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ISSUE 04

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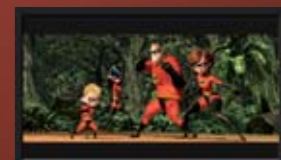
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The mission of *Ultimate Home Design* is to serve as a catalyst for homeowners to create demand for architects, designers, and builders to adopt the concepts and building practices that define human-centered, optimum-performance home design. *Ultimate Home Design* is aimed at broadening the segment of the American population that is paying closer attention to the products they buy, looking beyond price and branding to focus on other elements of the production and value chain. Increasingly homeowners want to support sustainable building practices that result in a higher living standard. *Ultimate Home Design* is for those homeowners who want to promote a broader shift in patterns of production and consumption by encouraging practices that better reflect their personal values. We are advocates for using products that reduce energy and use renewable, recycled content or otherwise environmentally preferable materials. An important part of our mission is to promote building practices that result in a substantial reduction in energy use for space conditioning, water heating, lighting, and appliance operation. Another important aspect of our mission is to promote construction practices that improve the indoor environment and reduce the risk of building-related illness. This translates to improved occupant health and comfort by improving thermal comfort; natural lighting and electric illumination; and controlling humidity, odor, noise, and vibration.

Ultimate Home Design is for the thinking homeowner, who wants to be educated and learn about intelligent options for home design, whole-house system design, and comprehensive electronic lifestyle features that can enrich the quality of day-to-day life while reducing the cost of operating a home. With the knowledge gained reading *Ultimate Home Design*, you will be empowered to make intelligent choices about the design and make-up of your home, whether considering remodels or additions, planning a new home, or evaluating an already-built home. *Ultimate Home Design* will explore the wide range of possibilities within the context of designing Optimum Performance Homes™ that integrate universal design architecture; sustainable green building materials and techniques; energy-efficient power systems for electricity, lighting, heating, and air conditioning; water conservation techniques; and comprehensive electronic lifestyle features.

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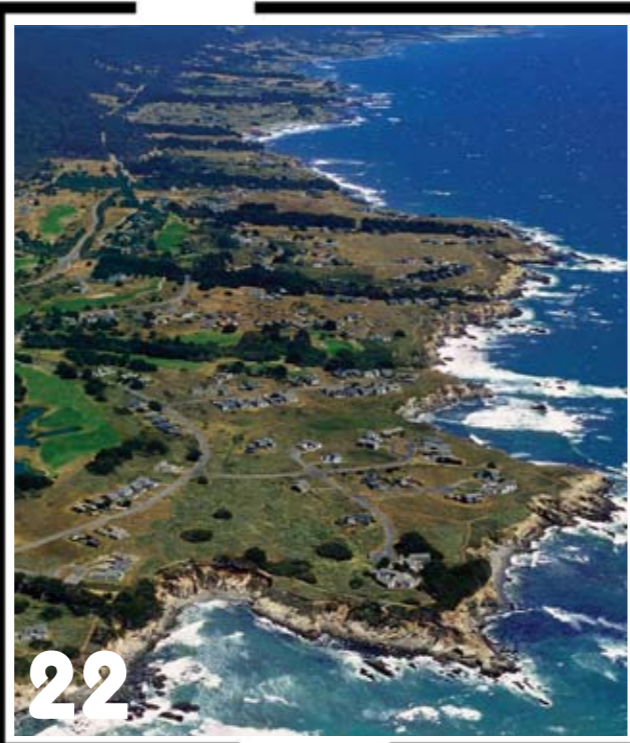
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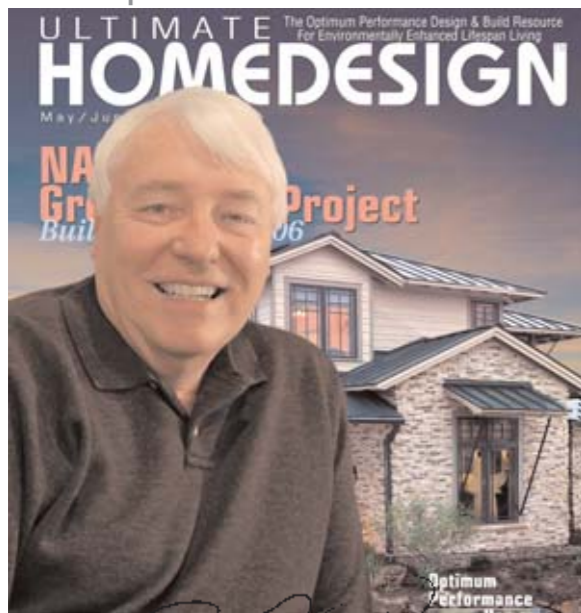
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Inside This Issue

Part IV continues as a case study of the design and building of the first Optimum Performance Home™, a Platinum-level LEED® for Homes project. LEED (Leadership In Energy & Environmental Design) is a certification program of the U.S. Green Building Council. Complementing the case study is a second article by

Julie Stewart-Pollack, ASID, IDEC, on the subject of Biophilia, which can be defined as the human love for nature. In this article, Julie conducts a preliminary analysis of the Optimum Performance Home's biophilic attributes based upon the current site, landscape planning, and architectural design of the home as described in the first four issues of *Ultimate Home Design* magazine.

Our cover story is about the first-ever LivingHome™, a revolutionary alternative to the traditional house. LivingHomes makes green living a reality with a new line of architectural prefab homes that exhibit zero energy, zero water, zero waste, zero carbon, and zero emissions. LivingHomes proves less is more with the first residence in the nation on track to earn Platinum-level LEED for Homes certification.

Rosemarie Rossetti describes the realization of dealing with her disability in her current home and the design of a new home. The house, the Universal Design Living Laboratory (UDLL), will serve as a national model to bring about awareness of universal design to the public and the building, remodeling, architectural, and design industries. This UDLL will serve to help people better understand how to create a more comfortable living environment that will enhance their quality of life.

Ward Hubbell discusses the Green Building Initiative™, which was formed to promote credible and practical green building tools for commercial and residential builders. With this initiative, you can learn how to bring green to the mainstream by practicing the National Association of Home Builders' newly released Model Green Home Building Guidelines.

Terry McMains authors an article about rain harvesting—the act of collecting runoff storm water from what can be a multitude of surfaces and storing the water in either above-ground or below-ground tanks from which water can be pulled from as a dependable water supply.

Jay Hall and Ann V. Edminster contribute Part II in the series, "So You Want A LEED® Home...What's It Going To Take To Get One Built?" They cover the steps required to integrate the design of a home with LEED for Homes, including the aspects of size, style, number of rooms, level of finish, etc., as well as specific performance goals, such as zero net energy.

Ray Adams discusses the big change happening in home design as elements move past basic aesthetics and toward functionality. Universal design seeks to provide ease of use and accessibility, while still incorporating aesthetically pleasing elements that add value to the home.

Darren Palmieri authors an article on fire sprinkler systems as integral to state-of-the-art homes. Such systems are increasingly mandated by law for new home construction.

Finally, there is a questionnaire with answers pertaining to residential solar electric systems. **UHD**



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Hire A Certified Aging-In-Place Specialist (CAPS) And Make Your House A Home For A Lifetime

The Remodelers Council of the National Association of Home Builders (NAHB), in collaboration with the NAHB Research Center, NAHB Seniors Housing Council, and AARP, developed the Certified Aging-in-Place Specialist (CAPS) program to address the needs of consumers who want to make their house a home for a lifetime—regardless of one's age or functional abilities. The CAPS program is designed to address the growing number of consumers that will soon require these modifications. While most CAPS professionals are remodelers, an increasing number are general contractors, designers, architects, and health care consultants.

CAPS professionals have been taught the strategies and techniques for designing and building aesthetically pleasing, barrier-free living environments. The CAPS program goes beyond design to address the codes and standards, common remodeling projects and their costs, product ideas, and resources needed to provide comprehensive, and practical aging-in-place solutions.

How long do you plan to live in your current home?

- If you're like the majority of Americans over the age of 45, you want to continue living in a familiar environment throughout your maturing years. According to the AARP, older homeowners overwhelmingly prefer to age-in-place, which means living in your home safely, independently, and comfortably, regardless of age or ability level.

How should you modify your home to make it more comfortable?

- To age-in-place you will probably need to modify your house as you mature to increase access and maneuverability. These modifications range from the installation of bath and shower grab bars and adjustment of countertop heights to the creation of multifunctional first-floor master suites and the installation of private elevators.

Who can you rely on to modify your home?

A Certified Aging-in-Place Specialist (CAPS) has been trained in:

- The unique needs of the older adult population
- Aging-in-place home modifications
- Common remodeling projects
- Solutions to common barriers

The CAPS designation is a reliable way to identify professionals to modify your home.

- CAPS professionals have the answers to your questions.

They have been taught the strategies and techniques for designing and building aesthetically enriching, barrier-free living environments. The CAPS program goes beyond design to address the codes and standards, common remodeling expenditures and projects, product ideas, and resources needed

to provide comprehensive and practical aging-in-place solutions. CAPS graduates pledge to uphold a code of ethics and are required to maintain their designation by attending continuing education programs and participating in community service.

Before you modify your home:

- Keep in mind that when you hire a Certified Aging-in-Place Specialist, you are buying a service rather than a product.
- Each CAPS professional draws from a different knowledge base and will approach your project in a different way.
- No matter where you start in the process, you will eventually need to hire a professional remodeler to actually make the modifications to your home.

Here's a checklist to help you modify your home:

- Figure out how much money you have to spend on the home modification project.
- Seek referrals from friends, family, neighbors, coworkers, and others who have had similar work done.
- Contact trade associations such as your area's local Home Builders Association or Remodelers Council.
 - Check with your local or state office of consumer protection and the local Better Business Bureau.
 - Verify the remodeler has the appropriate license(s) in your state.
 - Look for professional

"I feel better about being able to stay in the familiar surroundings of my own home now that it has been fixed up by my CAPS contractor. The changes I made to my house—like grab bars and better lighting—were cheaper than moving to an assisted-living apartment!"
—Elsie Peterson, Houston, Texas

"My mother was 80 years old and losing her vision. I had a CAPS remodeler build an addition onto my home. The barrier-free bathroom and the new, wide walls have made all the difference for her. The impact on my mother's life was profound. She became more self-sufficient, more confident, and happier."
—Roy Liard, Denver, Colorado

designations such as CAPS, CGR (Certified Graduate Remodeler), or GMB (Graduate Master Builder).

- Ask your professional remodeler for a written estimate of the work to be done based on a set of plans and specifications. Be prepared to pay for this package.
- Select a professional remodeler with plenty of experience with your type of project. Remember, the lowest price does not ensure a successful remodeling project.

When considering modifying your home, ask yourself:

- Do I want to add a bathroom and possibly a bedroom to the main level?

- How can I make my kitchen more functional?
- Am I worried about preventing falls?
- How much money can I budget for this project?
- Will I need to get a home equity loan?
- Will other members of my family benefit from modifications?
- Will remodeling increase the energy efficiency of my home?
- Where do I find a professional I can consult with about my needs? **UHD**

To find CAPS in your area visit <http://www.nahb.org/directory.aspx?sectionID=126&directoryID=188&print=true>.

Baby Boomers Ready To Rejuvenate 50+ Housing Market

The 50+ housing market will receive a rejuvenating lift from "baby boomers," who won't be shy about letting builders know what they want, and they won't be grudging when it comes time to pay for it, according to participants in a recent NAHB (National Association of Home Builders) teleconference.

"Boomers have a strong preference for homeownership," NAHB Chief Economist David Seiders said "The rising numbers of members of this group heading into the traditional retirement years will boost demand for new housing."

Although many boomers and older Americans say they would prefer sitting tight and aging-in-place in their current homes, the demand for housing created specifically for graying Americans is strong. According to numbers from the U.S. Census Bureau's American Housing Survey, six percent of all housing starts in 2003 were age-restricted or age-targeted. "As the boomers age, that number will grow," said Seiders.

Georgia-based builder Norman Cohen reported that he is finding that buyers in his company's active adult communities are demanding more and more options. "Our customers are not looking for cookie-cutter homes," he said. "They want upgrades and options. We have about 300 to 400 pre-priced options, and we find that buyers come up with options we haven't even considered. And they are willing to pay for them. They've sold their previous home and they have the money to get what they want."

Cohen, Chairman of NAHB's 50+ Housing Council, added that "most 50+ buyers are not looking for a new place to live,

but for a change in lifestyle." Aging homeowners don't want to have to worry about maintaining their homes. Cohen's company, Camelot/Signature Development, builds what he calls "lock it and leave it" communities, where all the painting, gutter cleaning, landscaping, and other maintenance are taken care of.

Although there is a segment of the market looking for "destination communities," most of the 50+ home buyers Cohen has been seeing want to stay within five miles of where they used to live, or near their grandchildren or other family members.

In another trend reported during the teleconference, age-restricted communities are rapidly losing the stigma that used to be associated with them.

"When my company began building active adult communities six years ago, 'age-restricted' had a negative connotation, but now that's changed," said Cohen. "It's a positive because a lot of 50+ buyers want to be in a community with people like themselves. So many people are interested in it that it doesn't concern me about advertising age-restricted as a feature because people are seeking it out."

Seiders predicted that the demand for age-restricted housing, which is allowed under a 1995 exemption to the Fair Housing Act, will keep growing. **UHD**

Source: NAHB Nation's Building News

Green Basics: You Don't Have To Go Weird To Go Green

Doug Lowe, President of Artisan Construction in Charlottesville, Virginia, believes there's a "hidden demand" for green building. The demand has even bit his family. He's building a green home for them.

Alex Hannigan, of Hannigan Homes, a custom home builder in Orlando, Florida, sees growing consumer demand for more energy-efficient houses and is putting more green features in his homes. In fact, one very noticeable and notable home he's built this year, the New American Home at the International Builders' Show, has several green build features. (See *Ultimate Home Design*, Issue 2, March/April 2006)

The home's innovations—four high-efficiency heat pumps (SEER 15) in six controllable zones; three tankless, propane-fired water heaters to help minimize piping and reduce stand-by losses; specially coated windows to reduce cooling and heating loads; and more—are expected to result in a 61-percent reduction in energy usage for heating and cooling, and a 50-percent reduction for water heating compared to a similarly sized home in the hot and humid climate of central Florida.

The home also features a HEPA filtration system for clean indoor air, an impressive roof gutter system that will collect rainwater and use it to irrigate the landscaping, and mulch made from recycled building materials. The home's design also makes it ideal for cross ventilation when the air conditioning is turned off.

A Simple Path To Green

Green building, while not quite mainstream, is making serious inroads toward higher awareness and acceptance.

"You don't have to go weird to go green," says architect Peter Pfeiffer, of Barley & Pfeiffer Architects of Austin, Texas. Pfeiffer, who has been designing green homes for two decades, was a featured speaker at the National Home Builders' (NAHB) National Green Building Conference in Albuquerque, New Mexico, last March.

Pfeiffer believes in an integrated approach to what he calls the "five pillars" of green building:

- Increasing energy efficiency
- Using materials appropriately
- Conserving and reusing water
- Providing a healthful living and working environment
- Building attractive structures that will last

In terms of design, going green can involve scaling down square footage and building two-level, rather than one-level homes, for instance; lowering ceilings a bit; placing skylights

more strategically; and minimizing recessed lighting. This can all be done, he says, "without sacrificing style, livable space, or beauty."

Make The Buyer Aware

In terms of gaining buyer acceptance, Pfeiffer counsels builders, remodelers, and other industry professionals to simply explain the benefits of going green.

"If you explain to clients that building a green home will cost a few hundred dollars a month less to operate and that the home will be healthier for their children, they will understand the value of spending a little more upfront," he says. "It is up to builders and other industry professionals to help their clients 'make the right choices' about going green," Pfeiffer adds.

For instance, according to Pfeiffer, a given household only occupies a 4,000-square-foot or larger home for two or three years, so scaling down square footage meets most consumers' needs.

Likewise, he believes the demand for two-story homes—which are inherently more energy-efficient than single-story homes—should remain strong, even as consumers age, with a little education from builders, of course. He points out that, even though customers seek one-level living as they get older, many of these consumers actually remain mobile till very late in life, so their "need" for single-level living is premature.

Form Allows Function

The single most important factor in energy savings is the orientation of a house, Pfeiffer says. All floor plans should indicate the northern exposure, and placing garages on the west side of homes helps control intense afternoon heat inside a home, he adds.

Rather than a rain umbrella, a roof should be thought of as a shading device for the home and can be constructed using techniques, materials, and colors to best serve that purpose. Overhangs can be used to shade windows.

Pfeiffer believes more emphasis should be placed on design features that address air conditioning, not only because of the energy savings but "because of the damage condensation can do." This focus should be in all but the most extremely cold climates, like in Minnesota or Alaska. "Number one, control humidity," he says, because in half the country the air is drier outside a house than inside.

Pfeiffer offers several other green building tips:

- **Wrap, wrap, wrap.** Pfeiffer recommends spending \$200 to \$300 more for a commercial-grade wrap on a 4,000-square-foot home for immediate payback in energy bills and to control moisture.

- Consider using structural insulated panels (SIPs) to reduce the time spent weathering a home under construction and, consequently, the time it will take for the framing to dry out. "A 2,500-square-foot home can be weathered in three to four days using SIPs," he says.

- Consider Hardyplank exteriors. Brick, stone, and stucco can be "very risky" when it comes to mold.

- Metal roofs allow airflow without having to ventilate an attic. "If you keep the roof from getting hot, the whole frame of the house stays cooler," Pfeiffer says. A lighter color can save five to seven degrees.

- Make sure your subcontractors know how to properly flash windows to keep moisture out.

- "Right-size the air-conditioning unit. Installing too large a unit will cool a home too rapidly and not allow it to dehumidify. Between 40- and 50-percent humidity is ideal in a home," Pfeiffer says.

- Replace incandescent bulbs with fluorescent lighting. Every 75-watt bulb replaced saves a ton of coal, and the heat generated by a 100-watt bulb is equivalent to having an extra person in the room in warmer climates, Pfeiffer notes.

- Energy- and water-conserving appliances save non-renewable resources, of course. But here's something you and your customers may not know—with their sealed doors, front-loading washers keep moisture contained and control household humidity as well.

"Get the basics down before you do anything exotic," Pfeiffer says. "Simply designing a house to be appropriate for its site will go a long way toward building green," he adds. **UHD**

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Sarah Scaglione

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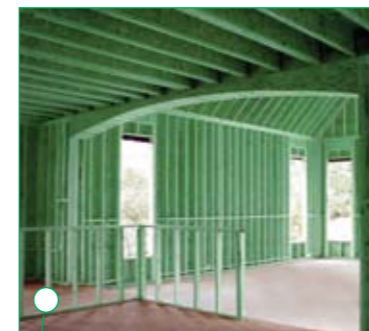
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LivingHomes™

building
green
prefab
homes

Gary Reber



LivingHomes™

The residents on Highland Avenue, a quiet hillside street in Santa Monica, California, have welcomed a new neighbor, the first-ever LivingHome™, a revolutionary alternative to the traditional house. In April, the first LivingHomes model home was “installed,” or lowered onto a concrete slab in 11 modules by a 350-ton crane over the space of eight hours, transforming an empty site into an architectural landmark. With the installation complete, conscientious consumers who value design, health, and ecological sustainability in the products they buy are that much closer to having a home to match their lifestyle.

Founded by CEO Steve Glenn, LivingHomes, LLC (www.livinghomes.us) is a developer of modern, sustainable prefabricated homes designed by world-class architects. The company and its products fill an important void in the residential housing world, offering a unique level of considered design and production. Never before have consumers had access to a home that marries the highest levels of green and good design, not to mention value. LivingHomes targets the growing class of “cultural creatives”—people who value design, health, and ecological sustainability in the products they buy. These conscientious consumers drive Priuses, buy Bosch appliances and Design Within Reach furniture, shop at Whole Foods, and give money to the National Resources Defense Fund. Now with LivingHomes, they have a home to match their lifestyle.

LivingHomes' first full-time model home is a three-dimensional exhibit of modern design and healthy living. Glenn's vision for LivingHomes, one that is unique among home builders and which already has received the endorsement and financial backing of leading venture capitalists, was born of his frustrated desire to be an architect as a young man. Realizing his talents lay in the business of innovation, the technology entrepreneur, who was a founding member of Clearview Software, idealab, and PeopleLink, set his sites on redefining the residential development space. Marrying his passion for the environment and business acumen with guidance from a team of experienced advisors, including iconic architect Ray Kappe, Glenn has spent the last two years making his LivingHomes, dream a reality.

“Our mission is to create homes and communities that inspire people and foster family and community interaction, making modern life easier, healthier, and more comfortable,” says Glenn. “We’re developing homes that combine world-class architecture with environmentally responsible design to offer an unprecedented level of form, functionality, and sustainability—at a cost that is considerably less than a similar, site-built custom architectural home.”

Glenn tapped internationally-renowned architect and Southern California icon Ray Kappe to design the first suite of LivingHomes. Kappe, founder of the acclaimed Southern California Institute of Architecture, has been much lauded by colleagues and the general public over the last 35 years, receiving the American Institute of Architects Los Angeles Gold Medal and the Richard Neutra International Medal for Design Excellence, among numerous other awards.

Nature Made—Factory Built

What sets LivingHomes apart from its competitors is the fact that the company will incorporate environmental considerations and energy systems that are unparalleled in production homes, prefab, or site constructed (“stick-built”).

“We are designing our homes to create the healthiest living environments—and to radically reduce the impact they have on soil, water, air, and energy use,” says Glenn. “We are following the four core tenants of good sustainable design: to reduce, reuse, recycle, and reclaim. Our goal is ‘zero energy,’ ‘zero water,’ ‘zero carbon,’ and ‘zero emissions.’”

Glenn's model home is slated to be one of the first residential projects to be evaluated by the U.S. Green Building Council's pilot LEED® for Homes program, and is expected to garner the highest level of LEED for Homes certification—Platinum.

“People are sometimes confused about what it means to be a ‘green’ home,” says Glenn. “As a result, we’re using LEED for Homes to help to give them some context, and provide a basis for comparison to other homes.” LivingHomes is


committed to only building homes that are at least LEED for Home silver qualified. The United States Green Building Council's LEED (Leadership in Energy & Environmental Design) for Home program (www.usgbc.org) includes site inspections of homes and a four-tiered rating system.


To meet the high standards set by the USGBC and to respond to the market's appetite for healthy, sustainable living, each LivingHome includes an extensive environmental program. The model home will be “zero energy,” meaning that it will produce all the power that it consumes. Photovoltaic cells on the roof will produce the home's energy and an active rooftop solar system will use the sun's energy to heat the home's water. A radiant heating system embedded in the floor of the home will warm the space more efficiently and healthier, rather than forcing air laden with contaminants throughout

“LivingHomes targets the growing class of ‘cultural creatives’—people who value design, health, and ecological sustainability in the products they buy.”

the home. While the home is over 70 percent glass, a building material that is generally not considered to be very energy-efficient, LivingHomes uses double-paned glass from Fleetwood and Polygal polycarbonate fenestration that has three times the thermal properties of regular glass, allowing the model home to sacrifice neither the aesthetic nor the practical. Another goal is “zero water”—the home will not use city water for irrigation; instead, a rooftop garden insulates the home and absorbs sunlight (reducing the heat island affect of standard black roofs), and features a storm water management system that will collect rainwater in a cistern to be used for landscaping irrigation. A gray water system will also collect and recycle water from the sink and shower to be used for irrigation purposes. To achieve “zero emissions,” the home features formaldehyde- and urea-free millwork and no- or low-VOC paint. Each LivingHomes purchase includes an allotment for a carbon-offset to cover the manufacture and first-year operations of the home. Through key partnerships with companies that are equally committed to sustainable design, the model home will feature appliances by Bosch, LED lighting by PermLight, photovoltaic cells by PermaCorp, fixtures by Kohler, Forest Stewardship Council-certified lumber by Eco-Lumber Co-op, special roofing by Carlisle, a spa by Jacuzzi, furnishings by Design Within Reach, and home theatre displays by Runco International.

synopsis

 LivingHomes combine world-class architecture with environmentally responsible design to offer an unprecedented level of form, functionality, and sustainability—at a cost that is considerably less than a similar, site-built custom architectural home.

 LivingHomes incorporate environmental considerations and energy systems that are unparalleled in production homes, prefab, or site-constructed (“stick-built”).



"Since building in harmony with nature and environmental considerations have always been important aspects of my work, I was thrilled when LivingHomes approached me to design their first line of sustainable prefabricated homes," says Ray Kappe. "I am proud to be part of one of the first companies in the world to seamlessly fuse modern design with green design."

In addition to the use of sustainable materials and the incorporation of environmental systems, LivingHomes has optimized its construction and purchase process to minimize material usage. Prefabrication saves considerable construction waste over traditional site-built methods (40 percent of construction material ends up in landfill versus 2 percent for prefab). Rather than demolish and contribute to landfill, LivingHomes deconstructs and reuses materials from existing structures.

To make LivingHomes more affordable than similarly constructed custom homes, LivingHomes is standardizing its designs and engaging in community development, so the company can manufacture homes in volume, using factory

Prefab Know-How

Prefabrication (off-site, factory construction) improves quality, and reduces cost, production schedules, and construction waste. Assembled over a four- to five-month period in a regional factory, LivingHomes are literally "installed" in one day. Key advantages of prefabrication include:

1. Site work and factory work are performed simultaneously instead of one after the other.
2. Full-time factory employees substitute for dozens of contractors, saving time, money, and management overhead.
3. Modular construction streamlines the process by enabling the use of better tools, providing access to otherwise difficult-to-reach places, and allowing multiple trades to work concurrently.

production. In addition to waste reduction, prefabrication can save considerable time and money over stick-built methods (see sidebar), and the quality is actually higher since modular homes must be built to withstand the rigors of being transported by truck and lowered into place by cranes.

Form And Function

The Santa Monica model home represents one of four base models designed by Kappe and offered by LivingHomes. In Kappe's hallmark Californian modernist style, it boasts clean lines, indoor/outdoor space, extensive natural light, built-in furniture, and a "Living Roof"—a rooftop garden area with fire pit. Known for designs that are "the apotheosis of the California wood house," Kappe has always believed firmly that modern architecture can be warm, earth-friendly, site-sensitive, and very livable.

"We have spent a considerable amount of time trying to understand how people live in their homes—and how homes need to respond to their changing needs," says Glenn. "As a result, we include a number of features that make it easy for homeowners to change and grow their space, including movable walls, changeable millwork, and a structural system that allows rooms to be added."

Currently LivingHomes is completing only custom projects for homes that range from 800 to 4,000+ square feet. In the future, LivingHomes will offer standard floor plans and customers will be able to choose between basic packages, personalizing their home to their specific needs by selecting different floor plans, materials, and environmental packages. The four Ray Kappe LivingHomes will range from \$150 to \$250 per square foot, excluding foundation and transportation of modules. The moderately priced homes are designed for infill, move-up, and second-home venues. For first-time buyers, LivingHomes will offer a smaller, more affordable one-story home with many of the same features as the other models, but on a smaller scale. LivingHomes can be built individually

on small to medium flat or hillside lots of 3,000 square feet or more to facilitate urban infill development or in small communities of 10 to 70 homes.

Next Up From LivingHomes...

In addition to making their product available directly to individual home buyers, LivingHomes is also targeting developers and production home builders with the specific goal of creating communities that embrace modern design and sustainability. Contrary to traditional housing developments, LivingHomes communities will be smaller with homes clustered together, when possible, to preserve open spaces. LivingHomes will also strive to preserve natural environments by locating communities near mass-transit hubs and within reasonable walking distance from other retail and commercial facilities. As with individual products, LivingHomes communities will incorporate green and energy-efficient design at every level to mitigate the impact that the communities have on soil, water, and land.

LivingHomes is already at work on a community in Joshua Tree, California. The area is becoming a magnet for a burgeoning community of artists, and entertainment and creative

professionals who are drawn to its stark and alluring setting and solitude.

To offer customers the best designs, LivingHomes will partner with world-class architects who have a proven ability to develop residences in line with LivingHomes' values. David Hertz—largely considered to be one of the top modern green architects in the country and an expert in materials and building systems—is currently designing the next LivingHomes product.

Although targeted at a niche market of people who value good, modern design and healthy, sustainable living, the LivingHomes message seems to be resonating with a large audience: five homes are already in various stages of development in Northern and Southern California. LivingHomes' first factory is in Southern California, so, at this time, it will be more cost-effective for them to complete orders in the western states. The company will be securing production facilities that will allow them to better serve other parts of the country in the next year. **UHD**

Visit LivingHomes, LLC at www.livinghomes.us. For additional information about LivingHomes, please contact Lisa Jackson or Haily Zaki at Clifford Public Relations, 323 966 4600 or lisa.jackson@cliffordpr.com/haily.zaki@cliffordpr.com

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The First Optimum Performance Home™

site planning part IV



The Sea Ranch, Sonoma County, California

Gary Reber

Introduction

This is the fourth article in the series documenting the design and construction of the first Optimum Performance Home™. The project has been selected by the U.S. Green Building Council (USGBC) for inclusion in the national Leadership In Energy & Environmental Design (LEED®) for Homes pilot program, their new green build certification initiative.

The home will be built at The Sea Ranch, located in Sonoma County, along the Northern California coastline of the Pacific Ocean.

The showcase project is exemplary of the "Ultimate Home Design™" concept, which integrates age-friendly universal design with the best sustainable building practices while exerting minimal impact on the environment. Universal design is the inclusive, non-discriminatory design of products, buildings, environments, and urban infrastructure, as well as information technologies that are accessible to and useable by (almost) all. With respect to home design, the idea is to design and build homes that have no physical barriers, thus sustaining people of all ages and all capabilities in a functional, comfortable, and aesthetic lifestyle.

A building science systems approach to home building is the cornerstone of the project with emphasis on the relationships between the home's components and the envelope they create. Also

"The Optimum Performance Home's site plan is designed to strongly support the efficient use of the community's water supplies, equitable allocation of water resources provided by the community and harvested on-site, elimination of water pollution and contamination from poorly-designed or failing septic systems, and general land use patterns that conserve and protect water resources within the overall ecosystem at The Sea Ranch."

paramount is good stewardship—proper regard and respect for the rights of neighboring homeowners, resource efficiency, and the surrounding natural setting. The goal is to optimize occupant health, comfort, and safety; maximize energy efficiency and structural durability; and minimize environmental impact. Many of these goals are intrinsic to the LEED criteria and procedures. In addition, the aim is toward providing a nurturing home environment to support independent living and sustainable lifestyles.

Part I of this case study series appeared in Issue 1, January/February 2006. The introductory article extended to 16 pages and covered extensively the project scope. Part II appeared in the March/April issue and focused on site planning and preparation. Part III expanded on the approach to Low-Impact Development (LID) for the site.

This is Part IV, which presents a further refinement to the site plan and drainage design, which still has not received final approval from The Sea Ranch Design Committee, which appears to be the final hurdle to be met before the project is submitted to the Sonoma County Building Department for final structural and code approval, which is necessary to obtain a building permit.

As noted in the previous articles in this series, the home design integrates all of the concepts advocated in Ultimate Home Design™. I conceived the "Optimum Performance Home"

synopsis

As with any "planned" development, especially one sensitive to environmental impact, one should expect refinements to the subjectively interpretive design guidelines and rules over time, while adhering to the founding principles expressed in the CC&Rs.

The Optimum Performance Home project could be argued to be a microcosm of the design and building challenges facing participants as The Sea Ranch development approaches build-out.

Paramount is good stewardship—proper regard and respect for the rights of neighboring homeowners, resource efficiency, and the surrounding natural setting.



SITE PLAN
SCALE: 3/32" = 1'-0"

- | | |
|----------------|--------------------------------|
| 1 Septic Tanks | 6 Stream |
| 2 Building #3 | 7 Aquatic Culture |
| 3 Dog Run | 8 Building #1 |
| 4 Building #2 | 9 Garden |
| 5 Courtyard | 10 Pervious Driveway & Parking |

and "Ultimate Home Design" concepts, and have a vested interest, as this will not only be my home but my office as well. My goal is to demonstrate how today's products and building methods can make life safer, more comfortable, and more enjoyable. The science of optimum performance homes is about building structures that use less energy, are quieter and more comfortable, have fewer problems with material degradation, provide clean air and water, and do less damage to the environment. As an integrated holistic design, the house will serve as a home for many people and serve in many phases in one's life.

An "Unbelievable" Case Study

The approach I am taking with this series of articles on designing and building the Optimum Performance Home at The Sea Ranch is to present a case study, which details every phase in the design and building of this

Platinum-slated certified LEED home project (see "So You Want A LEED® Home—What's It Going To Take To Get One Built?" on page 56).

For our readers who have not personally experienced such a process, we believe that this serialized documentation will be enlightening and beneficial to approaching your own home design and building project (see "The Architect's Role As Designer And Implementer" in Issue 2, March/April, 2006 and "So You Want A LEED® Home" in Issue 3, May/June 2006).

Of course, this is our experience, and not all aspects of our approach will apply to your project. Nonetheless, there will be aspects of our approach that will be educational and useful. I hope that, as a result, you will be rewarded with a better appreciation to the extent of commitment necessary to successfully design and build a new home with as much respect for the natural environment as this project demonstrates.

Home Visions

We all have different visions of our ultimate home design, which express our individualism—a deep-rooted trait ingrained in the collective American psyche.

Common to the visions expressed are the desire for our homes to be beautiful, comfortable, and respectful of Mother Earth. Our responsibility as the caretakers of our planet should be to wisely use her sustainable resources. To realize such a dream and turn our dream homes into reality often presents challenges and obstacles that appear, at times, to be insurmountable. I have often pondered, while engaged in this leading-edge green building project, whether the notion of responsible sustainable green building can ever become the norm.

About Architects And Landscape Architects

As I noted in this article series in Part III, Issue 3, over the course of a four-year period that I have spearheaded the design of the first Optimum Performance Home at The Sea Ranch, I have become aware that what is needed is a more direct link between the design community and the responsibility they exercise in the building process as it impacts a sustainable and interconnected community. Too often, design teams, including design committees and planning commissions, are "not interested" in trying to incorporate something they are "not familiar with." Too often "architectural design" overpowers "function" to the detriment of alternative sustainable solutions, and, as a result, saddles communities with undesirable environmental consequences. This is a lose-lose proposition that forces progressive property owners to adopt less-than-optimum design compromises in order to receive the necessary approval from such oversight authorities in order to build.

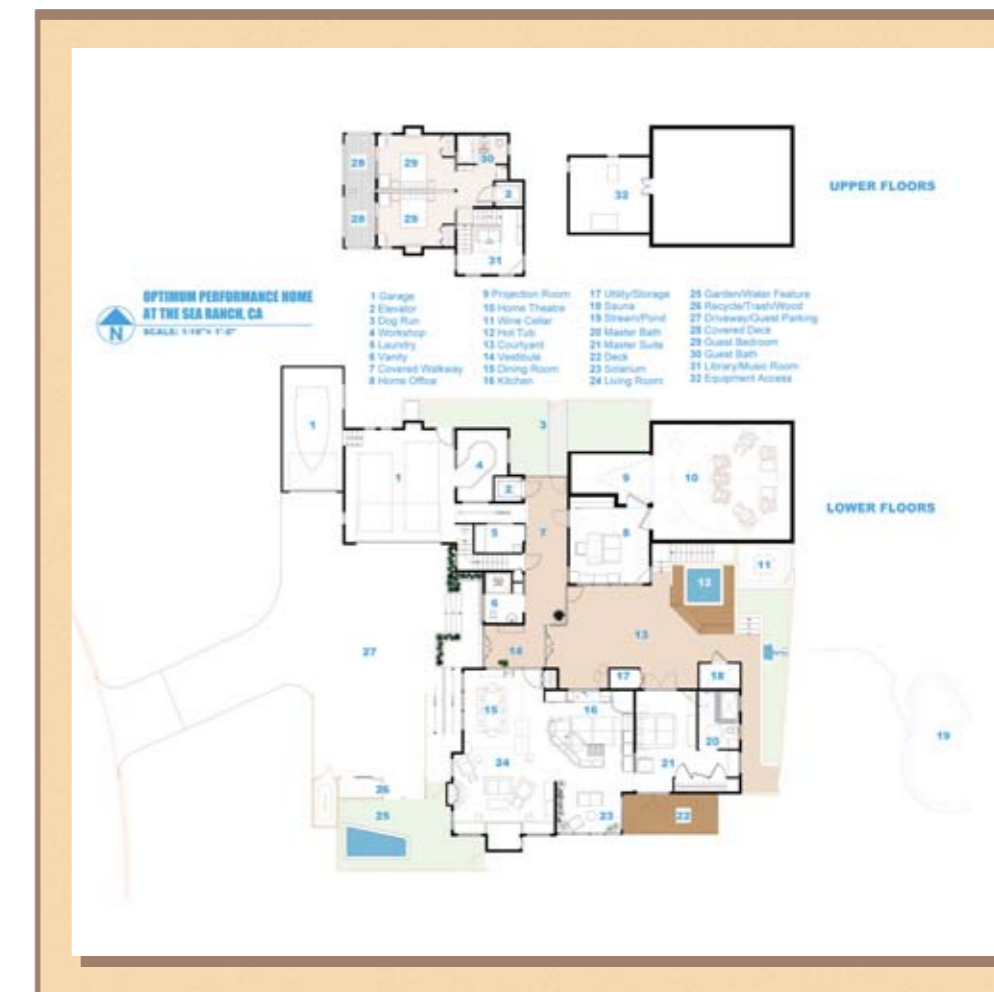
This is the quandary that the Design Team and I face in turning our dream home project into reality at The Sea Ranch.

As such, the often-agonizing process of design review that we have been documenting will probably be read as an "unbelievable" case study in trying to gain support from the members of the architectural profession that comprise The Sea Ranch Design Committee. These professionals serve on a paid basis and are appointed to the Design Committee by the Board of Directors of The Sea Ranch Association, a Common Interest Development.

In this series, we have fully documented our efforts to promote sustainable design and resource conservation and embrace new building science practices that truly result in a home that touches the earth lightly during both construction and day-to-day operations once built, and respects the beauty and diversity of the natural setting surrounding it. (We have not fully documented the unbelievably agonizing process we have endured for obvious reasons. After all, we seek agreement and support, not dissension and denial.) Yet we continue to be challenged with new (and old but thought-to-be resolved) conditions as we seek final construction plan approval so that we can then proceed to obtain a building permit from Sonoma County.

The essential issue continues to be the site planning as related to drainage and landscaping. Rather than take a leading proactive role in treating us as one of their architectural clients and really guide us in the design specifics that will meet their approval and realize our dream, the experience continues to be an expensive, time-consuming trial and error, acceptance or denial process, which is now six months into the third year of the project's design review.

One landscape architect member of the Design Committee, in particular, will not accept our credited and nationally respected licensed environmental engineer's proposed solution, even though he has warranted that his site plan and drainage design will function as documented. Our environmental designer's proposed LID solution



addresses the wet condition on our site due to the lack of control of drainage originating on the adjacent two lots abutting the east and south of the project property.

Landscape architects are self-described as practitioners of urban design and revitalization, site planning, responsible land use, and community master planning that protects and enhances natural, cultural, and scenic resources and avoids environmental degradation by respecting ecological systems and landscape character. They are supposed to be competent in the design of innovative approaches to provide for the efficient use of water and the protection of water quality. This includes the design, planning, and management of coastal zones and waterways, enhancement and revitalization of wetlands, wastewater

treatment, storm water management, and irrigation in all climate zones.

As professionals, architects and environmental designers are supposed to be trained, educated, experienced, and ethical, as well as have integrity. Their clients look to them as professionals for all of the above, including leadership, listening, and solving problems in a practical manner.

Codes And Established Methods

The Optimum Performance Home's site plan is designed to strongly support the efficient use of the community's water supplies, equitable allocation of water resources provided by the community and harvested on-site, elimination of water pollution and contamination from

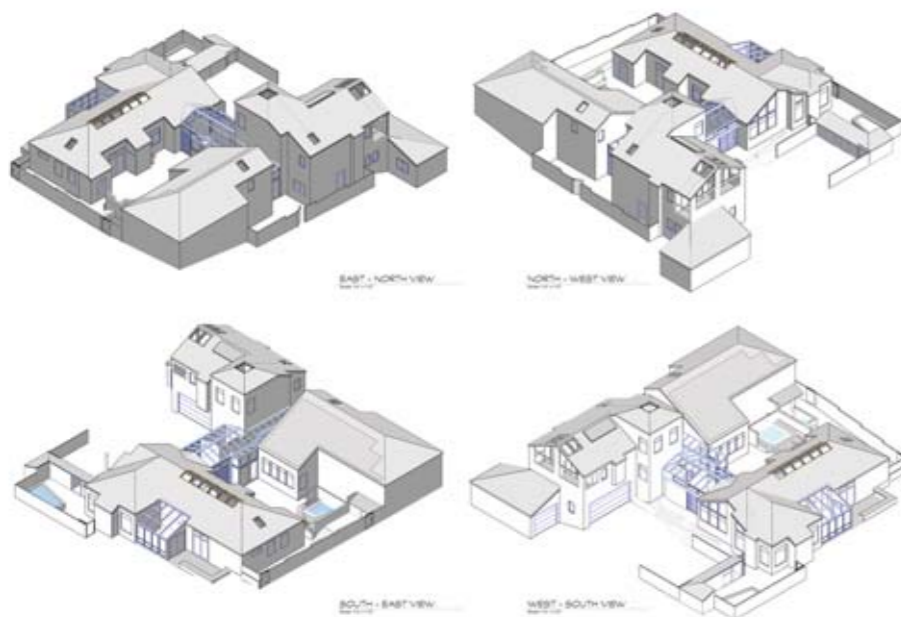


Above: A perspective of the southwest view created by architectural designer Ed Rose.
Below: Four perspective views of the Optimum Performance Home at The Sea Ranch

poorly-designed or failing septic systems, and general land use patterns that conserve and protect water resources within the overall ecosystem at The Sea Ranch. The water-efficient site plan and drainage design promotes "smart water use."

As noted in Part II in Issue 2, a frequent observation in the environmental design community is that codes and established methods often present barriers and restrictions on projects that are attempting

to be more resource-efficient or accommodate a better environmental "fit." And while this particular project must comply with a distinct set of guidelines and rules and pass before a design review committee, most green building projects will have a similar experience in adjusting to codes and going before planning commissions. In addition, members of planning commissions and design committees are frequently architects or



design professionals themselves, and may have strong opinions about how a project should look or what the standard of practice should be.

In our particular case, I believe that putting forth the Design Committee's specific solutions that they would support and approve would have effectively condensed the process down to a year and six months, rather than three years and six months, while still counting days, weeks, and dreadfully months to final approval. Such a proactive role on the part of the Design Committee and staff would have further resulted in far less expense overall, both in terms of the cost burden on the client for professional design services and the escalating cost of construction, and costs borne by the property owners who comprise The Sea Ranch Association and employ members of the Design Committee.

Preface

As a Californian, I am very conscious of the examples that California and the Pacific Northwest have set forth as this territory has become recognized as a mecca for green designers, architects, and builders practicing sustainable design.

In 1965, The Sea Ranch development became the first development of its kind that embraced environmental conservation on a large, community-wide basis. Architecture at The Sea Ranch embraces the natural lay of the land as implemented in environmentally-sensitive site-specific home design. The Sea Ranch builds on the ideals of preservation and appreciation of the rural coastal history and respect for the land.

In the early years and into the 1980s, amenities and services to support full-time living were limited and, as a consequence, homes were small, poorly insulated, resource and energy inefficient, and regulated to second home usage. Since the 1990s, the level of amenities

and services provided in the surrounding area has become more substantial and, as a result, is attracting a progressive class of younger professionals who want to remain productive and have the resources to sustain an independent lifestyle, while living in this beautiful development. This new generation of Sea Ranchers, while at present with little political clout, are demanding much more finely crafted home designs that respect the past architectural pallet but provide more room for living a full-time productive lifestyle facilitated by advanced electronic communication. This trend propelled by "baby boomers" is the future of The Sea Ranch. Home design will be based on serving the personal needs and requirements of this new generation of independent, entrepreneurial homeowners, which is destined to result in a wave of new larger homes on vacant lots, and remodels. As of May 2006, there are 1,716 homes built and 573 undeveloped lots—all spread over 5,000 acres of which approximately 2,500 acres are permanent nature preserve in the form of community commons.

This is the context in which the Optimum Performance Home project must perform, while respecting the environmental sensitivities The Sea Ranch has embraced.

Site-Specific Design And Low-Impact Development

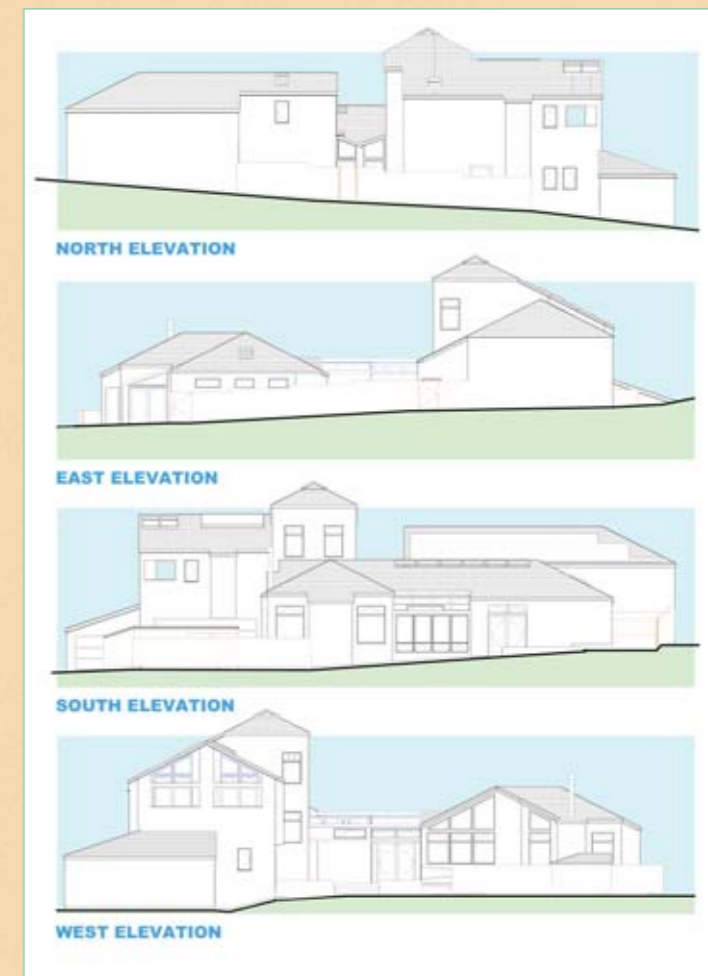
Gary Reber & Bill Wilson

At the core of The Sea Ranch concept is a set of guidelines for development with a strong sensitivity to environmental stewardship. These guidelines, which were thought out and incorporated into The Sea Ranch Declaration of Covenants, Conditions, and Restrictions (CC&Rs), embody the principles that development of home sites are to embrace. These principles

are expressed as design criteria and rules interpreted by three (six, including alternates) Design Committee members appointed by the property owner-elected Board of Directors of The Sea Ranch Association.

It bears repeating what was written in Part III. Over the years, the implementation of the guidelines, which are, for the most part, subjectively interpreted, has resulted in greater demands on recent projects and their owners, who have endeavored to design and build their dream homes under the same rules that applied to other property owners who engaged in the design process before them. As with any "planned" development, especially one

sensitive to environmental impact, one should expect refinements to the subjectively interpretive design guidelines and rules over time, while adhering to the founding principles expressed in the CC&Rs. The impact is that property owners in the design process are subject to new interpretations, rules, and limitations that were not imposed on homeowners who bought property and made plans under earlier interpretations of the guidelines, particularly now that the development is in the build-out and "infill" stage. As well, precedents may be applied differently than in the past. The Optimum Performance Home project could be argued to be a microcosm of the design and building challenges



The elevations of the Optimum Performance Home at The Sea Ranch

facing participants as The Sea Ranch development approaches build-out.

During the last few years, new thinking about the use of sustainable and renewable materials and building science approaches and techniques, and on-site energy generation, have been taking hold on a national level. This new thinking is the future of environmentally-responsible housing development, aimed at better stewardship of Mother Earth. The Sea Ranch planners and designers are faced with this new reality, which is challenging them to expand their thinking and application of the long-standing guidelines. The guidelines, in turn, were envisioned to protect The Sea Ranch concept from degradation of the natural environment and the perceived blight of typical subdivision development, done without regard to good site-specific design.

When one purchases a lot at The Sea Ranch, one must assume, as does the community, that responsible property

owners will respect and adhere to the philosophy and requirements of the Design Manual and Rules, as well as The Sea Ranch CC&Rs, which read:

“It must be assumed that all owners of property within The Sea Ranch, by virtue of their purchase of such property, are motivated by the character of the natural environment in which their property is located, and accept, for and among themselves, the principle that the development and use of The Sea Ranch must preserve that character for its present and future enjoyment by other owners.

“It is also assumed that those who are entrusted with the administration of The Sea Ranch will discharge their trust in full-recognition of that principle and, to the extent consistent therewith, will foster maximum individual flexibility and freedom of individual expression.”

It has always been the intent in designing the Optimum Performance Home at The Sea Ranch to respect

and adhere to the philosophy and requirements of these documents in terms of natural settings, simplicity and modesty of development, and sustaining the predominance of nature.

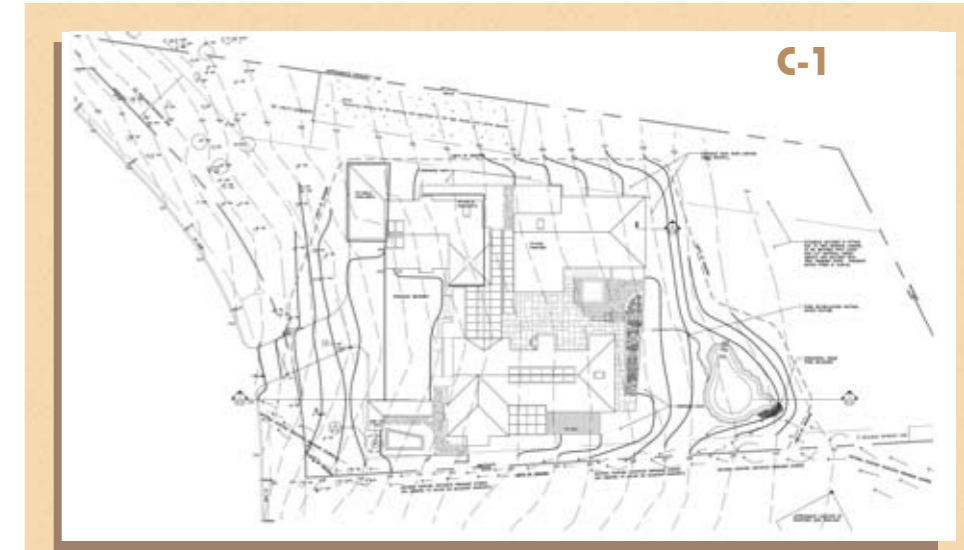
With respect to the preservation of the character of the natural environment, the guiding principles in the environmental design and site preparation and development has been to employ resource-efficient sustainable design and development practices. The intent has been to reduce the environmental impacts and harm to natural systems, enhance environments and human health, and avoid, minimize, and mitigate the adverse effects of modern construction practices.

Just as the Low-Impact Development design features seek to foster a healthier watershed and, hydrologically speaking, approach “zero impact,” so is the intent to improve the energy performance of the proposed home in such a manner

that it effectively will be nearly a net “zero-energy home.” To accomplish these twin goals, site design includes saving indigenous trees and unique natural vegetation, constructing on-site storm water retention/infiltration features to integrate with the natural hydrology, preserve and enhance habitat, orient buildings to optimize solar resources, use of active renewable energy systems, optimizing passive solar design, and making water and energy conservation choices in fixtures and appliances.

The Optimum Performance Home is designed to be a building that touches the earth lightly during both construction and day-to-day operations once built, respecting the beauty and diversity of the natural setting.

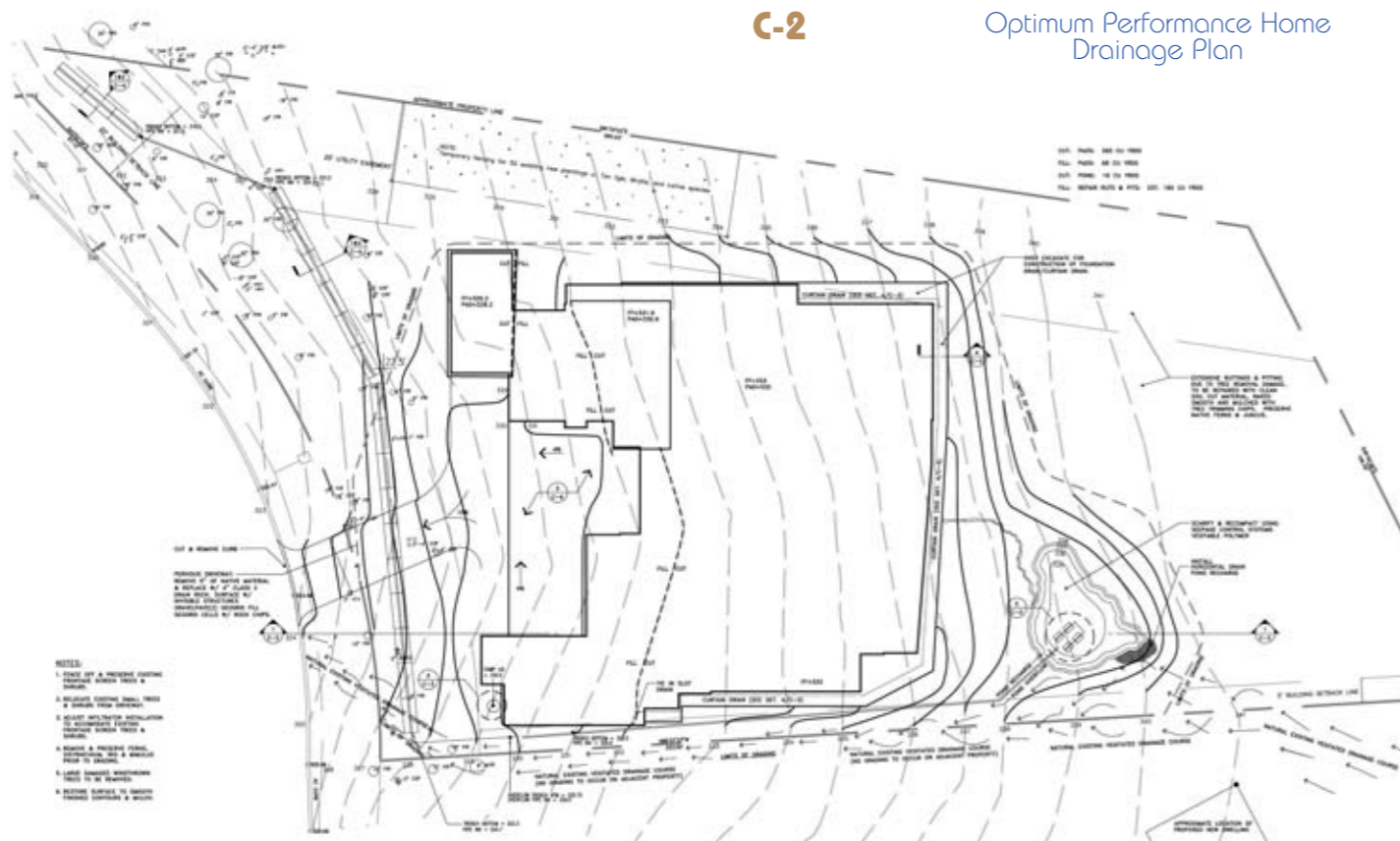
These measures are at the center of designing and constructing green homes that satisfy the human physical and psychological need for contact with nature. At the core of the architectural design



Optimum Performance Home Grading & Drainage Finish Grades

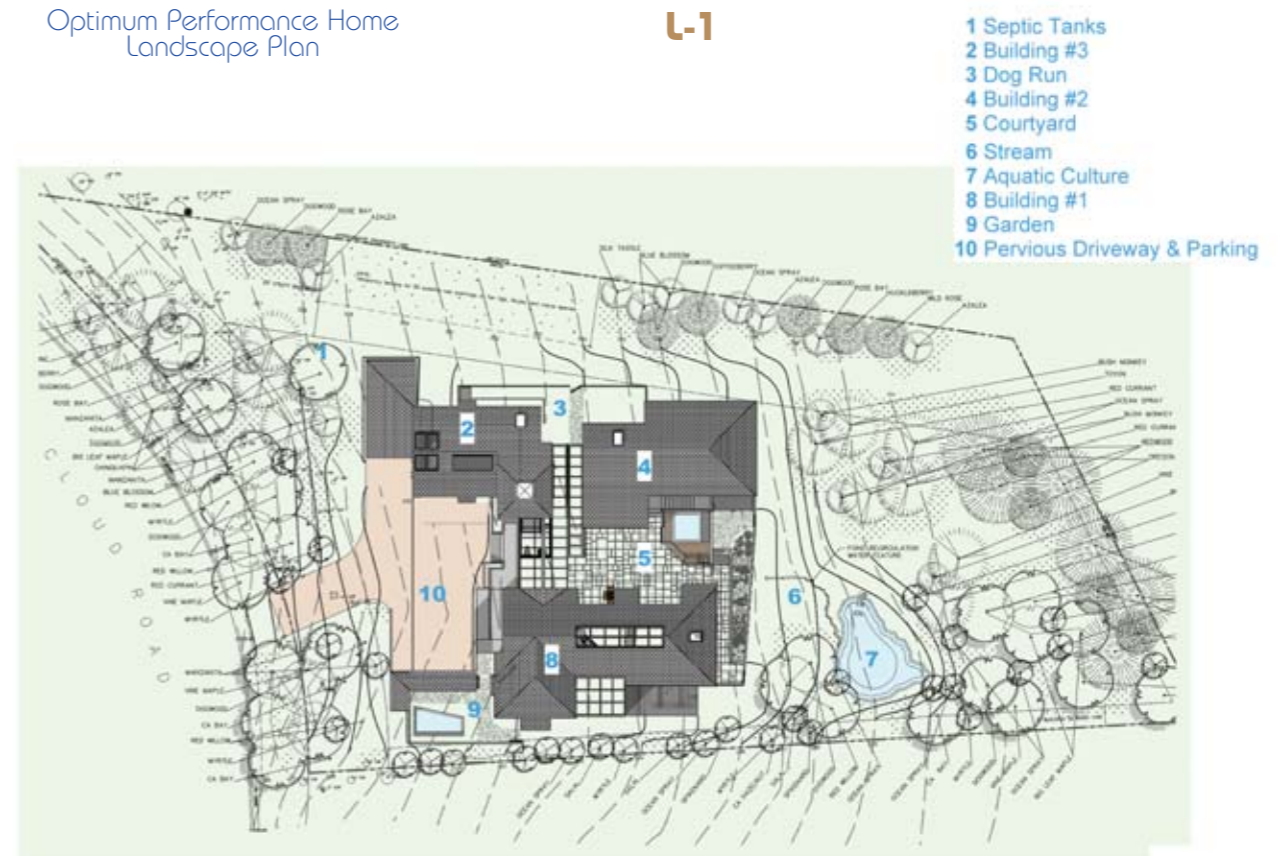
of the Optimum Performance Home is a built habitat that is full of daylight, sunlight, natural fresh air ventilation, outdoor views, and indoor and outdoor green spaces—a habitat that achieves a harmonious relationship between its occupants and the natural environment.

(Please see Julie Stewart-Pollack’s article in this issue on the biophilic design characteristics of the Optimum Performance Home. Biophilia is the idea that people possess an inherent affinity for nature, and when applied to the built environment, it enhances people’s



C-2

Optimum Performance Home Drainage Plan



Optimum Performance Home Landscape Plan

L-1

- 1 Septic Tanks
- 2 Building #3
- 3 Dog Run
- 4 Building #2
- 5 Courtyard
- 6 Stream
- 7 Aquatic Culture
- 8 Building #1
- 9 Garden
- 10 Pervious Driveway & Parking

physical and mental well being through positive connections to the natural environment.)

Environmental Plan Options

As described in Part III, our approach, in essence, strives to adapt the planned development to the background hydrology at the site, the regional hydrology that affects the site, and the site's position in the overall watershed. The ultimate goal in utilizing this approach is to balance necessarily impervious surfaces, such as building roof area with enhanced infiltration and storage of rainfall and runoff, eliminate unnecessarily impervious areas like driveways and walkways and replace them with pervious paving, maintain high water quality, enhance infiltration and groundwater recharge, enhance interflow, and maintain the incremental contribution over time to the base flow of regional streams.

Sheet flow and runoff crossing onto the site from the neighboring property to the south are indicated on drawing C1 by the arrows designating the existing, pre-development flow pattern along the southern property line. The existing natural vegetated swale meanders somewhat back and forth across the property line, with the majority of flow taking place on the neighboring property until the front of the two adjacent lots. At this point, as indicated, it spreads out and tends to swing onto the project site. This natural overland drainage pattern will be preserved, and no grading is to occur on the neighboring property to the south. A DVD of the natural drainage pattern was sent to the Design Committee showing a walk-through along the southern property line.

The LID plan for the site seeks to distribute runoff at every opportunity, as close to the source of the runoff as possible.

In contrast, conventional drainage planning generally collects runoff from different sources and discharges it off-site through a pipe, or more recently

with some sort of accommodation being made to water quality and detention requirements, such as a detention basin or infiltration trench.

Since LID is a distinct departure from the conventional drainage plans that have previously been implemented on The Sea Ranch, in which runoff is directed to the drainage in more direct ways, and because of the unique hydrology of the subject parcel, the proposed LID environmental plan requires consideration and study to form an impression of how the integrated systems will work and to better understand the project in context. It is admittedly difficult to derive this kind of information piecemeal from a set of finely-scaled drawings. In appreciation of this, the following will attempt to clarify the elements of the environmental plan that were presented to the Design Committee on June 2, during the current Final Construction Plan submittal stage. This is the latest revised and updated submittal, which addresses the last set of conditions conveyed to the Design Team in telephone and in-person communication with the Design Committee and their staff.

The current status of the project remains as Preliminary Plan approval with conditions for Final Construction Plan approval to be reviewed on June 2. Unfortunately, our printer's deadline does not allow us to cover in this article the outcome of the Design Committee's action on our submittal of an updated set of drawings, which hopefully, comply with and satisfy the Design Committee's *last* conditions for approval.

What follows is our response to their remaining issues as we have interpreted them, drawing on the recommendations and preferences expressed by the Design Committee over the course of previous submittals, communications, telephone conversations, and meetings. Some of the modifications could be regarded as fairly drastic at this stage in the proceedings, such as the indirect inference that a slice be taken out of the middle of the house to enable a two-foot

additional setback from the south property line, which was done. This was done, along with provision of an upgrade to what had been a rough grading plan.

Screening And Reduction Of Apparent Building Mass

Two mitigating elements were requirements of the Design Committee in the Preliminary Plan approval stage: a) "the visual screening of the development provided by both existing and proposed on-site vegetation," and b) "the reduction of building mass provided by 'digging' the structure into the grade at the east side of the lot."

The other major constraint has been the generally wet condition of the site, which is subject to sheet flow from adjacent properties as well as having groundwater moving across the bedrock, only five or six feet below the surface.

Drainage

To avoid having to place a curtain drain across the entire lot uphill of the property, a combination foundation drain and curtain drain has been designed within the pad excavation footprint, which wraps around the rear and sides of the building compound (see drawing C-2), and building materials and a building and foundation system have been selected, which will provide moisture protection to the portions of buildings that are below grade.

Once the water reaches the front of the building, Infiltration chambers are designated for shallow burial across the front of the property, in an open area between the house and the frontage trees and shrubs. This band of Infiltration chambers will provide an optimized way for excess water to be re-integrated with the groundwater and the natural gradient, and actually correct a pre-existing problem that contributed to the downing of several large pines and the nearly continuous saturation of parts of

the surrounding area and frontage.

Unfortunately, the use of the Infiltration chambers and their location relative to the remaining understory tree screen across the frontage was not clearly understood at our initial Final Construction Plan submittal, but we are sticking with this approach as it is a sound engineering approach and supports the LID objective.

The band of Infiltration chambers that is planned across the property frontage is part of the integrated system designed to balance the perched shallow groundwater, seepage, and sheet flow that move across the property from the neighboring south and east properties. The purpose of the Infiltration chambers is to work in concert with the proposed foundation and curtain drains that will intercept groundwater behind and around the sides of the house and return it to the groundwater in front of the house. The combination foundation and curtain drains are from grade to at least one foot in depth into the bedding formation, which is generally about six feet below grade across the site.

An earlier rendition of the home design (depicted on the approved Preliminary Plan) showed the house as earth-banked to set it deeper into the ground and reduce the apparent bulk in the now-deforested landscape. But following that Preliminary Plan, we submitted a plan that set the buildings the same depth into the terrain, but banked away from the buildings so that soil moisture would not be up against the walls. The visual effect (reducing apparent mass) was the same, since anyone viewing the site from "across the way" would not see the receding banks, but would rather just get a view across the plan of the land and see the recessed house. Despite arguments that this was a sounder approach to meeting the visual goals and dealing with a major site constraint (the hydrology), it was rejected.

Our updated drawings submitted for the June 2 review show the previously approved earth-banked implementation. Thus, on the recommendation of the Design Committee, and in keeping with the Preliminary Plan approval for the project, the submitted grading and drainage plan shows the compound buildings earth-banked, rather than showing the surrounding earth sloped back. The building pads will be over-excavated beyond the final building footprints by a few feet to accommodate construction of the foundations and drainage systems, and then built up to the finished grade.

This was not our preferred solution, as our desire was to minimize slope disturbance, as well as to minimize soil disturbance and erosion, and to better protect the building materials from the hydrostatic pressure and potential long-term damage due to the constant moisture. Part of the decision included a determination that construction of the deep curtain drain across the back of the property would, in balance, be just as disruptive as the extension of the house pad cut by a few additional feet, and would result in a less reliable method of protecting the home and building materials from the continuous presence of groundwater and seepage. This was arrived at based on the geology and soils report provided by Keith Colorado, a project engineer with BACE Geotechnical, based in Santa Rosa, California.

With this design, as with the previously proposed sloped grade adaptation behind the house pad cut, the pad cut still has to be cut back as shown, in order to construct the foundation regardless, regardless of whether or not the ultimate construction would be earth-banked in order to construct the foundation, then backfilled with engineered fill.

The Infiltration chambers are to be carefully installed and set back toward the house from major tree roots and the existing screen of trees and plants that currently exist at the site. The trench

bottom is to be shot dead level (with a transit), so that any excess water that is introduced to the Infiltration strip will tend to redistribute evenly across the site, and infiltrate back to groundwater, which is perched across the site at approximately 5- to 6-feet below grade at the boundary of the overburden and bedding formations. The trench bottom for this Infiltration strip will be approximately 2.5- to 3.5-feet below grade.

As previously stated, the Infiltrators are to be installed between the frontage screen and the residence, outside the drip line of any trees, and without damage to any supporting root laterals. As with all aspects of this project, a great deal of care and attention will be placed in the construction of the home. The intent and design of the Infiltration chambers is to preserve the native hydrology and enhance groundwater recharge, and this will prove beneficial to the landscape, existing or planted, rather than detrimental. The Infiltration chambers, working in tandem with the pervious driveway, will also alleviate the saturated conditions that persist for long periods along the frontage of the property that result when the asphalt street and curb act as a dam to sheet flow moving across the site.

Also, as previously discussed, the area was planted with large pines back in the '60's, which grew (30-inch plus trunks), matured, declined (due to drought, beetles, and other factors, and finally blew down in the high winds of November, 2003.

Landscaping

The Vegetation Management Plan (the Roberts vegetation plan), for management of windthrow properties, has been closely studied and adhered to in the careful environmental design of this site. The Vegetation Management Plan clearly supports the use of understory trees, such as laurels and wax myrtles, in the manner in which the site's environmental plan intends to establish them, as

well as the selection of redwoods for the rear of the property to the east.

In addition, the Vegetation Management Plan recommends against such screening trees on wetter properties, and the interception of cross-site sheet flow and seepage will actually help to preserve the remaining frontage vegetation, which has been subject to extended periods of soil saturation. The integrated system for handling this cross-site water, including the Infiltrator chambers, will eliminate the present condition, in which sheet flow overflows onto the street along the entire Fly Cloud Road frontage, along which the site is located. This sheet flow begins on the property to the south of the site, and is present for much of the year, creating saturated soils around the entire existing screen of trees and shrubs.

We have fully embraced the Vegetation Management Plan, which provides for a wide variety of vegetation species, which we have incorporated into the landscape plan. The selection and variety has also been done with an eye towards providing habitat and a succession of flowers, nuts, and seeds year-around, to support birds, butterflies, and foraging animals. The landscape selection makes use of the managed extra moisture that this site features and which is not generally available at other sites, and which could enable the site to support a higher order of landscape without irrigation. This includes several native bulbs of considerable beauty, such as purple iris and Tiger lilies. While other, drier sites may be somewhat limited in native plant selection, this one could be naturally lush, and indeed, left clear of the tall trees that had previously crowded out other species, it is becoming just that without any encouragement or intervention. (See drawing C-1)

The Design Committee has expressed concern that too many varieties are implemented in the landscape plan and have indicated that a further

possible condition will be to reduce the number of plant species. Yet the Vegetation Management Plan does not specify that plant species shown appropriate for a particular site need to be limited in their diversity and implementation, leaving the homeowner to somewhat guess what will be acceptable.

The existing frontage plantings consist of a mix of Douglas firs, madrones, myrtles, laurels, tanoaks, coffee berries, and ferns, with some pines (targeted for removal) remaining in the overstory. As expressed in the landscape plan, the frontage screening is to be enhanced by infilling this remnant screen with dogwoods, maples, rhododendrons, and azaleas, and a lush understory of ferns and native irises. Except for the driveway entry, the goal is to completely screen the home to well above eye level. Additional screenings are designed for the areas between the Infiltration chambers and the house, creating multiple layers and a very effective visual masking of the home itself.

Native plants are to be collected from the site and preserved in a field nursery prior to grading, including irises, sisyrinchium, mimulus, ferns, small coffee berries, and other species of interest. Initial plant collections made during the tree clearing have been successful, and the plants are to be replanted as ground cover and understory following construction. The Sea Ranch stockpiles greenwaste to be chipped and made available to property owners, and a deep mulch cover will be used to restore bare areas and help infiltrate rainfall, as well as supplying soil humus.

The neighbor to the north has already planted a fenced area containing 50 tanoaks and myrtles, with trunk sizes ranging from 1 to 3 inches in diameter, as indicated on the landscape sheets, and these screen trees have been indicated by trunk diameter rather than ultimate canopy, as are other existing trees that make up the frontage screen. This planting straddles the northern

property line and into the PG&E right-of-way on the parcel, and when grown out will effectively screen off the planned buildings from the neighboring property.

The landscaping is expected to require only spot irrigation during the late summer and during the hot period, usually occurring in the fall for the first two years, and then be self-sufficient.

Plan Elements

A level "pad" is to be created below the building footprint as part of the universal design requirements for the residence. The design of the building pad was undertaken specifically to "build to the site," to not involve excessive grading or excavation, and to not involve engineered slopes or excessive fill. This includes the following elements of the plan, which are presented again in our latest submittal:

- The design plan is to preserve native topsoil and hold any graded topsoil aside for replenishment of areas that have been damaged by the tree removal activities and any areas exposed during construction. The plan anticipates mixing cut soil with mulch, spreading it in a thin layer, and re-establishing regenerative topsoil.
- The entire water handling system is designed to alleviate existing problems at the site, which were to some degree responsible for the downing of major trees and are even currently impacting the asphalt paving of Fly Cloud Road.
- The drainage plan is designed to positively affect existing vegetation and foster beneficial growth in new plantings by removing excess saturation, while preserving ambient soil moisture and healthy topsoil conditions.
- The drainage system is designed to deal with the existing problem at the site and prevent future drainage problems.
- In a very elaborate and detailed way, the house is "tailored to the site, not the site to the house."
- A hydrologic plan has been developed to intercept the water that moves

across the house site, transfer it around the house, and return it, through Infiltration chambers, to the natural hydrology in front of the house, using a pond as a stabilization feature on the whole system. This should effectively address the movement of water from the neighboring properties across the site, providing a dry pad, while at the same time maintaining the existing natural hydrology.

• One of the factors that has influenced the design is the easement for power lines along the entire northern property line. This necessarily has pushed the home over to the southern side of the property. This creates a false impression that the lot is smaller in size than it actually is and that the home is larger than it actually is. In reality, there is a significant belt of open space along the entire northern side of the property. But to satisfy a new Design Committee condition, we have moved the main residence north two feet to provide more space along the southern side of the property for drainage and vegetation planting. This, unfortunately, has resulted in a reduction in the depth of the courtyard and vestibule entrance.

• Additional refinement of the slope of the driveway has resulted in further minimizing the grading in keeping with disturbing the natural environment as little as possible. As mentioned earlier, this involved taking a 2-foot slice out of the middle of the house plan. This also necessitated some additional design of steps, a deck, and a ramp leading to the main entry vestibule doors, which now creates a more dramatic entrance.

• The driveway and the path leading around the home's perimeter are to be constructed using drain rock in the base and Invisible Structures Gravelpave. As such, they will infiltrate runoff and transmit it to the infiltration system or to a foundation drain, obviating the need for surface inlets.

• The site has been extensively rutted during tree removal, and some additional

tree removal remains to take place. Excavated soil from the building pads and tree chips will be used to restore the rutted areas, consuming all or most of the excavated soil from the recessed pad excavation not otherwise used as fill. The repaired areas will be replanted.

• Extensive site controls will be integrated into the management of the site during construction, so that no silt leaves the site, and runoff is managed and controlled and retained on the site.

To summarize all of this, interaction between the LID grading and drainage design, the Permaculture and native plants landscape design, and the placement and design of the home, are all intended to work together to result in a well-integrated, successful project on a difficult site.

The Pond

The Design Committee in a previous meeting and letter expressed concern that the proposed pond "may pose a safety risk...the pond and stream now become major features of the site." Further, the Committee stated: "their proposed locations at the high side of the lot are contrary to the patterns of nature and appear artificial and 'forced.' In addition, the grading plan implies over a six-foot total depth posing a risk to both humans and animals, and potential liability issues."

Rather than press this issue, we decided to implement the smaller pond that was shown on the site plan and was approved with the Preliminary Plan submittal.

The pond has been reduced in both dimension and in depth, and now follows the footprint originally approved by the Design Committee. It has actually been placed in a depression on the site that has contained standing water for the past two years. The pond continues to contain the water quality and storage features that were presented to the Design Committee in discussions on

the larger pond that was shown on the previous drawing submittal. It will recirculate for water quality, with water drawn down through the bottom gravel substrate and underdrain filter. Makeup water is to be pumped up to the pond from water harvested from the foundation drains, and surface recharge is from horizontal drains placed in crossflow coming across the property line, as indicated on Drawing C-2. This pond will act as a "flywheel" on excess runoff and provide some water quality and detention elements, as well as providing, preserving, and enhancing the habitat values of the site.

For water quality, there is a small recirculating stream flowing down to the courtyard area in the back of the home, at which point it is pumped back up to the pond. This is to create a drawdown to the under-gravel filter and water quality in the pond. The stream is small and natural in appearance, and will be invisible from neighboring properties.

The pond's gravel filter consists of a manifold of Infiltration chambers buried in gravel and rock chips. Water to feed the recirculating stream is to be drawn from this underdrain, similar to an under-sand filter in a home aquarium, this will insure that water is drawn down through the pond bottom, removing particles and providing aerated water for resident bacteria, which will consume wastes and nutrients and out-compete algae that might otherwise become established in a stagnant pond.

The pond is to be constructed as a dip in the topography, without any constructed berm or engineered containment that might be subject to failure, and sealed with a vegetable oil polymer (provided by Seepage Control) that is completely non-toxic and used for this purpose, and the pond will not leak. The pond is to be natural in appearance and landscaped with native wetland plants and bulbs, many of which are now found at the site, and shielded or screened from neighboring properties. The pond is intended to be both entirely

functional and to be a real amenity to the area, in effect making the best use and actually augmenting a difficult situation in regard to excess moisture at the site.

During the dry months, it is anticipated that seepage will continue to recharge the pond through the horizontal drains (provided by Smart Drain). In addition, water collected from the combination foundation and curtain drains can be pumped to the pond, if there is capacity, and this is expected to be available year-round.

Summary

The above updated recommendations of the Design Team were presented in a letter to the Design Committee on May 1, 2006, along with revised drawings, necessarily done in a hurry. At their meeting on May 19, the Design Committee decided that rather than write another denial letter, they would allow us further opportunity to resolve their conditions, which now included removing the two-foot section out of the house layout. As previously noted, the next submittal review is slated for June 2, as this issue of *Ultimate Home Design* goes to press.

It appears that the Design Committee is satisfied with the updates to the architectural plans that they recommended as part of their latest conditions for approval.

While it appears that some progress has been made and that final approval is imminent, assuming no further conditions, you will have to wait until the next installment in this case study article series to find out what happens. Hopefully, we will satisfy the Design Committee and obtain final approval so that we can then proceed to file with the Sonoma County Building Department for their review of structural and Code issues, and finally obtain a building permit. Department for their review of structural and Code issues, and finally obtain a building permit. Needless to say, we are anxious to get started!

The design review process for the Optimum Performance Home at The Sea Ranch is now in its fourth year (three-years, six-months as of June 2006). The design process has been an unbelievable endurance experience. As a case study, our project is instructive with respect to dispelling the often unrealistic expectations about the design process and the multitude of challenges facing leading-edge projects, and serves to educate prospective homeowners about the realities of building.

Moreover, the "indeterminate sentencing" that sometimes takes place before planning commissions is not unique to The Sea Ranch. Vague guidelines with subjective interpretations, changing personnel, and strong notions as to what constitutes good design lead to many projects getting "hung up." To add to the problem, most Boards of Supervisors do not give proper direction to their Planning Departments or work to clarify ambiguous design guidelines, resulting in a "tail wagging the dog" situation. To further complicate matters, there may be a subtle bias against "growth" and further development, even on vested lots. The inconsistency and constantly moving target can result in a frustrating experience for the prospective homebuilder.

No doubt, the process itself has weighed us down over this unexpectedly long period of time. But, as stated before, while our resolve to overcome the many objections and challenges has been sorely tested, we are committed to achieving success in the building of the first Optimum Performance Home. **UHD**

The Authors

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Acknowledgements

Ed Rose is a residential architectural designer. His company, Rosebud Studios is based in Monte Rio, California. Ed has been designing homes and remodels on The Sea Ranch and surrounding areas since the late 1980s. His skill in listening to and understanding his client's architectural program and then translating that into a workable and pleasing design acceptable to the rigorous philosophy of The Sea Ranch Design Committee is responsible for the final successful approval of the "First Optimum Performance Home" at The Sea Ranch. This included the fairly new design concepts of universal access and aging-in-place, use of "green" materials, and meeting the exacting guidelines for a residential LEED® designation. It wasn't until Ed joined our team that we began to make progress with the Design Committee in this challenging process. Ed provided all of the images of the site plan, floor plans, elevations, and isometric perspectives for the magazine. His extensive education and experience span numerous disciplines from architecture to industrial and graphic design to technical illustration, photography, and painting. Ed can be reached at 707 865 1146 or 707 785 9180 or rosebud@thegrid.net.

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biophilic design

For The First Optimum Performance Home™

Julie Stewart-Pollack, ASID, IDEC

synopsis

Biophilic design attributes are elements and qualities of the physical environment that connect us to the physical, psychological, and cognitive benefits derived from direct experiences with nature.

Biophilic design attributes include: dynamic natural light, natural ventilation, access to open and/or moving water, frequent opportunities for spontaneous interaction with nature, sensory connections with nature, complexity and order, mystery, prospect and refuge, fundamental natural forms, and local natural materials.

Preliminary Analysis Of The Biophilic Design Attributes Of The Optimum Performance Home™ At The Sea Ranch

Sustainable design and development, in its many definitions and interpretations, is gaining tremendous momentum in the United States and around the world in both developed and developing countries. Standards for sustainable building materials and technologies, and environmentally responsible design strategies, such as the U.S. Green Building Council's Leadership in Energy & Environmental Design (LEED®) rating program, have made environmentally responsible design and building more accessible and easier to evaluate. In the U.S. alone, over 531 million square feet of commercial building space has been registered or certified under LEED since the first LEED rating system was released in 2000. With the creation of the new LEED for Homes rating system, interest in residential sustainable design is expected to soar in the next few years as homeowners discover that living in a healthy, resource-efficient sustainable home is not only possible, it is highly desirable.

However, sustainable design is typically regarded as a collection of "best practices" for resource conservation and improved environmental quality that rarely addresses the physical, psychological, and social consequences associated with living almost exclusively in built environments designed primarily to isolate and insulate us from nature. Although all sustainable design strategies and standards—including LEED—involve some considerations for human physical health, such as improved indoor air and environmental quality, many design professionals and environmental scientists believe that we must do even more. If sustainable design is to be truly embraced by the public, it must expand its considerations to include quality of life issues involving total human physical and psychological health and well-being.

When Harvard biologist Edward O. Wilson introduced to the world in 1984 the concept of Biophilia (the inherent need of humans to interact and affiliate with nature to achieve and maintain optimum health and well-being), he laid the foundation for the development of a new design paradigm. Based upon research in multiple disciplines revealing that interaction with nature provides a variety of physical, psychological, and cognitive benefits rarely found in built environments, this new design paradigm expands significantly upon the definition of sustainable design to include the essential relationships between human beings and nature, and between natural environments and built environments.

Studies of our inherent need for nature suggests that the natural world is a defining part of the human psyche; a major source of our sense of identity; physical, emotional, and cognitive development; and an important foundation for development of our aesthetic and spiritual experiences. They further

suggest that when we design and build without an understanding of this fundamental fact, we not only harm the planet, we diminish the quality of human experience and lose the wellspring of our health and well-being.

Biophilic Design Attributes

As discussed in Issue 3, May/June 2006 of *Ultimate Home Design*, the new design paradigm that takes sustainable design to the next level is called Biophilic Design. Biophilic Design recognizes the inherent human need for nature together with sustainable and universal design strategies to create environments that truly enhance life. The Optimum Performance Home™ at The Sea Ranch, one of two custom home projects in California in the LEED for Homes pilot program, provides an excellent opportunity to study the process of biophilic design from site development and landscaping to architecture and interior design. By utilizing certain design strategies called biophilic design attributes, the design of the home will connect its

"Biophilic design recognizes the inherent human need for nature together with sustainable and universal design strategies to create environments that truly enhance life."

occupants to nature and its many benefits in a variety of ways.

Biophilic design attributes are elements and qualities of the physical environment that connect us to the physical, psychological, and cognitive benefits derived from direct experiences with nature. We prefer these natural attributes in part because they literally bring buildings to life physically through the use of design strategies and materials, and symbolically through an understanding of deeply rooted affiliations, associations, and meanings. Biophilic design attributes include: dynamic natural light, natural ventilation, access to open and/or moving water, frequent opportunities for spontaneous interaction with nature, sensory connections to nature, complexity and order, mystery, prospect and refuge, fundamental natural forms, and local natural materials.

The following preliminary analysis of the Optimum Performance Home's biophilic attributes is based upon the current site, landscape planning, and architectural design of the home as described in the first four issues of *Ultimate Home Design* magazine. These attributes will be expanded upon and enhanced through the biophilic interior design of the home.

Some general strategies are described in this article, and future issues will discuss the development of these and other strategies that will be used to integrate biophilic attributes throughout the Optimum Performance Home at The Sea Ranch.

Dynamic natural light (rhythmical living light, patterns of brightness and shadow, sparkle)

The most significant difference between our experience of natural light and artificial light is that natural light is constantly changing in direction and intensity. The overall rhythm of sunlight moving from day to night and from season to season reveals and highlights colors, patterns, and textures; subdues and constantly changes them; then reveals them again in an entirely new way. Changing patterns of brightness and shadow, sparkle, and reflection capture and redirect our attention, helping to relieve stress and mental fatigue.

The correct placement and orientation of windows and skylights in buildings is critical to capturing dynamic natural light. Light should enter spaces from at least two different directions to enhance the experience of the sun's movement, eliminate glare, and provide changing patterns of brightness and shadow. Each of the four directions provide distinct lighting effects and experiences. For example: southern exposure provides warmth via passive solar gain; northern exposure produces flatter more diffused light; and eastern and western exposures afford the most dramatic experience of light movement.

Light should also enter spaces from different heights. For example, windows located high in the wall allow light to reflect off the ceiling and penetrate more deeply into the room. Light from above via skylights, transom windows, solar tubes, and clerestory windows adds increased depth and movement.

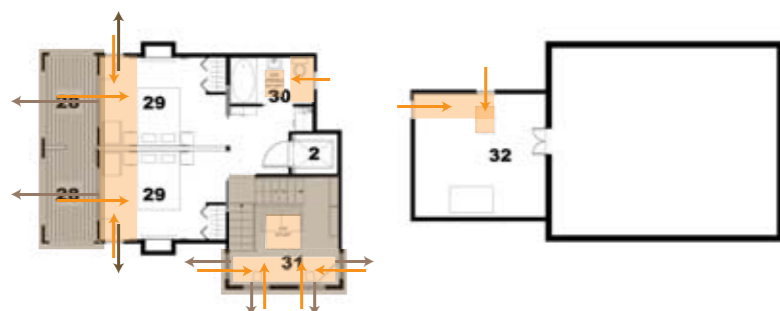
The design of the Optimum Performance Home incorporates dynamic natural light in a variety of ways. The sun penetrates into and throughout the three-building compound with primary living spaces oriented east, west, and south. Natural light enters all critical spaces from two or three directions (none are required or desired in the wine cellar and home theatre). Southern exposure provides an infusion of bright, natural light through the solarium into the kitchen area and will provide passive solar warmth and ambient light to the kitchen, home office, and solarium. Skylights placed throughout the home provide infused, ever-changing light from above.

As the design of the interior of the home takes shape, materials that respond to changes in the light's direction, intensity, and color will be used to enhance the experience of dynamic natural light. Artificial light will be designed to mimic natural light as much as possible and to provide individual control over brightness and direction.

Natural ventilation (movement of air, changes in air temperature, airborne scents)

**OPTIMUM PERFORMANCE HOME
AT THE SEA RANCH, CA**
SCALE: 1/16" = 1'-0"

- | | | | |
|-------------------|-------------------|--------------------|---------------------------|
| 1 Garage | 9 Projection Room | 17 Utility/Storage | 25 Garden/Water Feature |
| 2 Elevator | 10 Home Theatre | 18 Sauna | 26 Recycle/Trash/Wood |
| 3 Dog Run | 11 Wine Cellar | 19 Stream/Pond | 27 Driveway/Guest Parking |
| 4 Workshop | 12 Hot Tub | 20 Master Bath | 28 Covered Deck |
| 5 Laundry | 13 Courtyard | 21 Master Suite | 29 Guest Bedroom |
| 6 Vanity | 14 Vestibule | 22 Deck | 30 Guest Bath |
| 7 Covered Walkway | 15 Dining Room | 23 Solarium | 31 Library/Music Room |
| 8 Home Office | 16 Kitchen | 24 Living Room | 32 Equipment Access |







UPPER FLOORS



LOWER FLOORS

Biophilic Design Attributes

-  Dynamic Natural Light & Natural Ventilation
-  Access To Open And/Or Moving Water
-  Compound Mystery
-  Prospect & Refuge (Views)

Human beings were not meant to live in closed and sealed environments. We may be able to exist there, but we do not thrive there for long. The movement of fresh air through a space changes everything. It alters our perception of temperature, changes a static environment into one of subtle movement, and brings the world into our homes through scents carried on the breeze.

Few sites offer the potential for natural ventilation that The Sea Ranch site enjoys. The orientation of the home provides cross ventilation in all critical spaces through windows, doors, and operable skylights through which fresh air from the Pacific Ocean breezes will circulate. Interior materials and design elements that respond subtly to air movement will be used to enhance the experience of natural ventilation.

Access to open and/or moving water (visual, acoustical, symbolic qualities)

Water is one of the most evocative, universally shared symbols of life and a powerful biophilic attribute. We are instinctively drawn to water as a source of survival, as well as for aesthetic and recreational pleasure. In addition to human beings' historical patterns of habitat selection that have always favored living near the water, some of our most cherished and revered buildings, such as Frank Lloyd Wright's Fallingwater, use water as a primary design element.

Distant views of the Pacific Ocean from a variety of inside and outside spaces link the Optimum Performance Home to its symbolic associations with the sea. The planned excavated pond situated at the rear of the property serves not only a functional role as part of the hydrologic plan; it creates a biophilic focal point for the landscape surrounding the home and a habitat for local vegetation and wildlife.

Two private outdoor/nature areas are designed around water. Within the courtyard and visible from select interior spaces such as the master suite, the in-ground hot tub provides both visual and physical interaction with water in a natural setting. The private garden includes a water feature visible from the living room and the second-story library/music room. Additional interior water features will be designed to provide visual, acoustical, and symbolic connections to the compelling proximity of the home to the sea.

Frequent opportunities for spontaneous interaction with nature, including other species (integration of and free-flowing movement between interior and exterior spaces, visual and/or physical access to wildlife)

Biophilic design views the site and building as a series of exterior and interior spaces woven together in a tapestry. By integrating the natural elements of the site into the form of the architecture itself, we experience the unique relationships between interior and exterior from multiple perspectives as we

move from space to space within the home. Visual and physical barriers between indoor rooms and outdoor spaces dissolve into a mosaic of inside-outside spaces.

By using the walls and wings of the home to define "outdoor rooms," the experience of living is extended into a sheltered natural environment. Both distant views and views of nearby nature are important to this experience. Distant views link us to the greater natural order of the site, while nearby nature links us to the intricacies and immediate sensory pleasures of the site.

The architecture of the Optimum Performance Home is formed within, around, and about the natural features of the site. Free-flowing movement between indoor and outdoor spaces is enhanced by multiple transition areas such as covered walkways, courtyard, decks, and a garden that visually and physically extends the livable space into the natural environment. Three levels of views will be enjoyed: controlled views that look into the courtyard, private garden, or prepared places on the property maintained by the owners; local views that look out onto nearby nature; and expansive views that look out to infinity and include the Pacific Ocean and "big sky" views.

Pervious surfacing of the driveways, parking areas, and walkways maintain stronger connections with the natural immediate surroundings by eliminating solid pavement and retaining all potential runoff in the immediate watershed. The natural flow from inside the home to the outdoor paths link the home to nearby walking trails, gardens, stables, and riding trails along the 10 miles of coastline and further connects the occupants to the site and its natural surroundings.

Sensory connections to nature (physical, visual, material connections between interiors and nature)

While most built environments provide somewhat shallow and limited sensory experiences as compared to nature, biophilic design deeply engages all of the senses—in much the same way as sitting near the ocean, walking through the forest, climbing a mountain, or working in the garden. It is not a passive experience, but rather one that reminds us every moment that we are alive and a part of the life of the planet.

The four previously discussed attributes—natural light, ventilation, access to water, and opportunities to encounter nature from multiple perspectives—all directly enhance our sensory connections to the natural world and are abundant in the Optimum Performance Home. The surrounding natural setting of the home itself is so compelling, in part because it provides such a rich source of these attributes, and the site-specific architectural design takes full advantage of each.

Interior materials, colors, patterns, textures, and artwork will draw the qualities and features of the architecture and landscape inside enhancing a seamless interior/exterior sensory experience. This does not mean necessarily using exactly the

same materials, but rather materials that embody the qualities and features most desired from the architecture and the landscape.

Complexity and order (the relationship of variety and intricacy within underlying natural patterns of order)

Diversity and intricacy abound in the natural world. From micro to macro, nature's almost infinite variety provides environments for all species to live, learn, and thrive. But what makes it all work are underlying natural patterns of order that hold the diversity, variety, and intricacy together to maintain coherence. Natural patterns of scale and proportion, balance and harmony, novelty and familiarity, help us to organize and make sense of the complexity of the natural world. Biophilic design uses these same patterns to organize design elements and create built environments rich with information.

The architectural design of the Optimum Performance Home varies in scale and proportion appropriate to the site and surrounding landscape features. The façade, fenestrations, and surface details provide strong vertical elements in patterns that contrast harmoniously with the overall horizontal footprint of the home. Interior materials, furnishings, and details will reflect the multi-layered but elegant complexity of colors, patterns, and textures found at The Sea Ranch site.

Mystery (enhances the desire to explore, discover, and learn from the complexities of nature)

The relationships of complexity and order found in natural environments often take on the quality of mystery, defined by environmental psychologists Rachel and Stephen Kaplan as, "Something in the setting (that) draws one in, encourages one to enter and to venture forth, thus providing an opportunity to learn something that is not immediately apparent from the original vantage point."

Mystery arouses our intuition-driven curiosity and encourages us to interact more fully with our environments. In nature, mystery is experienced, for example, as we move through shadowed and shaded areas toward brightly lit areas, where distant views are partially obscured through foliage or disappear around a bend in the path. Biophilic designs create mystery in much the same way as nature does by sequencing interior and exterior spaces and elements so that some are partially screened from views (distant and near) as we move through and around the spaces. The compound layout of the Optimum Performance Home at The Sea Ranch creates a series of interior spaces interwoven with exterior spaces that are "revealed" as one moves through the home and surrounding exterior spaces. As the design of the interior of the home progresses, interior spaces will be planned to further enhance the subtle qualities of mystery that are found in the surrounding natural environment by creating spaces and partially screened views that change and expand as one moves through the series of indoor and outdoor rooms.

Prospect and refuge (strategic viewing conditions from a position of safety and security)

From the first crude shelters of our earliest ancestors to the most advanced, modern built environments available today, our homes have always been chosen and designed to provide primarily a place of protection. But all too often today that protection almost completely insulates and isolates us from the natural world and the many benefits we gain from interaction with nature. The attribute of prospect and refuge combines the desired levels of safety and protection with the ability to connect visually to a view of our surroundings—an advantageous combination historically for survival that

continues today to provide the benefit of relief of mental fatigue and stress, as well as for aesthetic experiences.

Pulitzer Prize-winning Harvard biologist and originator of the concept of Biophilia, Edward O. Wilson, observes our apparent universal desire for conditions of prospect and refuge this way: "...it seems that whenever people are given a free choice, they move to open tree-studded land on prominence overlooking water...Those who exercise the greatest degree of free choice...congregate on high land above lakes and rivers and along ocean bluffs." We are attracted to and appreciate these types of natural environments because, as Wilson explains, we are "responding to a deep genetic memory of mankind's optimal environment."

This is the environment from which the Optimum Performance Home derives its form, its orientation, and its design. The home overlooks the sweeping prospect of the Pacific Ocean, shielded from the road by natural buffers of native fire-adaptive trees, as well as meadow habitat brushes, flowering plants, and ground cover. Sheltered decks with panoramic views provide refuge and privacy. The home's design features a combination of inside/outside, large/small, shared/individual, and public/semi-private/private spaces offering many characteristics of prospect and refuge. The library/music room on the second floor is a particularly good example, with prospect in four directions via windows on three sides and a dramatic skylight overhead. The interiors of the home will use lighting, and furniture selection and placement, as well as visual screening elements to further enhance the prospect and refuge experience.

Fundamental natural forms (biomimetic models, fractals, natural progressions of scale, rhythm, proportion, repetition, symmetry, gradients)

Biophilic design views nature as the ultimate design model. Nature's forms,

geometric progressions, and patterns are studied and translated into the forms, progressions of scale and proportion, and patterns of the building and interiors.

This approach is based upon the science of Biomimicry introduced in 2002 by science writer Janine Benyus. She explains Biomimicry in this way: "The core idea is that nature, imaginative by necessity, has already solved many of the problems we are grappling with. Animals, plants, and microbes are the consummate engineers. They have found what works, what is appropriate, and, most important, what lasts here on Earth.... After 3.8 billion years of research and development, failures are fossils, and what surrounds us is the secret to survival."

By examining and seeking to understand the forms, processes, and patterns of nature, biophilic design is able to solve naturally some of the challenges we encounter when designing sustainable built environments. For example, using graduated repetition of scale is one effective way to help meet a primary objective and challenge in building homes at The Sea Ranch: integrate the structure with the site. Exterior elevations of the three buildings of the Optimum Performance Home illustrate how the buildings begin as low horizontal forms

that progressively rise vertically similar to the surrounding landscape.

Local natural materials (connect the site to the building and interior spaces)

Biophilic design emphasizes using natural materials native to the site and surrounding to create sensory connections between the built and immediate natural environments. Care must be taken during site preparation, construction, and specification of building and interior materials to avoid using endangered local natural resources or resources that, by removing them for use, will diminish or threaten established habitat for other species.

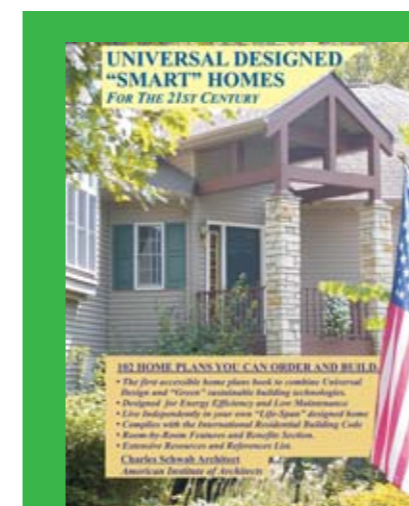
Some of the strategies for using local natural materials in the site preparation of the Optimum Performance Home include: preserving the fertile layer of topsoil for use in landscaping with native plants, and using natural groundwater management so that the unique watershed characteristics of the seasonally marshy meadow are maintained. In addition, damaged pines that were cleared from the site were stockpiled to be chipped to cover bare ground exposed after construction. These chips will also be used as much for mulch as a temporary site control

during construction to prevent the discharge of sediment. Finally, local, natural surfacing materials (floors, walls, countertops, cabinetry, etc.) will be used in the interiors to further connect the home to the site.

In future articles, we will examine how biophilic design attributes help to provide many of the physical, psychological, and cognitive benefits derived from the experience of nature, and how these attributes will be integrated in the interiors of the Optimum Performance Home at The Sea Ranch. **UHD**

The Author

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Universal Design Living Laboratory



(Figure 1) Author doing a load of laundry

Rosemarie Rossetti

My Story

When my husband, Mark Leder, and I got married on June 10, 1995, our dream home in Gahanna, Ohio was under construction. We moved into the home in October 1995 and fully intended to live there the rest of our lives.

When we worked with our builder, we asked the salesperson to put in a few wider doors in the master bedroom and bathroom to accommodate wheelchairs should our visiting parents need them for mobility as

synopsis

Universal design is human-centered design, accommodating people of all sizes, ages, and abilities.

The seven principles of universal design are: equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort, and size and space for approach and use.

they got older. We also had lever handles put on all the doors to make them easier to open. We were thinking ahead to our future and selected a two-story floor plan with the master bedroom suite on the first floor; to make the home more accessible should one of us not be able to climb stairs.

We hadn't counted on a sudden tragedy on June 13, 1998, while we were celebrating our wedding anniversary.

We had gone for a bicycle ride on a rural bike trail in Granville, Ohio. After riding for a few minutes, Mark thought he heard a gun shot and slowed down to investigate. As he scanned the scene he saw a large tree falling. He shouted "Stop!!!" but the warning was too late. Instantly, I was crushed by a three-and-one-half-ton tree and paralyzed from the waist down.

Traditional Home Design Problems

After six weeks in the hospital, I returned home with a different set of lenses—those of a person with a disability. Our

"Universal design is a framework for the design of living and working spaces and products benefiting the widest possible range of people in the widest range of situations without special or separate design."

traditionally designed home had many problems, the first of which were the steps—at all four entrances.

The temporary ramp to the front entrance that my husband, family, and neighbors built to push me in my wheelchair to get me into my home was very steep. The carpeting in my home was hard for me to roll on. Life in a wheelchair is hard enough. Living in my own home was a monumental task!

Doors had to be removed so I could enter the laundry room, bathroom area, and shower. Privacy was lost! Cramped quarters in the laundry room made me angry as I banged up the washer, dryer, and walls with my wheelchair. I use a top-loading washer and have to use a reacher—a stick with grabbers on the end—to pull out every single item. It takes forever to do a load of laundry.

Mark and I operate our separate businesses out of our home. Half of our house is "off-limits" to me due to the steps to the basement and steps to the second floor, which contain his office and our guest bedroom and bathroom.

Accessibility is a problem for me because as I sit in my wheelchair, I am four-feet, two-inches tall. Mark, in contrast, is six-foot-four. Due to my limited reach, my independence is compromised.

The kitchen is not designed to be wheelchair-friendly. Wall cabinets are too high, so I can only reach items on the bottom shelves. The 36-inch-high countertop is not at a level that is comfortable as I prepare meals. The light switches and electric outlets on the back wall are out of reach. The freezer section of my refrigerator is on top and not easy to reach. I strain to do dishes since there is no knee space under the sink, forcing me to approach the sink sideways. I use a reacher to



(Figure 2) Author at base of staircase in current home

get things out of the pantry. There is no space for my knees under the range, and I can't see inside large pots since the cooktop is at 36 inches high. The bottom-hinged oven is under the range and is not easy or safe for me to use because the door is in my way when it is open. The microwave is above the range and totally out of my reach.

The bathroom design also makes life difficult. There is no knee space under the sink, so I have to use the sink seated sideways. We have a portable shower bench in the shower that must be removed every time Mark takes a shower, and put back when it is my turn. Mark installed a hand-held shower nozzle for me to use at a lower height, while he positions it above his head when he showers. It is very difficult for me to transfer from my wheelchair to the whirlpool due to the height of the tub and lack of grab bars in this area.

In the past eight years, I have learned to cope with many changes, challenges, and inconveniences in my life. I have also been researching universal design, a housing solution that will lead to my future independence, accessibility, comfort, and safety.



(Figure 3) Author opening oven



(Figure 4) Shower stall showing bench

Universal Design Living Laboratory

Universal design is a framework for the design of living and working spaces and products benefiting the widest possible range of people in the widest range of situations without special or separate design. Universal design is human-centered design, accommodating people of all sizes, ages, and abilities.

There are seven principles of universal design. They were introduced previously by Wolfgang Preisler in, Issue 1, January/February 2006 of *Ultimate Home Design* in "Universal Design: Paradigm For The 21st Century."

Principle One: Equitable Use

- The design is useful and marketable to people with diverse abilities.
- Provide the same means of use for all users: identical whenever possible, equivalent when not.
- Avoid segregating or stigmatizing any users.
- Provisions for privacy, security, and safety should be equally available to all users.
- Make the design appealing to all users.

Principle Two: Flexibility In Use

- The design accommodates a wide range of individual preferences and abilities.

- Provide choice in methods of use.
- Accommodate right- or left-handed access and use.
- Facilitate the user's accuracy and precision.
- Provide adaptability to the user's pace.

Principle Three: Simple And Intuitive Use

- Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
 - Eliminate unnecessary complexity.
 - Be consistent with user expectations and intuition.
 - Accommodate a wide range of literacy and language skills.
 - Arrange information consistent with its importance.
- Provide effective prompting and feedback during and after task completion.

Principle Four: Perceptible Information

- The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

- Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.
- Provide adequate contrast between essential information and its surroundings. Maximize "legibility" of essential information.
- Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).
- Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

Principle Five: Tolerance For Error

- The design minimizes hazards and the adverse consequences of accidental or unintended actions.
- Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.
- Provide warnings of hazards and errors.
- Provide fail-safe features.
- Discourage unconscious action in tasks that require vigilance.

Principle Six: Low Physical Effort

- The design can be used efficiently and comfortably and with a minimum of fatigue.
- Allow user to maintain a neutral body position.
- Use reasonable operating forces.
- Minimize repetitive actions.
- Minimize sustained physical effort.

Principle Seven: Size And Space For Approach And Use

- Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.
- Provide a clear line of sight to important elements for any seated or standing user. Make reach to all components

(Figure 5)
Front elevation
UDLL

comfortable for any seated or standing user.

- Accommodate variations in hand and grip size.
- Provide adequate space for the use of assistive devices or personal assistance.

Mark and I are planning to build our next dream home and know much more than we did in 1995 when we built our current home. This home is more likely to serve us as we grow old. The house, the Universal Design Living Laboratory (www.UDLL.com), will serve as a national model to bring about awareness of universal design to the public and the building, remodeling, architectural, and design industries.

This UDLL will serve to help people better understand how to create a more comfortable living environment that will enhance their quality of life. The UDLL will serve as a resource for others to learn from—today and tomorrow.

An approximately 3,500-square-foot ranch-style home, presently in the final phase of design, is to be built in the Columbus, Ohio Metropolitan Area. Construction is anticipated to begin in the fall of 2006 and end in the summer of 2007. The home incorporates unobtrusive universal design, resource- and energy-efficient green building methods,

advanced automation technology, a healthy home construction approach, and the design principles of feng shui. The finest craftsmanship and state-of-the-art products and services will be incorporated. The gardens will also incorporate universal design principles, allowing me the ability to garden again, and use my skills and knowledge as a horticulturist.

Mark and I will each have a private home office, as well as one for my office assistant. We desire an easy-to-maintain residence with ample space for working, entertaining, and housing extended-stay family or guests.

Selecting A Builder

Building a custom home is a daunting task. Building a home that accommodates me as well as my husband, and includes three home offices, adds additional layers of complexity.

We started the process by identifying locations where we wanted to live. Then we went to model homes of builders in those areas. Of course, most of the time Mark got to tour the model homes while I sat in the converted-garage sales offices, since the homes were not wheelchair accessible. We settled on a housing development and selected CV Perry as the builder.



(Figure 6) Builder and architect group



(Figure 7) Author with architect and assistant

We looked at his one-story ranch floor plan and tried to modify the room positions and sizes to accommodate our needs; this was not successful. It was time to hire an architect.

The Design Process

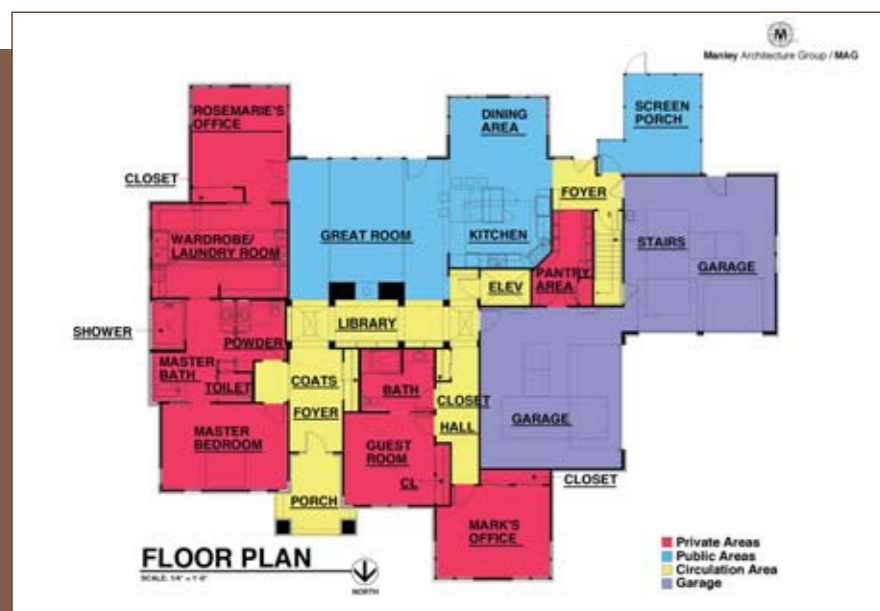
After many architects were referred to us, we scheduled interviews and contacted their referrals. Based on

previous experience building custom homes and ADA-compliant commercial architecture projects, we selected Patrick Manley in Columbus.

As we worked with him, we first tried to “shoehorn” our ideas for the floor plan into CV Perry’s floor plan and realized that this process was not working. Truly, we needed to design this house from scratch. We took the approach of designing the home from the “inside out.”

This involved designing the layout for each of the rooms on the floor plan first and then designing the exterior of the home. This strategy worked well. We took measurements of our existing rooms and positioned the rooms on the floor plan to best accommodate our need for sound and sight privacy as well as looking at how the space was to be used. We drew in existing as well as new furniture on the floor plan. Manley drew five-foot circles throughout the floor plan in order to show the turning diameter of my wheelchair. Doors were drawn in at 36 inches and hallways at 48 inches wide. We also examined pathways of travel to look at circulation patterns. This will be especially important as we bring in groceries from the garage and store them in the roll-through pantry.

We also looked at how space could be used for multiple functions, as well as the point where items or equipment would be used. This point-of-use mindset helped us to determine our need for space. We found that the laundry area would better serve us if it were incorporated in the master closet area. Manley also designed one of the hallways to serve double use, by utilizing the wall to serve as our library. The



(Figure 8) Floor Plan of UDLL

kitchen center island will serve as a work station for multiple cooks and also can be used as an informal dining area. Space was also saved by positioning the half bath adjoined with the master bath, with a pocket door between the two rooms. This powder room will serve my needs for a lower height vanity. Ever mindful of the total square footage of the house, we continued to monitor this closely to keep construction costs in budget.

As we continued to design the kitchen and bath areas, we realized that an expert was needed. I contacted Mary Jo Peterson in Brookfield, Connecticut, and she agreed to take on our project. She worked closely with all of us to carefully present options

that would accommodate Mark and me. She analyzed all of our reach specifications and carefully thought out the sequence of events that I go through to store, prepare, cook, and serve food, as well as clean up after meals.

Reflections

Now that we have been in the design process with Manley for a year and a half and Mary Jo Peterson for one year, we feel that our decisions on space planning were carefully considered. The time spent will make the home more useable, accessible, and aesthetically beautiful. Construction dollars will be saved due to our constant vigilance

of the total square footage. The architectural drawings will serve the builder and his contractors well as they create this one-of-a-kind prototype, which is expected to be replicated in whole or part, throughout the country. UHD

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The Author

Rosemarie Rossetti, Ph.D., is building a national model universal design home in metropolitan Columbus, Ohio. She is an internationally known speaker, trainer, consultant, and writer. To contact Rosemarie, learn about her speaking services, or subscribe to receive her free monthly articles, go to: www.RosemarieSpeaks.com. To learn more about the Universal Design Living Laboratory, go to: www.UDLL.com.

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to the mainstream

Ward Hubbell



Introduction

Little more than a year ago, the Green Building Initiative (GBI) was formed to promote credible and practical green building tools for commercial and residential builders. Designed to help mainstream the growing "green" movement, the GBI partnered with the National Association of Home Builders (NAHB) to educate builders on the NAHB's newly released Model Green Home Building Guidelines.

Today, the GBI, a not-for-profit organization, has already launched four major-market local green building programs and has established a base of more than 5,700 new associate members. Green Globes™, GBI's commercial ratings system, is a green management tool that provides architects, developers, builders, and others in the construction community with an assessment protocol, rating system, and guide for integrating environmentally friendly design into commercial structures.

Redefining Green

For years, green building has been a catchall phrase used to describe environmentally friendly construction. Encompassing the many practices and products used to build homes that are healthier and have reduced environmental impact, green building considers all aspects of construction.

This relates to many aspects inside and outside the home, from planting shade trees, which can reduce a home's cooling costs during the summer, to installing low-flow faucets or a programmable thermostat.

Strategies used by today's green building practitioners look at every phase of the construction and operation of buildings, whether they are focused on indoor air quality, energy efficiency, or waste reduction.

Ironically, many builders are already building green but don't realize it or know how to market it. They also don't realize that learning additional green building practices will not break their budget or require intensive training.

Building a green home starts with site planning and land development, then looks at everything from the orientation of the house on the property to its framing and insulation, energy and water efficiency, as well as the indoor environment. Even aspects such as the amount of construction waste accumulated and homeowner education can affect the overall environmental impact.

synopsis

-  *The Green Building Initiative (GBI) was formed to promote credible and practical green building tools for commercial and residential builders.*
-  *Strategies used by today's green building practitioners look at every phase of the construction and operation of buildings, whether they are focused on indoor air quality, energy efficiency, or waste reduction.*
-  *The GBI works closely with local Home Builder Associations across the country to develop locally relevant green building programs, as well as helping create demand through consumer education.*
-  *Increasingly, homebuyers are asking for green features and are willing to pay extra for them—especially when they realize the long-term utility savings, and health and societal benefits.*



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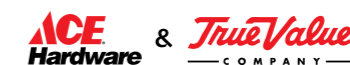
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A Local Approach

Over the last year, the GBI has worked closely with local home builder associations across the country to develop locally relevant green building programs, as well as helping create demand through consumer education.

In these markets, the GBI helps home builder associations facilitate a review process where the NAHB's guidelines are tailored to the specific area. The guidelines, which were developed by members of the home building industry, provide a framework for builders to reduce a home's environmental impact. In each market, the individual home builder associations further customize these national guidelines according to their location, climate conditions, availability of materials, the recycling marketplace, and the existence of rebate programs (see sidebar).

"Green building will continue to serve as an important issue among home builders, especially as more home buyers are educated about the benefits of green homes."

In addition, the GBI also provides local Home Builder Associations with:

- Educational seminars for builders
- Promotional and marketing support for local green building programs
- Web-based support such as model guidelines, case studies, and technical assistance
- Assistance in developing a Web site for their local green building program
- Market research regarding evolving consumer trends and attitudes

Participating Home Builder Associations benefit from the GBI's increased national awareness through its involvement in numerous industry conferences and events. In the last year, the GBI has participated in more than 35 trade conferences and also remains one of the key sponsors of the NAHB's National Green Building Conference.

Programs launched by GBI thus far include partnerships with Home Builder Associations in Houston, St. Louis, Kansas City, and Albuquerque. To insure a solid foundation for the local programs, the GBI works to sign on builders, in addition to creating a base of new housing starts, which are developed under the area's specific guidelines.

In the coming months, the GBI expects to triple its number of local programs and will add cities such as Las Vegas; Phoenix; Baltimore; Cleveland; Dallas; Boston; Hartford, Connecticut; and Durham, North Carolina.

Builder Impact?

As a builder, this may seem like just another added cost. In actuality though, having the capability to build green homes is a strategic business decision that will pay dividends now, and more so in the future as the trend continues to gain momentum.

With rising utility costs dominating recent headlines, many Americans are looking for ways to trim their monthly bills by making their homes more energy efficient. By incorporating various green building principles, the average home can save as much as 50 percent on their utility costs according to the U.S. Department of Energy.

Energy savings such as these can translate into thousands of extra dollars for a homeowner over the life of a home, while, at the same time, serving to enhance the quality of life in a home and reduce its environmental impact. In fact, if just one in 10 households incorporated energy-efficient heating and cooling systems, we could prevent more than 17 billion pounds of air pollution (U.S. Department of Energy)—the equivalent of removing more than 250,000 cars from the road.

Being able to offer a green home is another advantage for a builder to market to potential customers. Increasingly, homebuyers are asking for green features and are willing to pay extra for them—especially when they realize the long-term utility savings, and health and societal benefits.

Builders are also positively impacting communities by building green, and research indicates that even workers have improved satisfaction when involved with green projects.

Green Resource

In addition to helping local home builder associations, the GBI prides itself on offering information on the most up-to-date news on green building trends and relevant topics to industry professionals. More than 5,700 individuals—including builders, architects, Realtors, and academics—have signed up to become associate GBI members thus far, with the list growing every day. These individuals receive the GBI's monthly e-newsletter updates, which include the latest news, trends, and innovations in green building.

This past September, the American National Standards Institute (ANSI) formally recognized the GBI as an accredited national standards developer—making the GBI the first green building organization permitted to develop, maintain, and withdraw American National Standards. ANSI accreditation demonstrates the GBI's commitment to the ideals of openness,

balance, and consensus, and the GBI has further supported its commitment to ANSI by recently filing its intention to develop Green Globes (its commercial ratings system) as an American National Standard. GBI's standards development efforts stimulate competition and help to drive the improvement and innovation of all green building assessment systems.

Green building will continue to serve as an important issue among home builders, especially as more homebuyers are educated about the benefits of green homes. The GBI will remain a key resource for builders and home builder associations interested in populating mainstream green building

practices—helping expand green building practices in the U.S. and adding to the total percentage of buildings built in an energy-efficient and environmentally sound manner.

For more information on the Green Building Initiative, please visit www.thegbi.org or phone 1 877 GBI GBI1. **UHD**

The Author

Ward Hubbell is the Executive Director of the Green Building Initiative. He has more than two decades of experience as a leading communicator and strategic adviser in the natural resources field, serving in a range of capacities in the public and private sectors. He can be contacted at whubbell@thegbi.org.

The NAHB Green Building Guidelines

The NAHB worked together in an open, public process with over 60 stakeholder group members from the home building industry to create these guidelines. The main purpose of these guidelines is to provide a framework for builders to reduce a home's environmental impact. Individual Home Builder Associations can customize the guidelines for their local programs according to their location, climate conditions, availability of materials, the recycling marketplace, and the existence of rebate programs.

There are three different levels of green building outlined in the national guidelines—Bronze, Silver, and Gold. At all levels, there are a minimum number of points required for each of the seven guiding principles in order to assure that all aspects of green building are addressed and that there is a balanced, whole-systems approach.

Description Of Seven Guiding Principles

• **Lot Design, Preparation, And Development**—Even before the foundation is poured, careful planning can reduce the home's impact on vegetation, soil, and water, plus a home's long-term performance can be enhanced. Lot design principles such as saving trees, constructing on-site storm water retention/infiltration features, and orienting houses to maximize passive solar heating and cooling are basic processes used in the design and construction of green homes.

• **Resource Efficiency**—This section shows how certain framing techniques and home designs can effectively optimize the use of building materials. Construction waste management concepts are also discussed. In addition, information is provided

on how a home's durability and the amount of time and money needed for maintenance are affected by how certain materials are used.

• **Energy Efficiency**—This is the most quantifiable aspect of green building. The information in this section will help a builder create a building envelope and incorporate energy-efficient mechanical systems, appliances, and lighting into a home that will yield long-term utility bill cost savings and increased comfort for the homeowner. It contains the only requirements to participate in this voluntary program: compliance with the 2003 International Energy Conservation Code, use of ACCA manuals to size HVAC equipment, and third party plan review to verify compliance with the section.

• **Water Efficiency**—Although the relative importance of water availability and usage varies from region to region, the concern with adequate water supply is becoming more widespread geographically. Experience also shows that employing the line items from this section of the guidelines for indoor and outdoor water use can decrease a homeowner's need for water and thus reduce utility bills, regardless of location.

• **Indoor Environmental Quality**—Details in this part of the guidelines will indicate how to effectively manage moisture, ventilation,

and other issues in order to create a comfortable indoor living environment.

• **Operation, Maintenance, And Homeowner Education**—Given the level of effort a builder goes through to create a well thought-out home system, it would be a shame not to give the homeowner some guidance on how to optimally operate and maintain the house. Line items from this section show a builder how best to educate homeowners on a variety of homeownership matters.

• **Global Impact**—There are some issues related to home building and land development that do not fit nicely into the context of the guiding principles. The global impact principle addresses items that are a by-product of home construction.

The NAHB Model Green Home Building Guidelines are intended for mainstream home builders, many of whom are already incorporating some green building methods and materials into their construction practices. These guidelines will help standardize the green design and construction process and assist the builder toward incorporating more green building features into homes. **UHD**

Points Required For The Three Levels Of Green Building

	Bronze	Silver	Gold
Lot Design, Preparation, And Development	8	10	12
Resource Efficiency	44	60	77
Energy Efficiency	37	62	100
Water Efficiency	6	13	19
Indoor Environmental Quality	32	54	72
Operation, Maintenance, And Homeowner Education	7	7	9
Global Impact	3	5	6
Additional Points From Sections Of Your Choice	100	100	100

GOT WATER?

rain harvesting remembered and redefined

Terry J. McMains






Rain is captured from canals (scuppers) and caught by artificial catchment basin under landscape cobbles. Water is then directed into 4" drainage lines under the surface which transport the water into underground holding tanks, ready for use.

Rain Harvesting

Rain harvesting has long been viewed as a reliable source of water for much of the world. Fallen rain can be used as a supplemental water supply in some arid regions and is relied solely upon for existence by other parts of the world, including Australia and most islands. Rain harvesting is the act of collecting runoff storm water from what can be a multitude of surfaces and storing the water in either above-ground or below-ground tanks from which water can be pulled from as a dependable water supply. This is a well-practiced concept in most arid regions around the world and is currently being viewed as a valuable option for builders, developers, and municipalities as a means of supplying supplemental water to new homes. Parts of Europe, including Germany, see rain harvesting as a way of life, considering rainwater is a much healthier water, costs less to treat, and is free; all you really have to do is hold out your hands. The beauty of water features being run by rainwater and plants being fed by rainwater, which they thrive on, adds a sense of being connected to nature that simply cannot be accomplished any other way than living in harmony with rainfall.

Water-harvesting systems built into new home design can present unique opportunities to reflect the ability of enhancing

synopsis

-  Water-harvesting systems built into new home design can present unique opportunities to reflect the ability to enhance the home's personality.
-  Though it is unknown when the rain will come, even minimal amounts of annual rainfall can produce much of the water that is used for non-potable commercial and residential uses.
-  Rain-harvesting systems are generally comprised of five major components: capture, conveyance, tanking, filtration, and distribution.

the home's personality. The design and installation of replicated stream beds, cobbles, and water features offer excellent opportunity to showcase the home's uniqueness. Through careful initial design, water features within the home with flowing rainfall adds beauty and sound in any setting.

Sustainable water design in the United States was redefined in new home construction in Santa Fe, New Mexico in recent years. Rancho Viejo de Santa Fe, which is a master planned community located in Northern New Mexico, implemented rain-harvesting systems as a standard on every home built, roughly 120 per year. The water is currently being used for irrigation purposes only. Even with a very xeric landscaped layout, the rain-harvesting systems were able to reduce the amount of fresh water used by approximately 30 percent, which, spread out over hundreds of homes, results in millions of gallons of water saved each year.

"Rain harvesting has allowed Rancho Viejo to demonstrate to our buyers, other builders, and state and local officials the possibilities for water conservation. We have other systems in place to help reduce the impact our homes have on the environment, but rain harvesting is the most important part of reducing the water use of our homes," says Dee Witherspoon, Vice President of Construction for SunCor at Rancho Viejo.

Once the benefits were understood by local municipalities and the County of Santa Fe, an ordinance was created, which required any new structure, commercial or residential, of a certain square footage parameter, to have a rain-harvesting system as a supplemental water supply for irrigation purposes. This is the first municipal entity in the United States to require rain harvesting; the City of Santa Fe is soon to follow. Other cities, such as Seattle and Portland, are currently developing incentive-based programs for such efforts as well. Cities and developers in other dry regions, like Southern Arizona, are also working on developing incentive-based off-set programs of their own to reward such efforts.

A Viable Water Supply

Rain harvesting is a viable water supply even in dry regions. Though it is unknown when the rain will come, even minimal amounts of annual rainfall can produce much of the water that is used for non-potable commercial and residential uses. Recent calculations were completed for a potential test pilot project in Southern Arizona, which reflected annual gallons-saved estimates. The project would consist of 5,400 homes, sized an average of 1,500 square feet each. The results were astounding; this rooftop area with the average rainfall would yield a potential capture of 81 million gallons of water saved every year. For calculation purposes, 1,000 square feet of capture area with one inch of rainfall will produce approximately 630 gallons of usable water. Consider that this



Hole preparation for large modular rain-harvesting system. Excavation should be level and compact for modular designs.

"Rain harvesting is the act of collecting runoff storm water from what can be a multitude of surfaces and storing the water in either above-ground or below-ground tanks from which water can be pulled from as a dependable water supply."

Two 1200-gallon holding tanks connected to create 2400 gallon capacity for new custom home.





Sand and gravel backfill mixture is used between modular tanks and impermeable liner for structural support and to provide a means of underground purification for water being held. The liner creates an artificial aquifer environment from which water is extracted from the modular tanks.



Large rain-harvesting system completed, ready for backfill and final grading above tank.

could be applied to tens of thousands of homes built each year; it would easily result in billions of gallons of water saved each and every year.

Harvesting is generally divided into two categories—passive and active. Passive rain harvesting is a means of using landscape and infrastructure design to an advantage where storm water will flow to a specified and normally vegetative area within the landscape, which can absorb and use the water.

Rain-harvesting systems are generally comprised of five major components: capture, conveyance, tanking, filtration, and distribution. Capture and conveyance refer to the process of actually capturing the water from the

rooftop or surface and draining these capture points into well-designed drainage plans, which empty the lines into an above- or below-ground tank.

Underground tanks are preferable because of the lack of sunlight, which promotes algae growth, but also because they do not take up the surface area nor are they an eyesore, which above-ground tanks are often accused of. The level of filtration wholly depends on the intended use. If the water is to be used only for irrigation, there is little filtration necessary. If the water is intended for potable use, there is more filtration necessary. All other purposes fall somewhere in between. Many types of tanking solutions exist including steel, concrete, stone, plastic,

and modular to name a few. Simple polypropylene tanks are often the least expensive solution, however, technologies exist that can capture large amounts of rainwater and actually clean the water while underground, by creating a natural hydrologic effect. Costs of rain-harvesting systems depend largely on the amount of storage needed and project layout, but typically fall in the two- to three-dollar-per-gallon range. The water can also be used for a multitude of non-potable uses other than irrigation, including flushing toilets, washing clothes, and providing water for evaporative coolers. Other possibilities that exist for harvesting water, such as rooftop gardens, porous paving, and road drainage, are all viable solutions for providing supplemental water for new home design.

Rain harvesting will become an integral part of how we consider building sustainability into future projects. We need to rethink how we are building and how we can use what is given to us freely to our advantage and for our existence. There are good reasons for most other arid regions of the world to look at harvesting as a solution. Considering the reductions in water availability and the anticipated population growths, it will become a way of life for us as well, and once again for good reason. **UHD**

The Author

Terry J. McMains is President of Aqua Harvest, a rain-harvesting design, consult, and construction firm in New Mexico. Mr. McMains saw the inception of rain harvesting on a community scale and has since implemented rain-harvesting systems and design in commercial, residential, and master-planned communities. Mr. McMains is working with developers, builders, and municipalities in several states developing programs to implement rain harvesting as a viable water supply in all sectors. Mr. McMains is a State Director for the New Mexico Home Builders Association as well as National Director for the National Association of Home Builders. Terry can be reached by email at terry@aquaharvestonline.com or by telephone at 505 473 7776.

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Part II: The Relationship Between The LEED for Homes Rating System And Your Project Goals

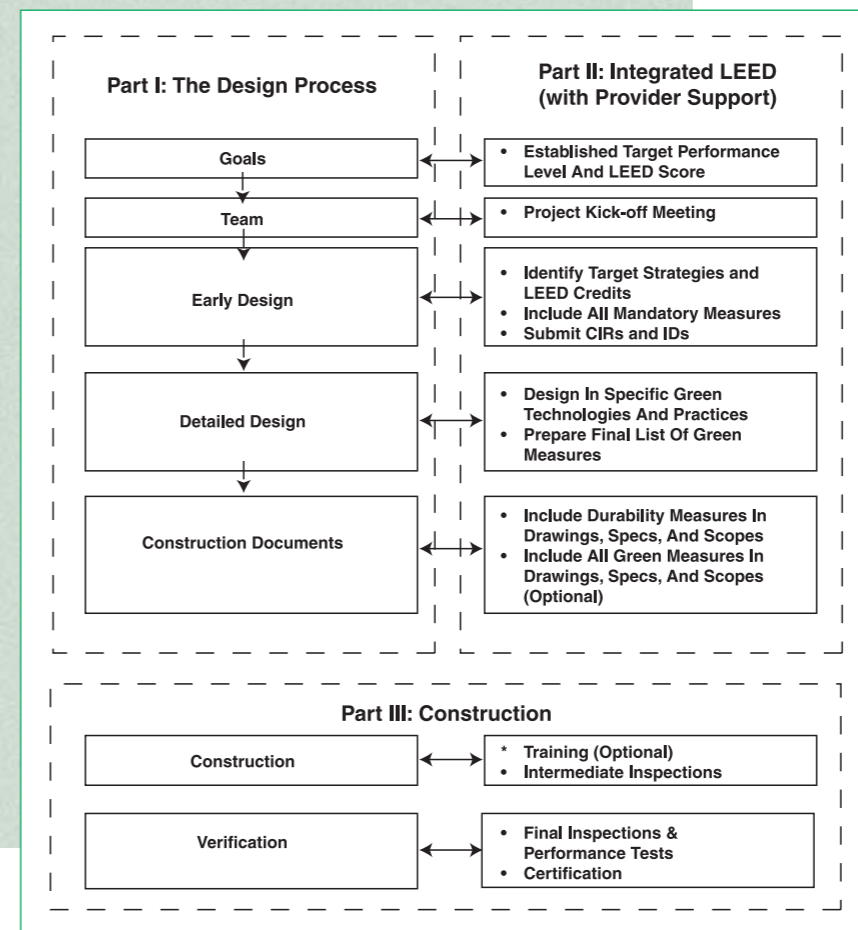
Overview

The U.S. Green Building Council's LEED-NC program has received a phenomenal amount of media attention. With this market leadership, LEED® (Leadership in Energy and Environmental Design) has become the de facto standard for green building in the commercial building sector. The LEED for Homes pilot Rating System is built on the success of LEED-NC, but has been structured very differently to better meet the needs of the home building industry. Specifically, LEED for Homes has:

- Rating measures, standards, and processes designed around the way the home building industry works;
- Three tiers of green measures (e.g., good, better, best) that are intended to guide builders from current practice to incrementally deeper levels of green; and
- A very streamlined and builder-friendly delivery system that is administered by organizations called LEED for Homes Providers. Providers are contracted to provide full-service support to builders in specific local and regional markets.

The pilot phase of LEED for Homes started in August of 2005 and runs through December 2006. The purpose of the pilot is to perform a limited test of the rating system before it is used more broadly. At the end of the pilot, based on lessons learned, the LEED for Homes initiative will be rolled out nationally.

(Exhibit 1) Schematic Diagram of Steps Required to Integrate the Design of a Home with LEED for Homes



"After the commitment is made to build a LEED Home, the specific project goals need to be established. These goals may include a broad range of aspects of the home, such as size, style, number of rooms, level of finish, etc., as well as specific performance goals, such as zero net energy."

When home builders take a first look at LEED for Homes, the most common questions they ask are:

1. What green features are required in a LEED Home?
2. What is the certification process for a LEED Home?
3. How much does it cost to build a LEED Home?

This article answers all three of these questions. In the last issue of *Ultimate Home Design*, we published Part I of this three-part article series called, "Before Home Construction Begins—The Design Process." This earlier article recommended valuable first steps for new projects. Key points in that article were that building a LEED Home requires new green home building skills and careful planning. The LEED for Homes Rating System is a useful tool to measure the level of "green-ness" of a home after it is completed. But, the up-front design team and design process are the most critical ingredients in assuring that the green measures are designed into the home in both a cost-effective and well-integrated manner.

In the next issue, we will publish a third article on integrating LEED for Homes into the construction and quality control processes.

A schematic overview of the home design and construction process is presented in Exhibit 1. This graphic has three dotted boxes in it, each representing one of the articles in this series.

What Green Features Are Included In A LEED Home?

There are several critical steps to planning a LEED Home. These steps were identified in last issue's article. A brief summary of how green measures should be selected and integrated into a LEED Home is provided below.

synopsis

- The pilot version of the LEED for Homes Rating System has a total of 108 points.
- The goals of the project need to be stated in terms of the performance attributes of the home (not just in terms of the number of LEED points), and the benefits to both the builder's team and the ultimate occupants of the home.
- Design consultants may be needed to complement the set of skills and experience of the existing team, to enable you to effectively address the targeted set of design strategies for your LEED Home.
- The design team needs to explore design options and technologies that are available in the marketplace, and often weigh and resolve goals that may sometimes conflict.

Step 1: Establish Goals

After the commitment is made to build a LEED Home, the specific project goals need to be established. These goals may include a broad range of aspects of the home, such as size, style, number of rooms, level of finish, etc., as well as specific performance goals, such as zero net energy. From the LEED for Homes perspective, there are two critical goals to be established:

1. What performance level is desired (Certified, Silver, Gold, or Platinum)?
2. How many LEED for Homes points are needed? (See table below.)

Performance Level	# of LEED for Homes Points Needed*
Certified	>= 30 Points
Silver	>= 50 Points
Gold	>= 70 Points
Platinum	>= 90 Points
* for an average-sized home	

Bear in mind that the pilot version of the LEED for Homes Rating System has a total of 108 points. Thus, the achievement of Gold or Platinum performance levels requires a commitment to adopt the majority of the measures included in the LEED for Homes Rating System.

Another significant aspect of LEED for Homes is the Home Size Credit (Materials and Resources Credit #1). This credit rewards homes that are smaller than the national average by awarding them up to 10 points. Effectively, this credit reduces the number of points required for each performance threshold (Certified, Silver, etc.) as the home size decreases, with a maximum reduction of 10 points (e.g., Platinum is as low as 80 points). Conversely, homes that are larger than the national average must achieve additional points at each performance threshold, increasing in proportion to how large the home is. For example, a home that is 6,000 square feet would need to achieve an additional 20 points for each performance threshold—e.g., 90 points for Gold—and would not be able to achieve Platinum. This credit is intended to recognize the inherent resource efficiency of smaller homes and the greater per-occupant consumption of materials and energy associated with larger homes.

Step 2: Communicate With Project Team

Once the project goals have been established, they should be communicated to all of the project team members. This is often done by means of a project kick-off meeting. Ideally,

each member of the project team should have the opportunity to weigh in on the goals and to air and resolve their different views and concerns before the project moves forward. A valuable outcome of a kick-off meeting is to get early buy-in from the team members that the project goals are achievable.

A project kick-off meeting is also an excellent forum to share the valuable message with the team members of the benefits of LEED for Homes measures. The goals of the project need to be stated in terms of the performance attributes of the home (not just in terms of the number of LEED points), and the benefits to both the builder's team and the ultimate occupants of the home. From the start, the project team needs to understand that the goal is a better performing home that is built to higher standards. Perhaps most importantly, the project team needs to understand that the home will be inspected and performance tested to ensure that the performance goals are met.

Step 3: Develop Early Design Strategies

Once the team has an aligned vision of the LEED Home to be built, the project team may follow one of two paths:

- A. Refine an existing set of home plans, or
- B. Develop a brand new design from scratch.

In the first case, an initial assessment of a current home design is needed. This detailed plan review includes:

- Identification of green features in the current design, if any.
- Assessment of key aspects of the home's performance, e.g., envelope and duct tightness, and whether further improvement is possible or desired.
- Evaluation of how effectively the plans convey the pre-existing green measures.
- Determination of the number of points awarded in LEED for Homes for those measures.
- Identification of strategies (general measures and/or credits) to add to the home's design and construction to reach the performance goals established earlier, in Step 1.


If you are starting from scratch, the focus should be on identifying specific green strategies to be pursued. For example, each LEED for Homes credit is structured as a general green strategy, and its sub-credits offer the more detailed approaches available for adopting that strategy, in many cases representing increasing levels of performance.

In some cases, design consultants may be needed to complement the set of skills and experience of the existing team, to enable you to effectively address the targeted set of design strategies for your LEED Home. Look for demonstrated experience as the primary criterion for selecting consultants.

(Exhibit 2) List Of Design-Related Credits In LEED for Homes

Resource Category	Description Of Measure
LL Location and Linkages	LL 2 Site Selection LL 5 Compact Development
SS Sustainable Sites	SS 2 Landscaping
WE Water Efficiency	WE 1 Water Reuse WE 2 Irrigation System
IEQ Indoor Environmental Quality	IEQ 3 Humidity Control IEQ 4 Outdoor Air Ventilation IEQ 5 Local Exhaust IEQ 6 Supply Air Distribution IEQ 8 Contaminant Control IEQ 9 Radon Protection
MR Materials and Resources	MR 1 Home Size MR 4 Durability Planning MR 6 Waste Management
EA Energy and Atmosphere	EA 1 ENERGY STAR for Homes OR EA 2 Insulation Per ResCheck EA 6 HVAC Manual J EA 7 Hot Water System Design EA 8 Lighting System EA 10 Renewable Energy EA 11 Refrigerant Management
ID Innovation and Design Process	ID 1-4 [Project-specific Proposals]

One critical step for both types of projects is to carefully review the mandatory measures. It is easy to push them aside, accepting that you have to do them, and instead focus on the immediate decisions at hand—what other green measures will you choose to include in the home? How will you earn points? But the mandatory measures need to be thoughtfully addressed and deliberately included in the home's design.

Note that several LEED for Homes credits have a substantial design component. These credits are listed in Exhibit 2. On the LEED for Homes checklist (available for download at www.usgbc.org/leed/homes), these credits have the symbol  shown next to the credit number. Because of the detailed design required for such credits, visual inspection by a third-party LEED rater is not sufficient to determine if the intent of the credit has been met. To address these unique credits, an Accountability Form has been developed to enable the

(Exhibit 3) List Of Credits With Cross-Discipline Benefits

Categories	Description Of Credits
LL and SS	Site Selection (LL 2) and Site Stewardship (SS 2)
SS and WE	Landscaping (SS 2) and Irrigation (WE 2)
SS and EA	Shading of Hardscapes (SS 3 to Minimize Heat Island Effect)
WE and EA	Hot Water Distribution (EA 7 to Minimize Waiting for Hot Water) Low-Flow Shower Heads (WE 3 to Minimize Hot Water Use) Appliances (EA 9 for Water Efficient Clothes Washers)
IEQ and MR	Low-Emission Materials (MR 5 to Use Healthier Materials) Durability (MR 4 for Improved Moisture and Water Management, Mold Avoidance)
IEQ and EA	Humidity Control (IEQ 3 to Improve Comfort by Reducing Loads Not Met by A/C System) Mechanical Ventilation (IEQ 4) and Air Sealing (EA 3) Combustion Safety (IEQ 2) and HVAC Equipment (EA 6) Fireplaces (IEQ 2), Local Exhaust (EQ 5), and Air Sealing (EA 3) Supply Air Distribution (IEQ 6) and Duct Sealing (EA 5)
MR and EA	House Size (MR 1 to Promote Smaller Energy Footprint) Durability MR 4, including: Uncontrolled Air Flow (EA 3) Uncontrolled Heat Flow (EA 2) Uncontrolled Solar Radiation (EA 1 and EA 4)

builder's designated responsible party to sign off on the credit. (The Accountability Form is included in the rating system, which can also be downloaded at www.usgbc.org/leed/homes.)

It is also important to note that many of the LEED measures have multiple benefits, which often cross over the rating system's five main resource categories. Several examples are provided in Exhibit 3. The real challenge with these measures is to be sure that the design team is aware of their multiple

benefits. Often due to unfamiliarity with a measure, it may be perceived by some team members as of limited value (i.e., offers little benefit for the cost). However, the design team is likely to be more supportive of including the measure in the home design if they are aware of the multiple benefits these credits confer.

At this early point in the design, if you need clarifications or if there are questions about how to qualify for specific credits, the project team must prepare and submit Credit Interpretation Requests (CIRs) to the Provider. Further, if you want to include creative green measures that are not included in the LEED for Homes Rating System, now is the time to submit requests for Innovation and Design Process (ID)

credits. Both CIRs and IDs must be approved by the LEED for Homes Technical Advisory Sub-Committees. Since this process takes several weeks, it is best to get these submitted as early as possible to avoid delays at the final certification phase.

Step 4: Complete Detailed Design

With agreement on the general design strategies, the project team now needs to flesh out detailed approaches to address each of the selected strategies. They need to explore design options and technologies that are available in the marketplace, and often weigh and resolve goals that may sometimes conflict. For example, you may wish to use an insulation material

that offers the highest possible R-value (thermal resistance) and embodies the lowest possible risk of toxicity across its entire life cycle.

Depending on the project team's familiarity with the various design options and products, some research may be needed. Generally, the goal of this research should be to identify proven technologies that will cost-effectively fulfill the desired strategies.

Step 5: Complete Construction Documents

Upon completion of the design phase of the project, the construction drawings, specifications, and scopes of work are created. The builder/contractor and subcontractors will rely on

these documents to know both what measures are to be installed in the home and how to install those measures properly.

All of the LEED for Homes measures—including the durability measures in the durability plan (credit MR 4)—should be explicitly included in the drawings, specifications, and scopes of work. The best way to ensure that the LEED for Homes measures are properly installed in the new home is to accurately detail each of these measures in the construction documents.

The Certification Process

The USGBC has selected 11 LEED for Homes Providers for the pilot. The

Providers are responsible for the following aspects of LEED for Homes projects:

- Recruiting of builders
- Selection of pilot projects
- Initial LEED for Homes design review and pre-construction rating
- In-progress inspections, as needed
- Final inspections, performance tests, and LEED for Homes certification
- General builder support

As part of this process, the Providers create a project documentation file for each LEED home. This project file includes a completed LEED for Homes checklist and a few additional forms as needed for specific LEED for Homes credits.

Providers are also responsible for the selection, training, supervision, and

assignment of on-site green raters. These field raters perform the visual inspections and performance testing of LEED Homes.

All things considered, the overall certification process for a LEED Home should take between two and four person-days, and requires the completion of four to eight single-page forms. Additional details of the certification process will be provided in the next article.

Cost Of A LEED Home

Preliminary information suggests that a LEED Home will cost about 3 to 4 percent more than a home built to code, including the cost of the third-party LEED for Homes certification process. It is difficult to generalize,

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because construction and land costs vary substantially across the U.S. As an example, for a 2,000-square-foot home costing \$300,000, the additional cost of the green measures for a Certified LEED Home might be between \$9,000 and \$12,000. If these costs are amortized over a 30-year mortgage, at today's interest rates with a 20-percent down payment, the monthly cost of these green measures would be approximately \$45 to \$60 per month. In other words, a LEED Home—built with measures intended to provide better health, comfort, durability, and environmental stewardship—would cost only about \$1.50 to \$2 a day more to buy, compared to a code home.

However, the utility bills for a Certified LEED Home will be 25 to 35 percent lower. Energy bills for a typical home built to code might be about \$2,000 a year, or \$167 a month (varying greatly depending on local utility rates), yielding energy savings of \$40 to \$55 a month. Water savings could be an additional \$10 to \$15 a month. So the monthly utility savings from a LEED Home almost exactly offset the additional cost increment of the green measures.

The bottom line is that the monthly cost of a code home and a Certified LEED Home are the same (including

both the mortgage payment and the utility bills). Which one would you choose? It seems like an easy decision to select the LEED Home.

Case study information is being gathered in the pilot. This information will provide more specific data on the cost of a LEED Home in various geographic locations and for various home sizes.

Summary

To effectively design a LEED home, several critical steps need to happen in a specific sequence. If any of these steps are overlooked, a substantial amount of extra effort may be needed to ensure that the home is able to fully meet the LEED for Homes requirements. In some cases, a missed step—for instance, overlooking a mandatory measure—could mean completely missing the opportunity for compliance with LEED for Homes.

To minimize the risk of missing an important step in the design of a LEED Home, the following suggestions are offered:

1. Start the integration of the home design and construction activities at the earliest possible phase of the project (i.e., goal setting or programming).
2. Include the whole project team in the LEED planning activities starting as

soon as possible. All project team members should develop specific metrics to assess aspects of the home's performance for which they are responsible.

3. The integration process should be highly interactive and iterative. Map out decision points and critical path interactions among team members, and track the schedule carefully.

4. Plan to achieve several more LEED points than are needed for the target certification level (e.g., plan to earn at least 53 points if you are planning to achieve 50 for the Silver performance level).

5. Include all LEED for Homes measures explicitly in the construction drawings, specifications, and scopes of work.

This approach will keep the whole design team on the same page in terms of the overall project goals and their respective roles in achieving those goals.

More details on ensuring the quality of the completed home will be in the final article in this series, entitled "Integrating LEED Into The Construction Process." This article will address the mechanics of building and verifying a LEED Home. It will also address the selection and training of subcontractors. **UHD**

The Authors

Jay Hall, Ph.D., has been consulting with the USGBC on the development of LEED For Homes for the past two years. His background includes 20 years developing voluntary market transformation programs including several of the U.S. EPA's ENERGY STAR initiatives and Fannie Mae's Emissions Trading Initiative. Since 1995, he has managed the consulting team that developed and supported the EPA's ENERGY STAR For Homes program. He resides in Annapolis, Maryland.

Ann V. Edminster, M. Arch., LEED AP v2.0, has designed more than 100 remodels and spent the last decade as a green building consultant. She is a member and past co-chair of the LEED Materials & Resources Technical Advisory Group. She has worked with the USGBC's LEED Homes Committee since its inception and served as its chair and co-chair for the past four years. Ann resides in Pacifica, California, and can be reached at Design Avenues, 650 355 9150 or avedminster@earthlink.net.

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Universal Design Homes Continue To Grow

as a popular approach in new home construction

Ray Adams

Introduction

There is a big change happening in home design as elements move past basic aesthetics and toward functionality. Universal design seeks to provide ease of use and accessibility, while still incorporating aesthetically pleasing elements that add value to the home. The home industry now requires products and construction methods selected for universal design to be long-lasting, safe, and effective.



Coastal Industries' Paragon 3/8-inch Swing Door offers a stylish alternative when incorporating a custom shower enclosure in the bath.

synopsis

The general public is very uneducated about universal design, and just like the general public, builders, designers, and remodelers fail to receive the proper education.

Universal home design is gaining popularity because homeowners realize the long-term benefits of incorporating these easy-living features, which extend the time they will be able to enjoy their home.

Mettina van der Veen, Program and Replication Project Director for the EasyLiving Home program (a voluntary certification program, which promotes basic access for everyone), says that the EasyLiving Home program requires a minimum of universal design features—a zero-step entrance, wider doorways, a full bath with ample maneuverability, and a bedroom, kitchen, and entertainment area on the main floor. Utilizing these elements in the home makes an entire property accessible and demonstrates a commitment to providing quality living spaces for all.

"Universal design seeks to provide ease of use and accessibility, while still incorporating aesthetically pleasing elements that add value to the home."

Misconceptions Of Universal Design

The general public is very uneducated about universal design and, just like the general public, builders, designers, and remodelers fail to receive the proper education. "Many builders think 'handicapped' and 'handicapped homes' do not sell easily, therefore, do not support universal design," says van der Veen. "Builders seem to be willing to add universal design features if the customer requests it, but do not want to incorporate it as the standard for their homes, and also complain that they do not know where to buy universal design products."

Building The Accessible

There are more than 50 million Americans with disabilities. A 1990 study by the Department of Education found that more than 20.3 million families in the U.S. have at least one member with a disability. The percentage of people with disabilities is larger than any single ethnic, racial, or cultural group in the world. Understanding the dimensions of the American population as a builder, designer, or remodeler will help you understand the important need for universal design elements in the home.

Universal home design is gaining popularity because homeowners realize the long-term benefits of incorporating these easy-living features, which extend the time they will be



DIVA De Provence is a premier manufacturer and designer of induction cooktops such as this three-burner cooktop.

able to enjoy their home. These homes provide independent living to a number of audiences such as children, people with disabilities, and the aging "baby boomers." All have unique needs that these design elements address.

"Those considered 'baby boomers' are living longer, and the increasing trend is for most to stay in their homes for as long as possible," says Rosemary Abell, Design Consultant for DreamMaker Bath & Kitchen of the Triangle. "Therefore, in order to be able to remain independent without the risk of falling and being injured, living areas need to be designed to support the needs of this generation," added Abell.

Education On New Design Elements

There are a number of seminars and classes that feature products, technology, and applications related to environmentally friendly practices, health and safety, and design. The understanding of homeowners' needs now, and in the future, will make you a more valuable addition to your design and



Vitra USA's Corina is ADA-approved and is also enhanced by its V3 Technology, standing for vacuum, velocity, and vortex.

development team. Van der Veen says that builders, designers, and remodelers can take the Certified Aging in Place Specialist training offered through Home Builders Associations and can also get technical support as an enrolled EasyLiving Home Builder (www.easylivinghome.org).

Below are some products that will jump-start your universal design education. If you're looking to become more familiar with some products in this area, look no further than the highlighted products below.

Toilets Add Versatility And Beauty To The Bath

With the rise of universal design, Vitra USA (www.vitra-usa.com) created a toilet to meet the criteria set forth by the American Disabilities Association (ADA) and also enhanced the system by installing its V3 Technology. New for 2006 is Vitra's ADA Corina V3 Technology system. The two-piece high-performance toilet is a variation to the traditional V3

Technology and features a top seat 17 inches from a finished floor—the recommended seat height in accordance with ADA standards.

Vitra's V3—Vortex, Velocity, Vacuum—is the perfect performance trio utilizing superb flushing technology. The V3 is a gravity toilet that has a performance comparable to Pressure Assist systems, which delivers discharge capabilities in a quiet environment.

Induction Stoves Create A Family-Friendly Kitchen

Creating a family-friendly kitchen is very important in universal design because so many hidden dangers arise in the kitchen area. Diva de Provence (www.divadeprovence.com), a leading manufacturer of professional-grade cooking equipment, provides induction cooktops that utilize electromagnetic energy to heat only the cookware and stay cool to the touch. While the food cooks, the surface remains cool, thus providing the safest cooking surface on the market for homes with young children. Diva Induction cooktops heat food faster and boil water in half the time of even the most powerful gas or electric ranges. This rapid heating process increases efficiency, saves both time and energy, and is safe for the children in the home.

Shower Seats Are A Sleekly Designed Necessity

The Trident Shower Seat from Bristol and Bath, (www.bristolandbath.com), has an adjustable height, which can be easily set for each family member. From women who enjoy the comfort of sitting while they shave their legs or wash their hair, to the disabled, this seat is a necessity in every shower. Made of the finest products, this well-built shower seat has a carrying weight of 300 pounds. The Trident Shower Seat is also sleek in design, creating a peaceful and elegant shower environment that truly makes showering an experience.

"The Shower Seat is one of our most versatile products," says Bryan Melville, Director of Bristol and Bath. "It can easily slide out of the way when not in use."

Shower Doors Are Crucial To Universal Design

Flat walk-in units and open showers are a necessity for the elderly and disabled. Shower enclosures are essential to this beneficial bathroom design. Most shower door manufacturers, like Coastal Industries (www.coastalind.com), also provide a variety of stylish finishes in order for homeowners to coordinate an entire look and feel of the bath, while still accommodating all members of their family.

"Reachable" Shelves

Making shelving and countertops a height that is reachable for all members of the household is a design element that is often overlooked, yet can be accommodated for in many ways.

"I am doing a universal access bathroom design right now and have found the coolest closet hardware for a very short person or someone who is wheelchair-bound," says Mark Lambert, owner of DreamMaker Bath & Kitchen of Bellingham, Washington. "Rev-a-Shelf, and other manufacturers, have come out with a pull-down closet hanging rod. We use the standard double-level hanging system (42 and 84 inches) except instead of a fixed rod/pole at the 84-inch level there is a hinged rod with a long handle that hangs down at the 42-inch level. This makes it possible for someone in a wheelchair to hang and retrieve clothing from the upper level."

Listen To The Homeowner

"First and foremost, consider the needs and wishes of the homeowners using the finished space when utilizing universal design elements," says Lambert. "Remember, the term 'universal access' does not mean there are standard layouts or products that will work for everyone in every situation."

"Manufacturers now have many more options for universal design than ever before, while the costs of those same products have decreased," adds Lambert. "In the past, you had the option of stainless steel and white. Color selections are now available in almost every product out on the market."

As universal design continues to percolate into the mainstream, more homeowners will begin to see the need for this type of quality living. Society can reap the benefits of having environmentally friendly products in their homes, as well as have a toilet seat



Bristol and Bath's Trident Shower Seat has a carrying weight of 300 lbs. and easily folds out of the way when not in use.

that does not hurt your knees or back. Universal design is the way of the future, and builders, designers, and remodelers need to jump on the bandwagon if they are to stay current with the times. **UD**

The Author

Ray Adams is the President of Coastal Industries, one of the leading manufacturers in the United States. Headquartered in Jacksonville, Florida, Coastal Industries celebrates 34 years of quality and commitment. It produces a complete range of standard and custom bath enclosure products to building supply, building specialty, kitchen and bath, glass and glazing, plumbing, manufactured housing, and recreational vehicle industries. Coastal Industries is a founding member of the Bath Enclosure Manufacturers Association (BEMA) and is a member of the National Glass Association (NGA).

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synopsis

-  While fire sprinkler systems have been in wide use commercially for more than a century, the technology has only recently been applied to homes.
-  The 2006 edition of the NFPA's Life Safety Code (NFPA 101) requires all new, single-family homes constructed in the U.S. to include a fire sprinkler system.
-  Fire sprinklers are increasingly considered part of the state-of-the-art safety features now deemed integral to "smart" homes.
-  The Home Fire Sprinkler Coalition is a non-profit and non-commercial organization that works to educate the public about residential fire sprinkler technology.

New Homes To Include A Fire Sprinkler System

In December of 2005, the non-profit Home Fire Sprinkler Coalition (HFSC) set out to measure awareness of residential fire sprinkler systems and gauge feelings toward builders who install sprinklers as standard new home features. Through a national survey of adults conducted by Harris Interactive®, HFSC found that 45 percent of U.S. homeowners said a sprinklered home is more desirable than a non-sprinklered home, most often citing the added safety that fire sprinklers provide (51 percent).

While fire sprinkler systems have been in wide use commercially for more than a century, the technology has only recently been applied to homes. This is a staggering fact, considering the grim statistics regarding home fires in this country:

installation



- Every 77 seconds, a home burns*
- Each year more than 3,100 Americans die in home fires*
- Eight out of 10 fire deaths in the U.S. occur in the home
- The average monetary loss in a home without sprinklers is \$45,000 versus \$2,500 in a home with sprinklers

* Fire loss in the United States during 2004, National Fire Protection Association, September 2005

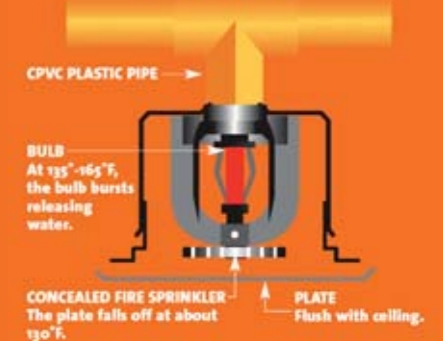
Unbeknownst to most homeowners, they are safer watching a movie in a stadium-sized theatre—or sleeping in a high-rise hotel room—than they are relaxing in their own home.

Recent guidelines by the National Fire Protection Association (NFPA) aim to drastically reduce the number of fire deaths. The 2006 edition of the NFPA's Life Safety Code (NFPA 101) requires all new, single-family homes constructed in the U.S. to include a fire sprinkler system. As this important code change begins to take hold through state and local code updates, it will also serve to educate homeowners and home builders about the effectiveness of residential fire sprinkler systems.

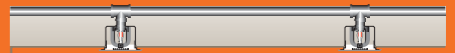
The significance of homeowner and home builder agreement on the importance of fire sprinkler systems cannot be understated. Often seen as "go-to experts" by new homeowners, especially those concerned with sustainable building practices, home builders are the de facto decision-makers when it comes to specifying products and home options. It's no surprise, then, that builders who offer fire sprinklers as a standard new home feature fared very well in the HFSC's recent study, where they were seen by homeowners as being "safety concerned" (70 percent), "innovative" (52 percent) and "caring" (51 percent). Additionally, 39 percent of

"Unbeknownst to most homeowners, they are safer watching a movie in a stadium-sized theatre—or sleeping in a high-rise hotel room—than they are relaxing in their own home."

HOW HOME FIRE SPRINKLERS WORK
Sprinklers cover a minimum 12 X 12 foot area. Extended coverage sprinklers can cover a maximum area of 20 X 30 feet.



Sprinklers are linked by a network of piping, typically hidden behind the walls and ceilings and usually drawing upon household water sources.



Each sprinkler protects an area below, and when heated by fire, activates.



Only the sprinkler closest to the fire will activate, spraying water directly on the fire.

homeowners said they would be more likely to hire such a builder to build their new home over a builder that does not offer fire sprinkler systems as a standard feature.

Fire sprinklers are increasingly considered part of the state-of-the-art safety features now deemed integral to "smart" homes. The Rapid Response™ Home Fire Sprinkler System, for example, is the industry's first branded fire sprinkler system



Sidewall Sprinkler

Concealed Sprinkler

Pendant Sprinkler

Flat Plate

Flush Pendant

designed specifically for homes. Available with an exclusive, 10-year Tyco warranty, the sprinkler system is among the most advanced on the market today, with piping hidden behind the walls and ceilings in finished areas. The most common sprinkler-head application is completely concealed within the ceiling—and no more obtrusive than an electrical outlet. Further, the sprinklers are available in a wide range of finishes and can easily blend into any décor or home design.

“But what about water damage from fire sprinkler activation?” an environmentally-conscious new homeowner might ask. The myth that water from fire sprinklers will create more damage than the fire itself is one of the most commonly held. In reality, a residential fire sprinkler uses only 10 to 25 gallons of water per minute and operates very early in a fire—either extinguishing flames completely, or suppressing heat and minimizing the development of toxic smoke until the fire department arrives. It typically takes only one or two sprinklers to suppress a fire, resulting in immediate and effective control. Additionally, fire sprinklers are very dependable and not likely to activate unless they are damaged, exposed to heat sufficient to cause activation, and/or frozen due to uncontrolled environments.

A hose used by firefighters flows 10 times the amount released by a fire sprinkler system, or 125 to 250 gallons per minute, and under far greater pressure. If sprinklers are not present in a home, fires typically burn for an additional 10 to 15 minutes, before firefighters arrive and begin spraying the structure. By then the fire has grown and spread, often requiring more than one fire hose to get it under control. The result is considerable damage from the fire, as well as water damage from the high-pressure hose.

In terms of fire sprinkler installation, all construction is done simultaneous to home building. In most cases, the sprinkler system is attached to the city water supply. In areas that utilize a well or where water pressure is extremely low, a holding tank may be used. The systems are usually installed after the HVAC, plumbing, and electrical systems have been installed.

An added benefit in “safe home” design is the integration of a residential fire safety and security alarm system. Many companies, such as ADT (a Tyco-owned company), offer this kind of service, integrating fire sprinkler systems with burglar, fire, and smoke alarm systems for total home protection.

Nationally, on average, the cost of a residential fire sprinkler system is roughly 1 to 1.5 percent of the total cost of the new home. Because homes differ in size, style, ceiling finishes, basement or lack of basement access, etc., each residential fire sprinkler system is custom-designed and installed. Most insurance companies offer a 10- to 30-percent discount for installing a fire sprinkler system in a home; thus, over a 30-year mortgage, the average sprinkler system pays for itself. Because the size of the discount varies widely, consumers should shop around for the best discount. Fire sprinkler contractors can also work with homeowners who want to retrofit existing homes with sprinkler systems.

The Home Fire Sprinkler Coalition (HFSC) is a non-profit and non-commercial organization that works to educate the public about residential fire sprinkler technology. Homeowners, builders, and all those interested in learning more can download a variety of free information at HFSC's Web site: www.homefiresprinkler.org.

Tyco Fire & Building Products is a leading manufacturer of water-based fire suppression system components and ancillary building construction products, manufacturing and distributing more than 28 million sprinklers worldwide every year, serving customers in residential, commercial, industrial, and institutional building projects. It continually expands its capabilities through aggressive research and product development to provide its customers effective fire protection and construction solutions. More information about Rapid Response can be found at www.tyco-rapidresponse.com. **UHD**

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Residential Solar Electric Systems

Q & A

Gary Reber

synopsis

PV cells absorb energy from photons emitted by the sun. The absorbed light energy elevates the voltage of electrons in the PV cell. These energized electrons flow through an electrical circuit, generating electric power.

A utility grid-tied solar electric system is designed to meet all or a portion of your daily energy needs.

A fixed PV system is solid-state and has no moving parts, making it the single most reliable form of commercial electricity generation, with very little maintenance required.

Questions And Answers

This article was sourced from Stellar Energy Solutions, based in Healdsburg, California. The company specializes in integrated renewable energy solutions designed for the future.

Q: Are photovoltaics (PV) a proven technology?

A: PV is the single most reliable energy system in existence. Solar electric systems have operated without maintenance for decades, even in the hostile environment of outer space.

Q: How long has PV been around?

A: PV has been used as the primary source of electricity on satellites since the 1950s. Since the 1970s, PV has been used more and more for “earth-based” applications as costs declined tenfold. Today, the PV industry is a billion-dollar-per-year industry with primary markets in developing countries. In many countries, PV is the most reliable and less costly form of electricity available.

Q: How do photovoltaic systems work?

A: PV cells absorb energy from photons emitted by the sun. The absorbed light energy elevates the voltage of electrons in the PV cell. These energized electrons flow through an electrical circuit, generating electric power.

Q: How are photovoltaic systems used?

A: Photovoltaics (PV) have been used for many applications over the past 50 years, wherever reliability is critical and sunlight is available. As the price of PV has dropped, applications have expanded from satellites to remote locations, to urban grid-connected residential and commercial installations.

Q: What is a utility grid-tied solar electric system?

A: “Grid-tied” means that your system is connected to the utility lines or the grid. A grid-tied solar electric system is designed to meet all or a portion of your daily energy needs. This connection enables you to get the balance of your electricity from your local utility; it also allows you to send excess solar electricity back to your power company.

Q: Can I use a utility grid-tied solar system as a back-up source during a utility power outage?

A: A utility grid-tied solar electric system can continue to provide electricity to your home during an outage if it has a bimodal inverter and batteries. Stellar Energy’s solar electric battery back-up systems (Stellar Power-up solution) are specially designed to provide power to such critical loads as refrigerators, furnaces, well pumps, lights, security systems, and computers. In the case of a power outage, the Stellar Power-up solution will automatically provide power to your critical loads, without you having to even push a button. This type of back-up solution will add \$3,000 to \$5,000 to the cost of a regular grid-tied solar roofing system.

Q: Does my system have to include batteries?

A: No. Batteries are only essential if you want to have ‘bacup’ power in the case of a utility outage. Otherwise, your utility grid-tied PV system will send any excess generated electricity back to the utility, thus using the utility grid (rather than batteries) as the storage medium.

“...PV is the most reliable and less costly form of electricity available.”

Q: Can I sell excess solar electricity back to my utility?

A: Some electric utilities, for example in California, will give retail credit to solar customers who feed excess electricity back to the power grid. Known as “net metering,” this utility policy helps you save money on your utility bill by slowing down your electric meter or spinning it backward. You will typically use that credit up during that month. In California, you must use all accumulated credit by the end of the year or it will be lost. This is why it’s important to correctly size your system.

Q: How do I know what size system I need?

A: The best indicator for sizing a solar electric system is your historical electrical usage, or the number of kilowatt-hours (kWh) you consume each month. It is especially important to determine an annual average of your kWh usage, because many families experience seasonal spikes in usage. This average gives you a starting point for comparing the energy output of various systems. Contact your local utility company to request a detailed summary of your recent monthly electric usage.

Q: What happens if the sun doesn’t shine?

A: Your utility grid-tied solar electric system will continue to produce electricity during cloudy weather, although the total amount will be reduced. Power will automatically be provided through your utility connection at night or during inclement weather.

Q: What kind of maintenance does a PV system require?

A: A fixed PV system is solid-state and has no moving parts, making it the single most reliable form of commercial electricity generation, with very little maintenance required. In areas where it does not rain for many months at a time, solar panels can accumulate dust and dirt. Washing systems a few times a year during the summer months is recommended in such climates. Performance impacts from soiling are marginal, particularly in climates where it rains at least once a month.

Inverters, the piece of equipment that converts the DC power from the solar modules to AC power for use in your home, will usually require maintenance in 15 to 20 years. Whether it’s a circuit board or fan motor, you should expect some cost in maintaining this piece of equipment. The California Energy Commission (CEC) requires all inverter manufacturers to provide a 5-year warranty. Other states may have warranty requirements. Some manufacturers offer 10-year warranties and still others offer additional 5- and 10-year warranties for an added fee. These longer-term warranties may help you avoid out-of-pocket costs down the road.

Q: Does tilting a solar electric system improve its performance?

A: One factor in the performance of a PV system is how directly it faces the sun as the sun moves across the sky. Some systems track the sun’s movement, but under many conditions, the additional costs, space requirements, and maintenance fully offset the increased efficiency. While flat systems produce more power than slope systems during peak summer periods, an optimal tilt angle to take advantage of peak summer production ranges from 15 and 30 degrees, depending on your latitude.

Q: How long does a PV system last?

A: Most PV systems have a 30-year design life. PV modules carry 20- to 25-year power guarantees from their manufacturers. Most solar modules degrade at approximately one percent per year, so at the end of 30 years, your system will still be generating close to 70 percent of its original output.

Q: Isn’t solar electricity expensive?

A: The after-tax cost of a “grid-tied” (no battery backup), system powering 25 to 100 percent of a typical home’s load is \$10,000 to \$40,000 or \$60 to \$240 per month. PV systems increase a home’s resale value, so if you finance the system, you will pay your electric bill at the bank and enjoy the appreciation. Buying a PV system today locks in your electricity cost at current prices for 20+ years while utility rates may climb.

For more information, please contact Stellar Solar Solutions at 888 242 8701 or visit www.stellarenergy.com. **UHD**

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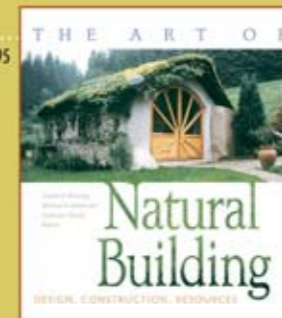
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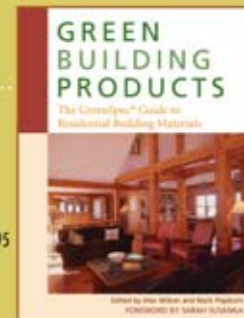
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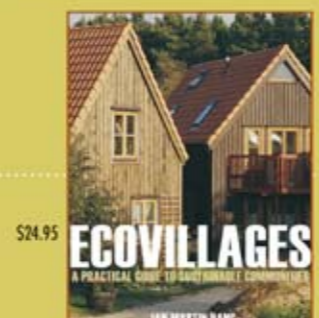


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