A New Look at Southern Housing

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SCH Report 6

2006

Abstract

During the 1960's and 1970's, especially post 1973 Oil Crisis, a proliferation of energy efficient houses and technologies occurred. The back-to-the earth movements, in the spirit of Henry David Thoreau, sparked off-the-grid lifestyles. Publications such as the Whole Earth Catalog, Better Homes and Garbage, and the Energy Primer were readily available. The character of the houses matched the character of their inhabitants. Both are distinctly, and intentionally, marginal. Both exhibit this "thoreauesque" regard for individuality and disregard for community. The house's aesthetic has a precisely defined engineered appearance. Its shed roofs are sloped to allow appropriate winter sun. It's proportioned and situated on a site primarily to respond to climatic factors. Both the house and the inhabitant's relationship are with nature.

Counter posing the energy efficient house is the contemporary suburban house. The character of the houses matches the character of their inhabitants. Both are distinctly, and intentionally, stylized and conventional. Individuality of the houses derives from their applied styles. The houses' aesthetic is a precisely defined conventional appearance. Traditional elements, such as Doric columns, Palladian arches, vernacular brick, expansive roofs, are layered over similar plans. The house forms respond to (or, arguably define) similar lifestyles. Their purpose is to promote a conventional social sense of community.

My thesis is that each situation, the energy efficient house with the individual family and the conventional suburban house with its community-oriented family, has merit. The US and the world can no longer accept a philosophy of waste and exuberance as represented by the typical, American suburban house. We, also, cannot turn to the overly heroic stance of the sustainable homeowner. A question, therefore, arises: How do we balance conventionality and sustainability, in particular in the southern house?

In this paper I will present a theoretical position on how we could balance these two significant forces on modern design and a description of a proposed sustainable house on the campus of Mississippi State University in which I endeavored to employ this position.

Introduction

To define the average, the common ground, the typical in American housing is arguably an impossible task. Geographical distinctions, historical features, cultural differences as well as the more abstract concerns, such as convenience or taste, distinguish particular housing. However, there are common attributes. According to the American Housing Survey (AHS), a publication by the US Departments of Commerce and Housing and Urban Development, the most typical house constructed in the US is in the south, contains three bedrooms and two bathes, is 1798 square feet in size, and is situated on an .38 acre lot. These attributes, number of bedrooms, bathes, and house size can serve as a beginning point for a design.

Conventionality, however, should not be diluted through quantification. It entails both social and behavioral concerns. The concept is, by definition, "an adherence to social behaviors, tastes, and methods; a customary way of doing something, or a community of like-minded people." The overriding popularity of suburban living testifies to the significance of conventionality. It should be considered an equally relevant ordering device as style, material, and environmental response. The designer who does not acknowledge conventionality runs the risk of alienating clientele.

Respecting conventionality, however, over diversity has its own risks. Conventionality and convenience are etymologically related. They both derive from the Latin verb, convenire, which means to come together. Convenience suggests a making of an easier life or promoting likeness, both of which result in cultural, social, and technological stagnation. Ironically, it can be argued that American suburbs were defined, in part, by convenience; it is easier to live with like-minded people.

Moreover, it is convenience that should be questioned when formulating a sustainable house. How should a designer develop a house that respects the land, its local climate, possibly local construction practices, durability issues as they apply to materials and maintenance, all the while acknowledging that the average home buyer can afford only a relatively small lot, a relatively small house, for Mississippi a monthly utility bill of $168 and who wishes to be like his/her neighbors? This question underpinned the design intentions of a proposed sustainable house located on the campus of Mississippi State University.

Sustainable House

Under the auspices of the US Forest Service Forest Products Laboratory and the Coalition for Advanced Wood Structures (CAWS), a multidisciplinary team of wood scientists, architects, landscape architects, mechanical and civil engineers are designing a sustainable house for the Southeastern United States on the campus of Mississippi State University. The objectives for this demonstration house are to solve climate-related housing construction problems endemic to hot-humid climates: high heat, humidity, decay fungi, mold, high wind, low velocity ventilation, and various insects, including the devastating infestation of the Formosan termite. We established two goals for the project. The first is to develop practical definitions for sustainability and durability for wood-constructed residences for hot-humid climates. While second is to educate the public of how to design and construct a sustainable house and landscape that employs at minimum of 75 percent less energy than the typical house presently built in the southeastern US, yet maintain a conventional aesthetic. From a personal perspective, it is my first architectural project in which the typical architectural concerns of aesthetics, program, and experience have equal roles as durability, energy consumption and production, economics, a relationship with the landscape, structural concerns, and ecological ramifications.

Before describing the house, a brief description of the members is necessary. The idea of the house and the coalition of different disciplines is the brainchild of Terry Amburgey, professor in the Department of Forest Products. He is a leading expert in the microbiological concerns in wood products, in particular decay and termite infestations. During his thirty years of investigating these concerns in both the laboratory and in residences around the world, he has experienced a myriad of inappropriate construction techniques, to which he wishes to address in this proposed house. Concerning termites, his expertise includes the Formosan termite, which are rampantly infesting the city of New Orleans and which eventually will overrun areas as far north as the 35th parallel in the US. A second member of the group is Pete Melby, Co-Director of the Center for Sustainable Design, a professor of Landscape Architecture, and author of Regenerative Design Techniques: Practical Applications in Landscape Design, which present strategies for sustainable design. Our third member, Carl James, is a mechanical engineer and inventor, who has worked on sustainable housing for Habitat for Humanity and designed cooling, heating and power systems. The fourth member Chris Eamon, is a civil engineer, who has also trained as an architect, and specializes in severe lateral loading, ones generated during severe storms and tornadoes. The last member is myself, who has over twenty years of architectural practice specializing in housing and energy efficiency.

As has been so eloquently depicted in stage and theatre, the southeastern US, commonly called the "South," is known for its sultry climate. Yearly average temperature is approximately 62oF, with the summer months (May through mid October) averaging almost 80oF; however, extremes range from 105oF to 110oF. Accumulated rainfall is 56", which is relatively consistent throughout the year and results in a yearly average soil wetness of 60% saturated. These statistics alone speak volumes toward the causes for decay, rot, and mold as well as the necessity for proper foundations, extensive roof overhangs, and sufficient cross ventilation. However, any cursory investigation of home construction in US suburbs over the past forty years would illustrate that style, regardless of location, and increased size of houses are the primary social influences for home selection. According to AHS, over one third of all housing units and one half all housing units constructed in the last fours years were in the southern US; therefore, any attention given to producing more durable and energy conserving houses would benefit an extensive percentage of the US population.

We developed six social, historical, constructional, landscape, environmental, and formal strategies for achieving the proposed seventy-five percent reduction of energy objective. Socially, we recognize the design attributes of traditional southern houses as antecedents for this research and demonstration house. It is not our intent to romantically rekindle the aesthetic of past with contemporary technology. The traditional houses were constructed prior to central heating and cooling; therefore, their geometry, their orientation, their proportions, their construction, their relationship to the ground, responded directly to providing comfort, which we ironically conceive as sustainable design. The most significant energy savings derives from the strategy of correct buildings proportions and orientation. To abet cross ventilation, residences in hot-humid climates should have a minimum of a 1:2 proportion with the long axis oriented due east and west. The long faces receive the maximum amount of low angle of our winter sun during the four months of heating and, more significant, to reduce the solar heat gain on the east and west elevations during our six months of cooling. This proportioning will save 30% of the projected energy use. Extensive overhangs, trellises, and screen porches designed to block the sun's rays during the summer months and allow them to penetrate during the winter months will save an additional 15% of the projected energy use. Our third strategy is to locate planting on the east and west sides to shade the building and to plant a wind ramp, which is planting that steps up in height, so to deflect our predominant northerly cold winter winds. The fourth strategy employs passive conservation techniques of high ceilings, which range up to seventeen feet in height (5.3 m) and thermal interception systems in the walls. The fifth, and final passive strategy is the incorporation of thermal mass in the flooring.The thermal massing, in conjunction with the ventilation strategy, will absorb heat during the summer months that will be dissipated by cross ventilation before it enters the main portion of the house and during the winter months, when the sun is low in the sky, the thermal mass in the main portion of the house, will retain the heat. The last three strategies each will reduce the projected energy use by 10%, for a total of 75%.

The team employed three design intentions to govern the form, function, and energy sensibility of the house. The first is conventionality. To live in an energy efficient house, people typically believe they must dramatically alter their lifestyle, which the majority of the US population is unwilling to do. In response, our objective is to design a house that appears conventional, yet provides a dramatic reduction in energy usage. As with some suburban houses, the narrow side faces the street, the garage projects forward, and the front door is sometimes recessed. We situated the garage on the northwest corner, which places it closes to the road and which will block northwest winter winds. The front door is located in the interstitial room that both distinguishes and connects the northern and southern wings. Its importance is defined by the two adjacent wings and not just applied ornament.

Besides aesthetics we addressed conventionality through the size of the house. In the US, the average sized house is approximately 1798 square feet (180 sq. m) [4], while according to the Tennessee Valley authority, the primary electrical power source for the southeast region, in the southeastern US the average size is 1,761 square feet (176 sq m). Our proposed house is 1776 square feet (176 sq. m) of conditioned space.The social intent behind this conventional sizing is to illustrate that the size of a sustainable house need not be either abnormally small, which suggest that fewer square feet translates to less area to heat and cool, nor abnormally large, which suggests additional rooms to accommodate the extra features. And from an economic perspective, the house should appear affordable to the broadest audience.

The room sizes are fairly standard with bedrooms ranging from twelve by twelve feet (3.6 m by 3.6 m) to twelve by sixteen feet (3.6m by 5m). The living and dining rooms are both nominally twelve feet by sixteen feet (3.6m by 5m). However, all living areas, such as living and dining rooms as well as the bedrooms have an adjacent room or space that provides the impression of a larger living environment. It is our intent to design a dynamic house. People can expand or contract their living space according to the seasons.

The third aspect of conventionality is lifestyle. The arrangement, room sizes, and public and private area organization are not dramatically altered from the typical. Regarding the arrangement, we always conceived of the house for a typical family, two parents and two or three children, which translates for the typical US house as three bedrooms with two and one-half bathes. Also, the arrangement respects the conventional public to private areas transition, wherein the more public areas are adjacent to the front door, while the more private farther away.

A fourth aspect of conventionality was its influence on construction. The longest span of any room is 16 feet (5 m), which can be readily achieved using stock dimensional lumber. All of the house can be built with conventional materials, however not all walls are the same thickness. We will vary thickness according to orientation, which will make the house more efficient, yet not be readily apparent.

The second design intention that influenced the buildings form is the demonstrational purpose. We intend to educate a wide variety of people, from school-age children, to university students and faculty, to fellow researchers of sustainability and durability of wood products, and the public at large. We plan to provide opportunities—displays, exhibits, variety of materials, and exposing portions of the buildings for people to inspect the workings and problems of the house. Our goal for our educational objective is to inspire people to design their own sustainable, energy efficient and durable, houses.

The educational aspect extends beyond the buildings. The chosen site was intentionally difficult. It is quite common for the typical US house to reside on a flat site, either one naturally defined or man-made. The reasons are strictly economical; a slab-on grade foundation is cheaper than a raised floor, yet the raised floor allows for cross ventilation. Our site slopes over six feet (2m) over the diagonal length of the house, which will require a combination of slab and raised floor. Raising the house above the ground creates stability problems for the foundation because of drainage issues. A particular educational component of the site is to illustrate carbon dioxide sequestering. The typical house in America requires three acres of trees and vegetation to sequester the carbon dioxide given off by the house. We will plant three acres of trees and vegetation to illustrate the required acreage and demarcate the area required for ours.

The third, and final, design intention is the research component. In conjunction with demonstrating sustainable and durable design issues, the facility will house multi-disciplinary research projects. A partial list is as follows:

1) Moisture control of windows, which is one of the most destructive, yet unknown causes for decay and failure in wooden structures;
2) Study of non-chemical control methods and treatments with very low if any mammalian toxicity, such as borates., to prevent decay and termite infestation
3) Natural herbicides to ward off Formosan termites;
4) Landscape as a significant factor in energy conservation and durability;
5) Tie-down systems for both foundations and roofs, so to counteract the high lateral wind loads;
6) Heat-interceptor systems, which have been erroneously called "radiant cooling"; to regulate interior temperatures

7) Study of hydroscopic materials to control moisture levels and humidity swings;
8) Low-velocity ventilation so to evaluate the location and size of windows in facades and the flow pattern of air; and,
9) Appropriate ceiling heights to control temperature and humidity.

Conclusion

Arguably one of the most used, but least understood terms by architects, engineers, or environmentalists is sustainability. It is an idea that when used as a noun, sustainability, it is not a thing but a goal, circumstance, standard, or ethos to which we aspire, yet understand that it now is more closely akin to Thomas Moore's Utopia than any realistic objective. This idealistic state defies establishing significant boundaries for practical purposes. If we don't establish working definitions for sustainable environments, then lay people will not recognize the value and antagonists will employ short-sided excuses, such as immediate economic benefits, to belay research and development.

The housing market in the southern US is the fastest growing market presently constituting almost one-third of all housing units. To develop a house that is both conventional in appearance, yet is potentially capable of requiring only 25% of the typical energy loads would address the need to change the ethos. Our proposed research and demonstration house is a part of an emerging movement, "the growth of solar suburbia." (Griscom, Mother Earth News, 8/9 2003, 57)