

ARCHITECTURE NARRATIVE

Gable Home Design Philosophy

Illinois' strong agricultural heritage is evident in the thousands of aging barns, silos and farmhouses scattered across the landscape. Although they were not designed by trained architects, these simple, vernacular structures have nonetheless become a symbol of Midwestern practicality and work ethic. For the 2009 U.S. Department of Energy Solar Decathlon, the University of Illinois team envisioned a home that unites this vernacular architecture with principles of sustainability. Gable Home is the achievement of this vision through the creative adaptation of vernacular building vocabulary, the use of materials reclaimed from demolished farm structures, the preference for environmentally conscious materials, and the utilization of innovative technology. Combining vernacular architecture with contemporary materials, technology, and design creates a synergetic relationship through which both aesthetics and functionality are enhanced. The result is a familiar, yet improved home that relates to Illinois' symbolic vernacular architecture, as well as its commitment to a sustainable future.

Midwestern Vernacular

Gable Home adopts a vernacular building vocabulary distinctive to many Illinois barns, the most apparent of which is the use of a steeply pitched gable roof that spans the entire length of the house. This feature satisfies both functional and environmentally conscious goals by effectively shedding rain water and reducing snow loads while also providing an efficient 45 degree surface for solar panel arrays. The solar panels designed for the Gable Home will generate vastly more energy than its annual demand. The large, sliding, exterior shading devices on the southern façade are reminiscent of typical sliding barn doors. The frequent use of sliding doors inside the home continues this reference while also allowing the interior spaces to be condensed.

Whenever possible, reusing existing material was preferred to the production of new material. Therefore, the traditional barn siding aesthetic was created through the use of siding reclaimed from a barn that was slated for demolition in Rockford, Illinois. Also, dimensional lumber was salvaged from the deconstruction of a grain elevator in Champaign, Illinois and reused for the exterior decking of the house. The



Figure 1 - Image of barn from which barn siding was reclaimed

reuse of these materials not only represents a conservative, sustainable approach to material usage, but also establishes a direct relationship between the Gable Home and vernacular farm structures.

Environmentally Driven

The team incorporated quality, environmentally conscious materials whenever reuse was not an option. For example, the material for the structural frame of the house was made of laminated bamboo, a rapidly renewable material, all of which fit onto a single shipping pallet. Each frame element is just $\frac{3}{4}$ of an inch thick, which significantly reduces thermal bridging. The standing-seam steel roof has an estimated lifespan of 50 years, which means that it will last longer than the solar panels, thereby minimizing long-term costs and maximizing the value of the panels. Additional advantages of the roof are the material recyclability, and the elimination of roof penetrations as the solar panels can be attached solely to the steel. Most of the lighting fixtures in the home employ energy efficient LED bulbs. The home also features low-VOC paint, linseed oil stain, natural resin panels for doors, recyclable tiles, cabinetry made of rapidly renewable and recyclable materials, natural linens, and flooring made from renewable materials and ecologically responsible pigments.

Designing quality passive systems for Gable Home was crucial to achieving energy-efficiency. Therefore, the University of Illinois team created a small but comfortable one bedroom, one bath home that meets Passive House standards. Passive House certification requires a tightly constructed building envelope with quality, energy-efficient windows. The envelope uses a combination of spray-foam and rigid insulation, minimizing heat transfer through thermally broken construction. In addition to architectural concerns, the use of energy analysis software helped to determine the optimum placement and size of each window. The windows are triple-paneled with thermally broken frames, and involve an air-tight installation process, which helps maintain a tight building envelope. The result is a design that allows ample daylight while maintaining a comfortable indoor temperature.



Figure 2 - Laminated bamboo frame during construction

Clean, Simple, Modern

The intent to use reclaimed barn siding came early in the design process and became the primary element of the clean and simple aesthetics of the house. The placement of the siding at a consistent

spacing of 12 inches on center established a rhythm that influenced many other areas of design. Most notably, the width of each window was designed to fit seamlessly into the siding. Also, the decking boards are spaced at six inches on center and the seams of the roof are spaced at 12 inches on center in order to align with the siding boards and thus preserve clean and continuous lines.

The steep gable roof allows for vaulted ceilings in the home which provide a spacious feeling to the interior, despite the fact that the home has just 550 square feet of living space. The furniture is modern and elegant, and in many cases can be adapted to the user's needs. The sitting furniture in the living room is modular and can be arranged in a variety of ways. The bedroom desk is movable and expands so that it can be used over the bed or in other spaces if desired. The house features a modern wet bathroom with bamboo flooring and a unique draining system. The bedroom is secluded from the more public kitchen and living areas, and also has a private exit to the exterior deck.

Toward Future Sustainability

By using vernacular building vocabulary, reclaimed materials, environmentally conscious materials, and innovative technology, the University of Illinois team created a sustainable home that relates to and preserves the symbolic, vernacular architecture of the Midwest. The synergetic relationship that exists between this vernacular architecture and new technology allowed for the creation of a home that will lead to a more sustainable future.



Figure 3 - Rendering of home as viewed from the south-west