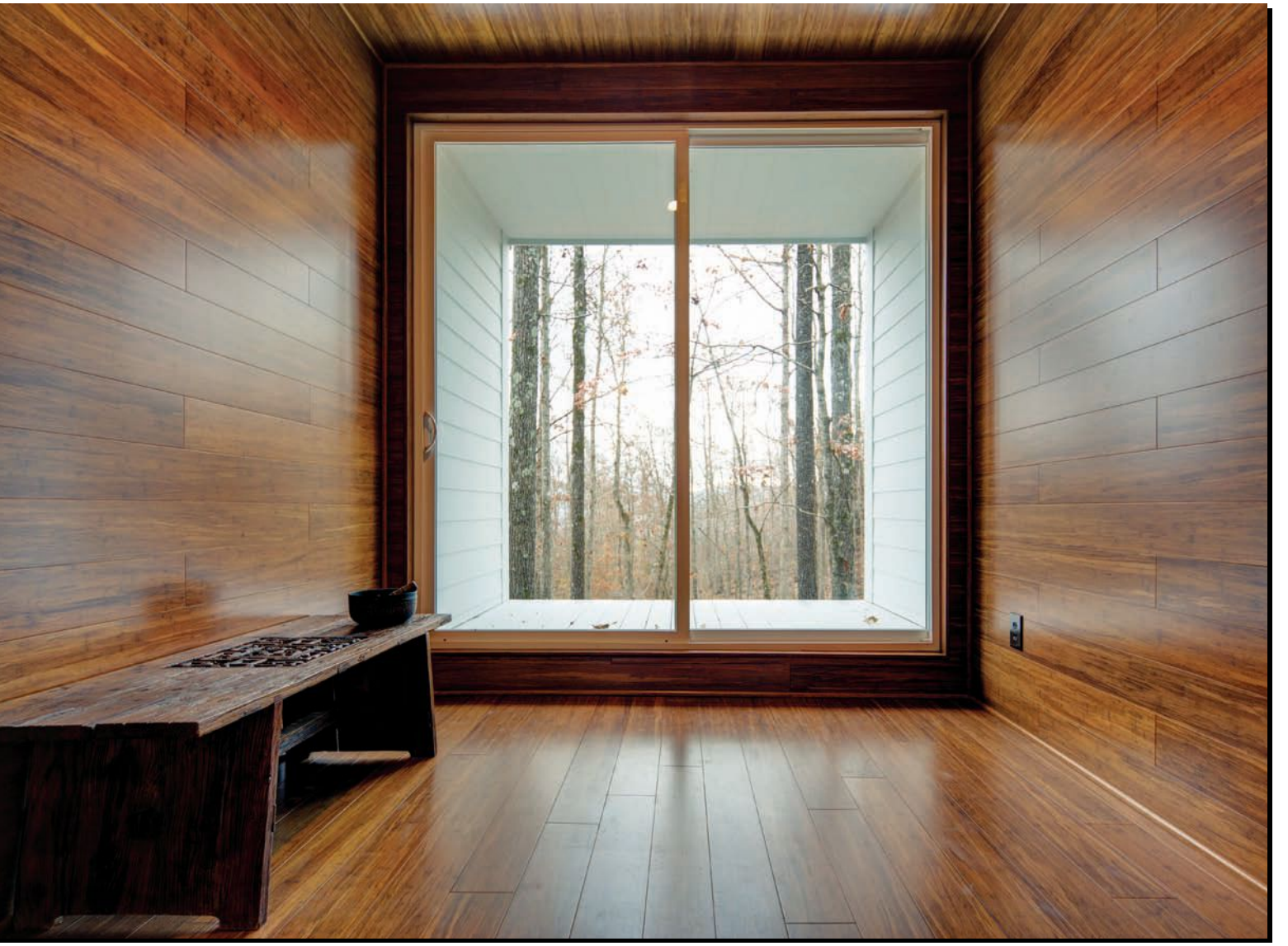
The result of overcoming these challenges is maximum efficiency in terms of both design and systems.

IMAGE BY GREG CLARK

Excellence in Design AWARDS

Off-Grid

Residential



Although the project has a relatively small footprint of 1,157 square feet, it has two bedrooms, two bathrooms, a meditation room, a kitchen, a dining room, a family room, an office and generous storage facilities. The spaces overlap, intermingle and complement each other to maximize usable area.

On the outside, this programmatic efficiency is mimicked by an equally minimal combination of basic building forms adapted to the site's particular characteristics (orientation, vegetation, prevailing winds, etc.), all wrapped in a highly insulated building envelope and then serviced by innovative passive and active systems that produce as much energy as the house can consume. Instead of air conditioning, the design harnesses natural breezes. Conventional forced-air heating is replaced by an open-loop heat exchange system that constantly circulates heat between a wood boiler, wood stove, hot water heater and radiant under-floor system—continuously and efficiently returning excess energy back into the loop.

The Gordon Ozarks Cabin blends with the natural surroundings aesthetically and spiritually.

ALL IMAGES BY GREG CLARK

LAND USE AND SITE ECOLOGY

The overall approach to site ecology was to avoid disrupting the area's innate natural flows and processes by simply making the building's footprint, in terms of both physical characteristics and energy consumption, as imperceptible as possible. The use of an elevated structural design not only allows local flora and fauna to inhabit the complete footprint beneath the house, but it separates the building envelope from the thermal mass inherent in the ground and facilitates the flow of prevailing winds.

The design team decided against a formal landscape design, considering that nature does a better job at selecting, seeding and growing appropriate species in the right places. The cabin employs a biomass heating system based on the collection of abundant dead or decaying trees (commonly referred to as "snags" in forest ecology terms) and the subsequent combustion of firewood in an EPA-rated wood boiler and stove. An independent 2.25 kWh solar array system covers the remaining electricity consumption. The house design is based on bioclimatic passive strategies that open a funnel-shaped volume toward predominant summer breezes and winter southern solar exposure.

EXCELLENCE IN DESIGN RESIDENTIAL CATEGORY WINNER

Information provided by the applicant.

NAME: Gordon Ozarks Cabin

LOCATION: Parthenon, Ark. (rural)

SIZE: 1,157 square feet

COST: $130,000

COMPLETED: October 18, 2013

NEW CONSTRUCTION OR EXISTING BUILDING RENOVATION: New Construction

CERTIFICATIONS: Targeting LEED for Homes Gold

IMAGE BY GREG CLARK

BIOCLIMATIC DESIGN

The orientation, placement and shading of the building were decided by a climate analysis derived from specialized software (Climate Consultant 5.5), in which the "off-grid" nature of the project highlighted the importance of passive design strategies to the fullest. Each climatic characteristic is either offset or supported by a resultant design response.

The high, funnel-shaped volume of the house is oriented perpendicular to prevailing winds to maximize natural ventilation. Because the design utilizes neither air-conditioning nor forced-air heating, minimal fresh air intake and internal air movement is required through low-consumption fans in the kitchen, bathrooms and attic.

Daylight averages10-11 hours per day with clear sunny skies 64 percent of the year, allowing the project to implement both passive daylighting and active solar photovoltaic systems. Windows are appropriately sized and strategically placed to take advantage of sunlight and views.

The building design focuses on integrating exterior and indoor environments through passive design strategies and an adaptable building envelope. Daylighting, natural ventilation and views, all primarily facing the southern exposure of the site, are captured through proper sizing and placement of operable windows and sliding glass doors. The use of exterior screens and adjustable fenestration offers the building envelope protection in winter and openness in summer.

MATERIALS AND CONSTRUCTION

The fact that the project is within a self-sufficient community provides synergies by utilizing surplus materials from previous construction within the subdivision and reciprocating with any leftover supplies for future houses in the area. Through the use of efficient framing methods determined by the LEED for Homes rating system, scraps from framing were minimized during construction, as were any excess resources with methodical quantity take-offs before ordering.

Material selection criteria vary according to means and methods of construction of any particular assembly. Helping to avoid costly transportation was local pine lumber, which was used for structural elements, and domestic slate that surrounds the hearth. Wide-plank bamboo floors help save both North American forests and tropical jungles. Counters are fabricated from 100 percent post-

PROJECT TEAM

ARCHITECT: DEN Architecture (Germán Brun, AIA, LEED AP BD+C, NCARB, and Lizmarie Esparza, RA, LEED AP BD+C, NCARB)

STRUCTURAL ENGINEER: Pavel Gonzalez, PE

BUILDER: Damian Fitzpatrick

SOLAR CONTRACTOR: Rocky Grove Sun Company (Flint Richter)

LEED CONSULTANT: Viridian Sustainable Building Consulting (John Coleman)

HERS RATER: Home Energy Rx (Andrea Ingalsbe)

MATERIALS

FLOORING: Yanchi carbonized strand-woven wide-plank bamboo

CEILING: USG (US Gypsum) 5/8" standard gypsum board

WOOD: Local southern pine lumber

ROOFING: Magnum MAG 29 Ga aluminum roofing (Polar White and Burgundy)

HVAC SYSTEM AND APPLIANCES:
- Heatmor 100 CSS outdoor wood boiler furnace
- Pacific Energy True North TN19 wood stove
- General Electric GTH18EBEBB refrigerator
- General Electric JGBS07DETBB oven range
- Bradford White Defender propane HWH

INSULATION OR ICFS: CertainTeed CERTASPRAY

INTERIOR FINISHES AND FURNISHINGS:
- Daltile
- Paperstone
- US Ceramic
- MS International

PAINTS AND WALLCOVERINGS: Benjamin Moore Eco-Spec

ENERGY EFFICIENCY:
- Rainharvesting wireless tank gauge and meter
- CREE warm white 60W replacement LED lights

BUILDING ENVELOPE:
- James Hardie Hardie-Plank
- Permapro Permawrap
- MI Windows and Doors

PLUMBING FIXTURES:
- American Standard Berwick
- Glacier Bay N2316
- IKEA Dalskar

OTHER:
- Rocky Grove Sun Company 2.25 Kwh solar array
- Outback Flexware power system
- Waterworker water heating expansion safety tank
- Dankoff Solar Flowlight booster pump
- Fantech RVF-4 exterior centrifugal fan
- Therma-Coil stainless steel Thermo-siphon water heating coil

consumer recycled paper. Lap siding is made of durable and maintenance-free cement board. Constructed of local southern pine using the traditional "balloon framing" technique, the house's building envelope is protected from the weather by a wall assembly of cement-based siding, a woven polypropylene water-resistant air infiltration barrier and a thick layer of open-cell spray foam insulation.

COLLECTIVE WISDOM AND FEEDBACK LOOPS

The project's success hinged upon operational systems since they had to work in order for the house to become habitable. Accordingly, preliminary modeling and design was essential to the accomplishment of the entire endeavor; in fact, the design phase (17 months) was four times as long as the construction stage. The project team, after having spent a post-occupancy evaluation weekend at the cabin, is proud to report that all systems are performing as designed.

The final product reflects a close collaboration between client, architect, engineers, sub-contractors, builder and the community. Problem solving, streamlined coordination and earnest teamwork helped achieve a quick construction timeline (four months) at a comparatively low cost ($130,000)—a rare achievement in today's contentious building environment. The entire process, from conceptual design to substantial completion (27 months), was instrumental in enhancing the design and its performance. Suggestions, recommendations and consultations constantly informed the progression of the project until its conclusion.

"The biggest lesson learned from the project is the necessity for an integrated project team and design process," says Brun. "The architect, the engineers and the builders all really need to be in sync in order to achieve an 'off-grid' home. We would also suggest a 'design-build' method because it fosters teamwork in order to achieve the sustainability goals within a reasonable budget."

The designers believe the malleability of this design-build methodology will surely be recommended for future projects in the community.

EID Residential Runners Up

FIRST RUNNER UP

SUSTAINABLE URBAN VILLA

SUBMITTED BY: Wolf Architects Inc.

SIZE: 3,460 square feet

LOCATION: Cambridge, Mass.

IMAGE BY ERIC ROTH

The project team used natural materials and a garden setting in a small urban site. The building was clad with several different types of wood, all of it milled from reclaimed lumber. (Much of this material was originally harvested over a century ago.)

The house features solar voltaic panels on the highest roof, a ground-source geothermal system, 100 percent permeable ground surfaces, underground recharger chambers and densely insulated exterior walls and roofs. Inside the house, builders used marble and slate quarried in New England as primary materials and heart-pine flooring throughout which was milled from reclaimed heavy timber beams. A birch-bark column in the entry vestibule and laser-cut leaf forms in sliding screens on the first floor are meant to present a poetic statement about the role of nature in the lives of the inhabitants.

SECOND RUNNER UP

ONENEST PROJECT

SUBMITTED BY: Greenspur

SIZE: 1,090 square feet

LOCATION: Delaplane, Va.

IMAGE BY KEN WYNER

The home was built using recycled materials and aesthetically pleasing and energy-efficient systems. Inspired by the classic barn and silo relationship, the home has virtually no hallways or wasted space.

The 3-bedroom, 2.5-bath home has 26-foot vaulted ceilings, a spa, wine cellars and a theater room. The multi-zone and ductless heating and cooling system features engineering and design enhancements that deliver increased efficiency ratings, decreased noise levels and improved piping capabilities.

Rather than using a traditional home foundation, OneNest used concrete piers and a steel chassis to set the home in concert with its natural surroundings. In addition to its energy efficiency, OneNest was built in a 100-day build cycle at 40 percent less cost than a traditional build. edc