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Subscription Rate

Ultimate Home Design is published bimonthly (six times a year) by Ultimate Home Design, Inc., 27645 Commerce Center Drive, Temecula, California 92590.

• \$30.00 six issues (U.S.), \$37.00 (Canada/ Mexico), \$50.00 (International Air Mail), Newsstand \$5.95 (U.S.) & \$7.50 (Canada)

• Back Issues: \$6.00 (U.S.), \$8.00 (Canada/ Mexico), \$10.00 (Outside North America).

• Special Editions: \$10.00 (U.S.), \$12.00 (Canada/Mexico) \$20.00 (Outside North America) Newsstand \$9.95 (U.S.) & \$13.50 (Canada)

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POSTMASTER: Send address changes to *Ultimate Home Design*, 27645

Commerce Center Drive, Temecula, CA 92590.

Retailer distribution, circulation, and advertising inquiries should be directed to the publisher.

Send subscription orders, address changes, adjustments, back issue requests, correspondence, and inquiries to *Ultimate Home Design's* Temecula office.

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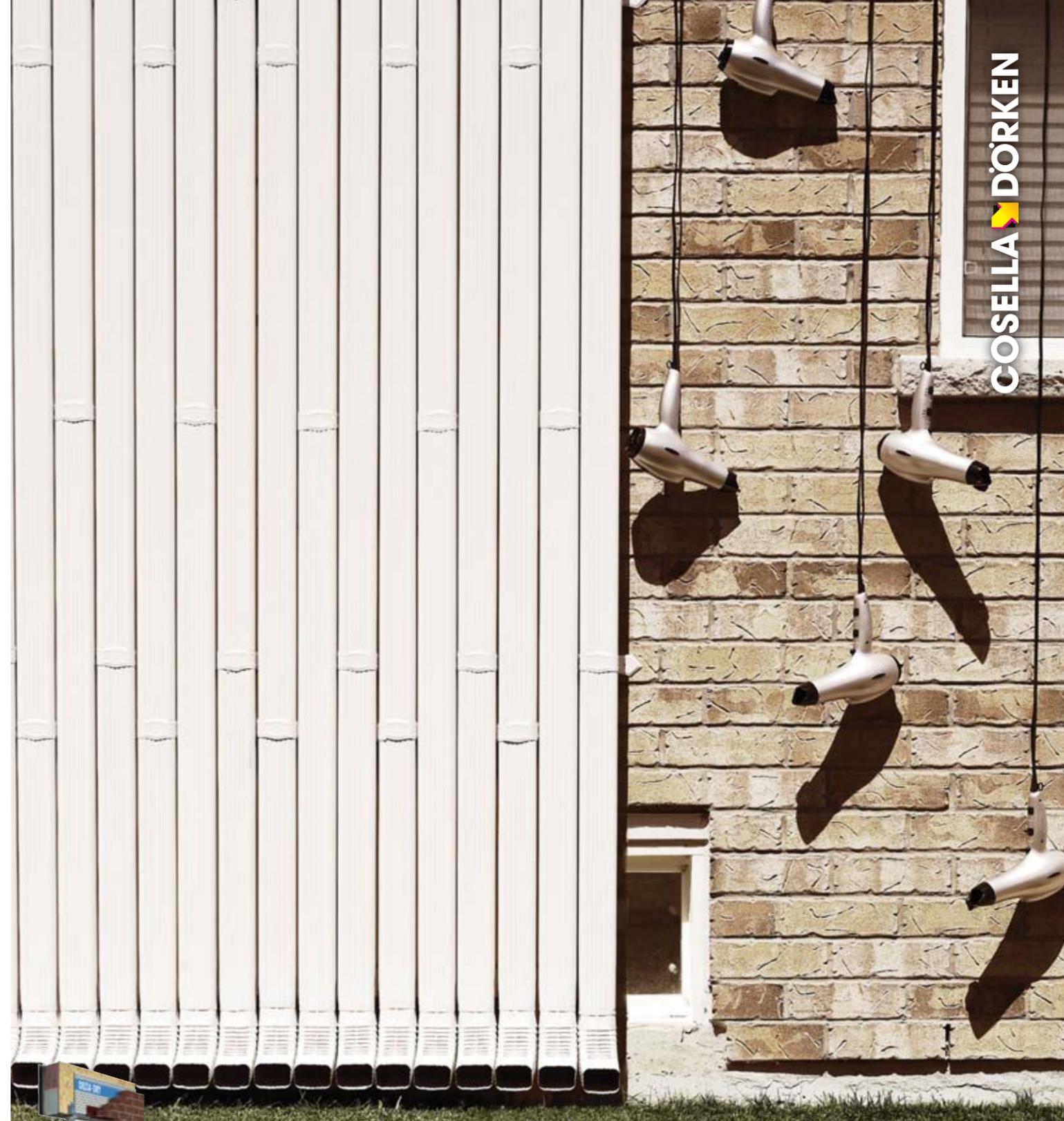
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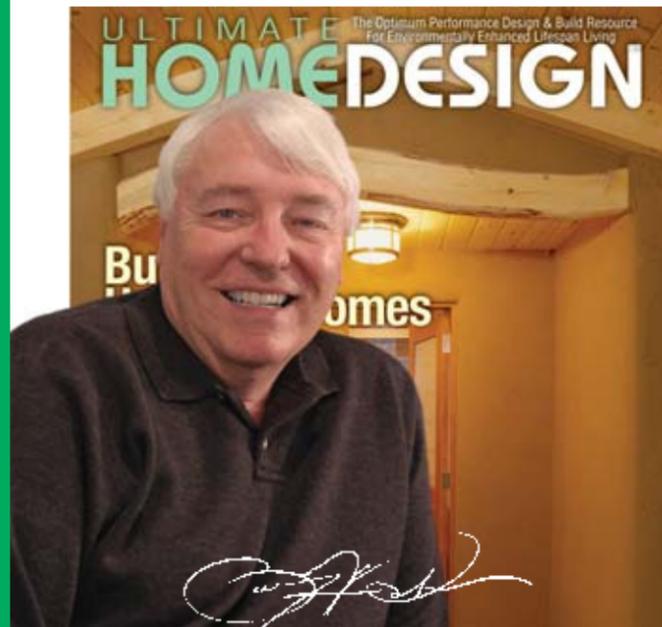
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Green Building Movement

In the last issue of *Ultimate Home Design*®, I wrote about the numerous Green Building Guideline initiatives that are now in place for builders to subscribe, thus giving home buyers a means in which to measure a home's performance by defined criteria.

During the month of May, I participated in several conferences focusing on ecology and technology.

EcoBuild® America (www.ecobuildamerica.com) and AEC-ST® (www.aecst.com) joined forces to present a conference in Anaheim, California on sustainable, green, and high-performance solutions for the built environment, and science and technology for architecture, engineering, and construction.

The American Wind Energy Association held its conference in Los Angeles and declared that wind farms should supply at least 20 percent of the nation's energy by 2030. That's a huge leap from today's contribution of less than 1 percent. To achieve this goal, attendees were told that an extension of the federal production tax credit was necessary to provide the necessary incentives to develop cost-effective wind turbines and other equipment, as well as bolstering the number of electrical transmission lines to carry wind energy to the power grid. There is also the need to address combating noise, dangers to wildlife (particularly birds flying into spinning blades), and visual intrusion caused by the rows of giant, white wind turbines that typify wind farms.

Wind farms have little or no harmful emissions and, with incentives, are relatively inexpensive to build com-

pared with other renewable power technologies. According to the wind power trade group, in 2007 wind farms will generate 31 billion kilowatt-hours of electricity—enough to power nearly 3 million average homes.

What I found really amazing is the development of new, small turbines designed for powering homes and small businesses. One such technology has been developed by Torrance, California-based PacWind (310 375 9952, www.pacwind.com). PacWind has invented, engineered, and is in full production on a revolutionary line of vertical axis wind turbines (VAWTs) that are completely silent, stable, and safe in all wind conditions up to 100-plus miles per hour. They are affordable (the Seahawk MSR price is \$2,995), maintenance free, operate in all climate conditions, carry a 10-year manufacturer warranty, and are powered by the PacWind Rare Earth Permanent Magnet Generator, which produces no pollution, making it a zero emission generator. The VAWTs are also bird, wildlife, and people friendly and well suited to residential applications. The small wind turbines are architecturally and aesthetically pleasing and can be disguised in wind-penetrating slatted towers to complement the architecture of any building and be attached to buildings, installed on rooftops, or mounted on standalone poles. They operate well in low-wind conditions, as low as 7 miles per hour.

Industry giant GE Energy, a major manufacturer of wind farm turbines, held their own technology show at Universal City, California to introduce their new initiative "ecomagination™." The GE ecomagination Homebuilder Program is a blueprint for building green homes utilizing environmentally-conscious products supplied by GE and its program partners. The program specification can offer more value to a potential homebuyer than an industry-accepted average home because of the monthly energy and water savings it can provide. The program includes all GE ENERGY STAR®-qualified appliances and lighting fixtures and optional GE Brilliance™ solar power systems. Furthermore, builders of these homes will have the option to recommend to qualifying homebuyers a mortgage offered by GE Money with financial incentives.

The GE ecomagination Homebuilder Program is the result of a collaboration between GE and Masco Corporation and Masco's installed services companies, Masco Contractor Services. The homebuilder program incorporates sound building science, high-performance energy- and water-conserving appliances and the Environments For Living® (EFL) certified green standards program, which applies to heating, ventilation, air-conditioning, ductwork, and the outer shell or "building envelop" that surrounds a home's living quarters. Homes certified under the EFL program will have a limited heating and cooling energy usage guarantee so buyers will have confidence their homes deliver the savings promised, as well as a three-year, limited-comfort guarantee that certifies there will

be no more than a 3-degree Fahrenheit temperature differential from the center of any conditioned room within each thermostat zone. A 2,500 square foot home built to the program specification is designed to save the homeowner \$600 to \$1,500 on annual utility bills, and achieve 20 percent fewer CO₂, SO₂, and Nox emissions, 20 percent less indoor water use, and 20 percent less energy use.

For more information on this innovative and advanced technology homebuilder program, visit www.ecomagination.com.

Another worthwhile event that I participated in was the Alternative Building Materials & Design Expo (AltBuild) (www.altbuildexpo.com), which took place in Santa Monica, California. This was both a trade and consumer show with 145 companies exhibiting. The

speakers, panels, and exhibitors were high caliber. The City of Santa Monica presents this annual Expo, definitely the most impressive green-building Expo in Southern California. Everyone attending the Expo shared a uniform motivation to learn about and promote green building technologies and practices. The exhibits included a Solar Energy Pavilion, a Water Pavilion with hands-on demonstrations and workshops involving low-water use irrigation systems, and an ENERGY STAR appliance and tax credit area.

I strongly urge other communities to sponsor similar green building events open to the public. Santa Monica and AltBuild producer Christine Dzielvelis of Platia Productions have proven that such an event is much appreciated as a way to expand green building awareness

and experimentation. As the momentum for green building keeps growing, such events will help meet the public's demand for education and guidance.

Since I am an advocate for universal design architecture as well as green building, the National Association of Home Builders' Building for Boomers & Beyond: 50+ Housing Symposium held in late May in Denver, Colorado was of interest because it addressed the "boomer generation," which is now at the formative stages of driving change in the way American homes will be designed and built while embracing universal design principles. The discussions were particularly relevant to the challenges we will all face with increased longevity and the desire to be able to "age-in-place" in our homes.

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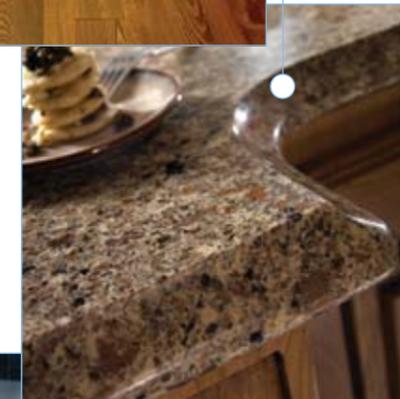
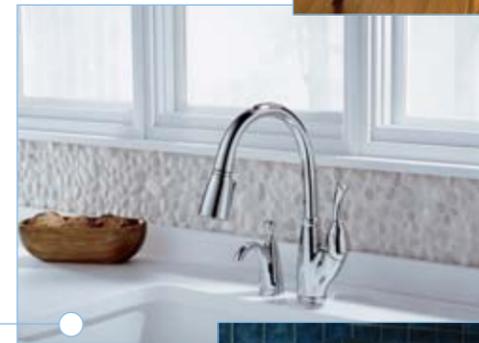
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heat and size of outdoor gas grills. For more information, phone 800 558 1711 or visit www.broan.com.

The First Optimum Performance Home™

universal design architecture part X

Gary Reber

Architectural Illustration By Ronald Devesa



synopsis

The home design not only provides for such lifestyle features to optimize independent living and physical and psychological health and well-being but also incorporates healthier green building materials and energy-saving approaches to achieve “zero-energy cost” home operation, water conservation and minimized environmental impact, as well as comprehensive electronic automated control features that enhance sustainable lifestyles.

Universal design supports the desire to “age-in-place” by creating homes that facilitate independence/self-reliance, as well as allow the homeowners to recover from illness or injury in the comfort of their own homes rather than in an impersonal institutional setting.

Universal design optimizes independent living, thus minimizing the negative impact and emotional stress that often comes with non-universal design homes.

Traditional homes are designed under the mistaken assumption that people never age or experience a disability.

Introduction

This is the tenth 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, and the goal is Platinum certification.

The home will be built at The Sea Ranch, located in Sonoma County, along the Northern California coastline of the Pacific Ocean, approximately 110 miles north of San Francisco.

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 natural 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 relationship between the home’s components and the envelope they create. Also paramount is good stewardship—proper regard and respect for the rights of neighboring homeowners and the



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surrounding natural setting, and resource efficiency. The goal is to optimize occupant health, comfort, and safety; maximize energy efficiency and structural durability; and minimize environmental impact. 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 covered the project scope. Thereafter, each issue has contained a part of the continuing series by working through site planning and preparation; Low-Impact Development (LID); further refinements to the site plan and drainage design; The Sea Ranch Design Committee-approved architectural/structural and grading/drainage submittals with conditions that translated to clarifications on certain building components and material finishes; particular aspects of the home's mechanical plan; structural aspects of foundations, structural walls incorporating Insulating Concrete Forms (ICFs) and Structural Insulated Panels (SIPs), as well as roofing; the acoustical design of the dedicated Optimum Performance Home Theatre™ and rear-projection room; interior design approaches and materials; and kitchen, bath, and home fixtures.

A Final Approval letter for The Sea Ranch Association Construction Performance Permit was issued on October 11, 2006, which is required by Sonoma County prior to obtaining a county building permit.

The necessary work to secure the building permit, including further refinement of the structural and mechanical plans, has been completed. Final construction plans are now in the review process with the Sonoma County Building Department. Five permits have been issued: site plan, landscape plan, septic system, geothermal bore holes, and grading. Assuming no further delays, the issuance of permits, the commencement of construction, site grading, foundation, and mechanical infrastructure is

"The first Optimum Performance Home at The Sea Ranch is not only universally designed but it is also intended to be a smart home in meeting the personal requirements and needs of the author and his family."



The Sea Ranch, Sonoma County, California
Photo Courtesy Rozanne Rapozo (www.natureasisoet.com)

anticipated to start in late June or early July 2007.

In this issue, the focus will be on the universal design architectural features of the home. Also see in this issue the article entitled, "The Interior Design Process, Part I—Synthesizing Sustainability, Universal Design, and Technology" by the project's interior designer, Julie Stewart-Pollack.

Design Concept

As previously noted in this series, the home design integrates all of the concepts advocated in *Ultimate Home Design*. The 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 and holistic design, the house will serve as a home for many people and in many phases of one's life.

The high-performance building systems that will be employed exceed what the building codes require, and are able to resist natural disasters more effectively than a code-minimum house. Greater home safety—and thus, homeowner peace of mind—is possible when building with stronger building materials and techniques. The Optimum Performance Home qualifies for the Fortified...For Safer Living® program of the Institute for Business & Home Safety (www.ibhs.org/business_protection). This program specifies construction, design, and landscaping guidelines to increase a new home's resistance to natural disaster.

The home will meet the guidelines and qualifications for the U.S. Department of Environmental Protection's ENERGY STAR®, the EPA's (Environmental Protection Agency) WaterSense®, and the American Lung Association® Health House® programs. As well, the home will meet the National Association of Home Builders' (NAHB) Model

Green Home Building Guidelines, the Sustainable Buildings Industry Council's (SBIC) *Green Building Guidelines*, and the "Green Points" program now being considered for adoption by Sonoma County and The Sea Ranch Association.

Furthermore, the home will be the subject of a case study analysis presentation before the Custom Residential Architects Network (CRAN), Full Spectrum Practice Convention of the American Institute of Architects (AIA) on October 20, 2007 in Chicago, Illinois.

The home is a case study of the California Energy Commission in terms of energy efficiency applications and a leading-edge water-saving plumbing plan.

Finally, the home is a national showcase for CEDIA (Custom Electronic Design and Installation Association), and is the subject of a series of articles on the design and installation of the electronic lifestyle components in the home.

Sustainable Lifestyle

As the American population becomes more diverse in household composition, baby-boomers, no matter what the makeup, will be the largest market for consumer goods and services, including new homes that will meet their needs for sustainability. In less than nine years, 70 to 80 million Americans will turn 65, while people age 65 and older already number 35 million. This means that within about nine years, over 100 million Americans will be senior citizens. But for those without the financial means, they will be relegated to conventional homes that do not meet their physical needs. According to a report issued by the Joint Center for Housing at Harvard University, 90 percent of all homeowners age 70 and older currently live in such homes. And the AARP, formerly the American Association of Retired Persons, reports that nearly

one-quarter of those 65 and older will have difficulty getting around within their homes in the next five years. The AARP Public Policy Institute also reports that as much as 80 percent of this group expects to work during what would normally be their retirement years.

The Optimum Performance Home at The Sea Ranch has been designed as a "forever home." The design fully supports "independent living" with a focus on a living and working environment that minimizes excessive tasks and stress. The essence of the home is to provide an environment to nurture its occupants, allowing them to be productive as long as possible. The home is designed to protect its occupants throughout their lives, especially during their golden years, thus minimizing the possibility of institutionalization.

The universal design elements, coupled with the biophilic design attributes of the home, respond to the deepest needs for physical and psychological

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Let's not just imagine a better house together.

health and well-being. The home will inspire and invigorate, reduce stress and mental fatigue, promote creativity and positive interactions, and even help heal. The "human-centered" design is intentionally "connected" to the natural environment surrounding The Sea Ranch, allowing its occupants to experience nature on a daily basis. 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. For an in-depth analysis of the biophilic attributes of the first Optimum Performance Home, please read "Biophilic Design" and "Biophilic Design Attributes," authored by Julie Stewart-Pollack in Issue 3 (May/June 2006) and Issue 4 (July/August 2006), respectively.

The home design not only provides for such lifestyle features to optimize independent living and physical and psychological health and well-being, but also incorporates healthier green building materials and energy-saving approaches to achieve "zero-energy cost" home operation, water conservation, and minimized environmental impact, as well as comprehensive electronic automated control features that enhance sustainable lifestyles. The home is designed to be accessible and usable by people of all ages and all abilities.

Universal Design Concept

The term "Universal Design," which is also referred to as "Accessible Design," "Inclusive Design," "Design For All," and "Age-

Friendly Design," was defined in 1993 by the late Ron Mace, an architect who spent most of his life in a wheelchair and who established what is now known as the Center for Universal Design at North Carolina State University. Mr. Mace explained universal design as: "An approach that incorporates products, as well as building features and elements, which, to the greatest extent possible, can be used by everyone." The idea behind universal design 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.

Universal design, however, is not yet the norm in residential architecture and interior design. Building codes are written and homes are built with the person of average capability in mind. Countertops, handrails, cabinets, appliances, and plumbing fixtures, and just about everything else, are installed according to specifications that meet an average person's physical stature and abilities. Thus, traditional homes are designed under the mistaken assumption that people never age or experience disabilities.

The Americans With Disabilities Act and the Fair Housing Act have subsequently raised public awareness of how not-so-average people have trouble living and functioning in average homes. While many people will first associate universal design with serving the needs of the disabled, think about the elderly and the day-to-day challenges they face living and functioning in the typical home. If you are one of our elderly readers, or a son or a daughter of elderly parents, you can relate to such challenges you or your parents face daily. Think about the so-called "baby-boomer" population who is now caring for their elderly parents, becoming well aware of the everyday problems encountered in the home. Anyone in that position can certainly relate to the sensible, practical, and functional approach to home design that can be achieved by incorporating universal design features.

The average household composition in the United States is becoming increasingly varied as our society becomes more diverse with households that include elderly relatives, caregivers, and unrelated adults. What also must be realized is that the American population is aging rapidly and people are living longer, with life expectancy now at 85 years for a majority of Americans. That means 20-plus healthy and productive years are awaiting a large segment of the population after they reach retirement age. Unfortunately, longer life expectancies also lead to a greater number of people with physical disabilities. Furthermore, increased longevity will touch every part of life, from work to career to health care and financial planning, changing family struc-

tures and transforming what it means to be both "old" and "young."

Universal design supports the desire to "age-in-place" by creating homes that facilitate independence/self-reliance, as well as allow the homeowners to recover from illness or injury in the comfort of their homes rather than in an impersonal institutional setting. And by designing flexibility into the home, it will be possible to prevent an elderly person's premature move to an institution simply due to their age or frailty.

The Optimum Performance Home is designed to incorporate functional live/work environments that nurture sustainable lifestyles and help people "age-in-place." With changing lifestyles in which more people work from home and increased home entertainment options, the EPA estimates that on average, Americans now spend 65 percent of their time at home. Applying a leading-edge universal design concept will ensure that the full range of human functional diversity is accommodated, as well as the future changes in how the household members perform their daily activities.

As noted, universal design is not simply for

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size, strength, and mobility. The home is designed to eliminate unnecessary barriers in order to create a more inclusive design that values social inclusion by all.

The home is designed to support the homeowners' ability to perform better than would ordinarily be the case. Easy-to-reach storage and work-spaces designed to allow the occupants to work while seated is much more efficient and convenient than bending and stretching while standing.

Incorporating universal design features into homes increase their marketability and resale value since they can be sold to people of all ages and abilities. No one is excluded as a potential buyer because of unnecessary barriers and hazards.

While this home will be bigger and have more amenities than some of The Sea Ranch's existing homes, it is not among the largest homes nor will it be out of place on the site or within the immediate neighborhood. The design is site-specific and approved by The Sea Ranch Design Committee. The Design Committee worked with our team during the design stages to make refinements that are in accordance with The Sea Ranch design philosophy.

Universal Design Features

The Sea Ranch is a community not yet equipped with the range of amenities that provide services and opportunities for medical clinics, pharmacies, grocery stores, and public transportation. However, the nearby community of Gualala is located just across the Gualala River from the north end of The Sea Ranch, and does have such amenities and has become the service center for The Sea Ranch. Thus, Gualala is a source for services, such as home-delivered groceries, health clinics, house visits by health care workers, special transportation, house cleaning, and maintenance and repair—all services which are extremely helpful to elderly persons, people with disabilities, and people with busy careers. The Sea Ranch does offer the Lodge and its restaurant, with plans for the expansion of the Lodge, and the Two Fish Bakery. A proposed commercial district serving The Sea Ranch is in the planning stages. Abundant recreational opportunities are provided at The Sea Ranch, including swimming pools; saunas; walking, bicycling, and horse riding trails; picnic and common areas; the Gualala River; and Pacific Ocean tide pools and coves with beaches.

those who may use a wheelchair, have impaired vision, or have limited use of their arms or hands. Universal design homes are "barrier-free" and provide sustainable living for anyone—healthy or ill, short to tall, young to old, small to big—and everyone in between. Universal design optimizes independent living, thus minimizing the negative impact and emotional stress that often comes with non-universal design homes. People who are very different can enjoy universal design homes, and those homes will be there for all inhabitants, especially when their needs change. Universal design is really all about optimizing the supportive home environment.

The first Optimum Performance Home at The Sea Ranch is not only universally designed but it is also intended to be a smart home in meeting the personal requirements and needs of the author and his family. The home may not look much different from standard homes, but it is much easier to live in than the homes to which most of us are accustomed. The idea was to adopt design features that make the home environmentally optimized, safe, and comfortable for everyone, young or old, whether they have a disability or not. And, as well, to use innovative design techniques that offer visual appeal and increase the appreciation value and the "curb appeal" for the home.

Flexibility was the goal, accommodating people who differ in height,

Additionally there is an 18-hole Scottish-style golf course.

Within this incredibly beautiful and wonderful setting, the first Optimum Performance Home will incorporate the following universal design features:

- **Pavements:** The grounds surrounding the immediate building compound footprint will use pervious surfaces for the driveway, guest parking, and exterior walk-around pathway. Netpave 50, a Netlon Turf Systems product of Rehbein Environmental Solutions, Inc., will be used as the surface system to provide automobile and rolling access to the garages while allowing ground water to nourish the property's trees and plants. Netpave 50 is manufactured from 100 percent recycled polyethylene to provide an attractive, easy-to-use, durable solution for permeable parking and access routes. The resulting surfaces comply with the American With Disabilities Act guidelines, all while enhancing the environment.

Netpave 50 units are 2 inches thick and are connected by a rapid-fastening system (lugs and slots). These unique flexible elements can be easily installed on irregular surfaces and gradients. Netpave 50 in the permeable high load-bearing driveway and guest parking areas at the front of the home will be filled with gravel, and the cellular structure will retain the stone and prevent loss or displacement. The Netpave 50 system will also be used to reinforce the paths around the home and grounds to support wheelchairs, walkers, canes, and strollers, in keeping with the attention to accessibility that is a focus of the overall home design.

The home's front fenced-in garden and pond area will be fully assessable using Netpave 50 and feature raised planting beds.

- **Zero-Step Entries:** No one will need to use steps or stairs to enter the home, navigate around the home, or enjoy the courtyard, porch, decks, or a



Rehbein Environmental Solutions, Inc.

- Netpave 50 is manufactured from 100 percent recycled polyethylene to provide an attractive easy-to-use, durable solution for permeable parking and access routes.



Kingsley-Bate®

- Kingsley-Bate® solid teak two-person glider chair featured on front porch.

walk outside to the garden, ponds, and stream. Everyone will be able to get out of a car and into the home without running into any barriers or thresholds. The design supports full "visitability," with no restriction to social interaction due to physical barriers, thus allowing people of all abilities to freely interact and socialize in the home. Safety hazards are virtually eliminated, especially benefiting older people trying to negotiate level changes outside and within the home.

- **Entry Steps/Ramp:** At the front of the home there will be a wide three-step entrance with treads 11 inches deep and alternate wide ramp walkway entrance to the front porch and glass-enclosed vestibule. The ramp is hidden in the design. The ramp will have a gradual sloping 1:20 ratio. This feature will facilitate easy access from the driveway, garages, and guest parking. The ground from the drive-



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Dimension One Spas® Chairman II

• A Dimension One Spas® Chairman II spa will be featured in the courtyard area. The D1 Chairman II is an ultimate performance and comfort spa that is renowned for energy-efficiency and reliability.



AMX®

• The AMX® whole-home automation control system will manage and control all lighting and other electronic devices. Homeowners can access their residence remotely over the Internet to communicate directly with their AMX technology.



Leviton® Vizia-RF & Acenti™ Home Control System

• Leviton® designs their products to be universal design-friendly and to make a home safer, more accessible, and more enjoyable for all occupants. Among the architectural-grade products are scene-capable switches, dimmers, plug-in serial and appliance interface modules, scene-capable plug-in lamp-dimming modules, four scene controllers, four zone controllers, IR and RF handheld remote controllers, and plug-in RS-232 interface modules for use with automation systems, and instant on motion activated light control modules.



Monster® IlluminEssence™ Lighting System Products

• Also featured is Monster®'s IlluminEssence™ Lighting System Products. The partnership between Leviton and Monster ensures the ultimate reliability in whole-home lighting systems, and makes it possible to intricately control lighting throughout the entire home.



way will gradually slope up toward the front entrance. The slate surface in front of the vestibule entry doors gently slopes away from them, so that water will not enter the home. This is the design with respect to all surfaces in front of exterior doors. The entry porch will provide ample maneuvering space on which will sit a Kingsley-Bate solid teak two-person glider chair, which allows one to sit down or drop off items.

• **Entrance:** The sheltered vestibule entrance will provide

arriving/departing occupants and guests protection from environmental elements. A convenient fold-down shelf near the front entrance vestibule can be used to set packages and items. The shelf will be recessed into the wall when not in use. The French door entrance can provide a 5-foot opening for deliveries of furniture or for children in strollers when fully opened. There will be a receptacle for UPS and FedEx deliveries as well. The drain-lined threshold will be flush, eliminating a tripping step or edge bump.

• **Primary And Secondary Spaces:** The three-building compound is designed with core spaces that are separated from those that are not needed or used on an everyday basis. These secondary spaces are visually defined and differentiated from the primary homeowners' realm. The separation will be facilitated through the design of the vestibule walkway to create privacy between primary and secondary areas. The design of the guest bedrooms, their foyer and food preparation alcove, and associated library/home theatre/surround music room could provide living quarters for a live-in caregiver. The guest bedrooms will share a pocket door, which, when open, will join the two rooms to create a more grandeur space. The pocket door will have locks on both sides. This feature will also be applied to the divider separating the guest bedroom decks. Private entrance access to the home office and secondary guest areas is designed to provide access without entering the zone of the homeowners.

• **Private Outdoor Spaces:** The primary and secondary spaces will have their own private outdoor spaces, with the courtyard serving as the central outdoor entertainment area.

• **Courtyard:** The courtyard will feature universal design elements including a 36-inch-wide glass insert door to the non-threshold entrance of the Finnleo® sauna, a seating height Dimension One Spas® Chairman II spa for easier accessibility, and gradual and wide ramp access from the courtyard to the Netpave 50 exterior walkways and pond. The courtyard also will feature a raised planting bed area located on the earth roof over the underground wine cellar. The raised planting beds will allow seating alongside and allow care of plants without back strain or knee pain.

• **Equipment Room:** The equipment room that houses the WaterFurnace geothermal and TrendSetter solar hot water equipment and Uponor

radiant heating manifolds (see Issue 5, September/October 2006), is designed with a north-facing full-wall swing-out door for convenient access to the equipment for repairs or replacement.

• **Security/Safety:** Motion detectors on the exterior entry light fixtures add safety at night.

• **Lighting Design:** The universal lighting design was developed by graduate students at the Lighting Research Center (LRC) at the Rensselaer Polytechnic Institute (RPI) in Troy, New York (see Issue 8, March/April 2007). The whole-home design provides focused light where it is needed to help people see better as well as help people with poor vision. Under-cabinet lighting in selected task areas will light up the area and provide a warm atmosphere. Floor lamps and night-lights will be positioned to direct light where needed. A set of amber LED pathway lights leading people from the bed to the restroom will activate upon getting out of bed at night. As well, the Kohler® bidet toilet seats (K-4709 C3™-200) feature a soft blue glow in the dark to help people find the toilet at night. Occupancy sensors, which combine hands-free switching with energy savings, will be installed in areas such as bathrooms, closets, and garages. Occupancy sensors turn lights on when a person enters the room and off when they leave. They do it automatically and even when people forget to turn off the light.

The stairway to the second floor will function as a lighted art gallery. All outdoor walkways and outdoor areas will have modest light levels using down-facing lights to adhere to the zero-light pollution policy of The Sea Ranch—no light directed upward. There will be an AMX® whole-home electronic automation management and control system. With the AMX technology, all lighting can be electronically programmed to turn on automatically and according to a particular ambiance. Leviton® and Monster® IlluminEssence™ light switches will feature large rocker controls, which are easier to turn on and off. There will even be applications in the home that use photo luminescent materials, thus providing a low-level glow that can be used to mark paths.

• **Lighting Controls:** All lighting controls, mounted 40 inches from the floor, will be free of in-built structure blocks.

• **Electrical:** All electrical outlets and computer terminals will be positioned on walls and on the front of cabinets for better access and to make it

easier for people with limited reach capability. They will be positioned between 15 and 27 inches off the floor, with some 30 to 44 inches from the floor.

• **Electronic Controls:** The home will be electronically smart to conserve energy. One of the safety features will be that of smoke detectors, whether battery or electrically powered, when triggered, selectively turn on lights to show escape routes. Likewise the Uponor fire sprinkler system will be wired to provide this feature. Remote control operation of lighting and all electronics will be facilitated throughout the home via Z-Wave® and AMX electronic automation. Motion sensors will activate the system to automatically heat the water at the master bathroom suite faucet and faucets in the two guest bathrooms. The Carriage House garage doors will be remotely operated by Z-Wave-facilitated Wayne-Dalton HomeSettings prodrives™ (see Issue 9, May/June 2007) And the VELUX skylights throughout the home also will be remotely operated (see Issue 8, March/April 2007).

• **Emergency Monitoring:** Monitoring cameras will be placed strategically and inconspicuously throughout the home to look in on any person in distress. Remote monitoring of the home's interior and exterior spaces will be facilitated via the Internet.

• **Open Plan:** The open-plan layout of the main residence is designed to enhance maneuverability and communication.

• **Ambience:** With floor space being quite efficient, it will also be very functional and, combined with the cathedral ceilings, it will create a comfortable feeling of space.

• **Barrier-Free:** The three-building compound is designed to be barrier-free with one-story living for the homeowners; the guest bedrooms are on a second floor, and this upper section provides for universal design features with both a wide stairway and elevator access. If needed, this second floor could provide flexible living space for an elderly parent or a live-in caregiver (now covered by several long-term care insurance plans). The latter can result in significant savings from deferred institutional living.

• **Flush Thresholds:** All thresholds throughout the home will be flush with the floor to make it easy for people to get through a doorway or passageway. They will also keep people from tripping and facilitate easy wheelchair maneuvering.

• **Contrast Color:** Good contrast will be provided between transition areas, such as around doorways. Contrasting paint colors between walls and doorjamb will be applied with horizontal and vertical illuminated delineation at night to provide a helpful cue for anyone who has a hard time focusing clearly. Amber LEDs that are photosensor and motion controlled will be used. Transition points throughout the home will be delineated to aid in orientation and help prevent trips and falls.

• **Glazing:** Insulated, solar-gain-reducing glass-enclosed hallways will be 8 feet wide in the vestibule walkway connector, and the main walkways will be 5 feet wide throughout the home, allowing easy movement from room to room.

• **Floor Materials:** All floorings will be non-slip surfaces to help people stay on their feet. Flooring will consist of Evergreen Slate and Bedrosians® slate, Kährs® Oak hardwood, Natural Cork®, Earth Weave

Wayne-Dalton® prodrive™ Garage Door Opener

- A Wayne-Dalton® HomeSettings prodrive™ garage door opener is specified for the two-car and single-boat garage doors by Carriage House Doors. This ceiling-mounted drive is quiet and reliable. It features Z-Wave™ operability that is integrated into the whole-house wireless automation network.



Bedrosians® Natural Stone Slate Flooring

- Bedrosians® natural slab Autumn Gold slate flooring will be the selected flooring for the entrance, vestibule and walkway connector, interior walkway, solarium, kitchen, and courtyard.



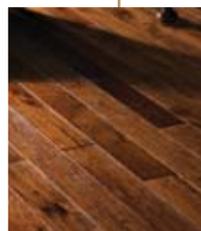
EverGreen Natural Stone Slate Flooring

- Fine natural Vermont slate from the EverGreen Slate Company, Inc. is of dense, sound rock, exceedingly tough and durable. It is also fire and waterproof and resistant to climatic changes, with absolutely no disintegration. EverGreen slate has the highest designation for durability in excess of 75 years.



Kährs® Hardwood Floors And Stairs

- Kährs® is one of the oldest manufacturers of hardwood flooring with a 150-year history. In addition to the Kährs flooring Woodloc® system used in selected rooms of the home, the stairs will be Kährs Oak constructed and meet all world formaldehyde emissions regulations.



Natural Cork®

- A Natural Cork® 100 percent high-density floating cork floor will enhance the ambiance of the wine cellar. The Santiago style is treated with five coats of UV-cured acrylic finish, which contains no volatile organic compounds (VOC).



Carpet Mills Broadloom Bio-Floor wool carpeting, and EarthSource Forest Products FSC (Forest Stewardship Council)-certified Ipé decking. The Earth Weave Carpet is a flat Berber weave that allows level transition where it meets the wood and slate flooring. This feature also is designed to reduce tripping hazards.

- **Windows:** Pella® windows throughout the home's living spaces will be low to the floor to allow viewing of the outside by children, pets, and seated adults. Lower windowsills also will expedite emergency egress.
- **Fireplace:** There will be pass-through access for firewood into the hearth area of the Delta fireplace by RSF Wood-Burning Fireplaces (see Issue 9, May/June 2007). This will allow easy handling of firewood

from the front fenced-in garden firewood storage area for burning in the Delta fireplace. The hearth will be positioned at an accessible height.

- **Garage Ramp:** A 36-inch-wide gradual sloping ramp will be provided from the interior of the garage to the glass-enclosed walkway with Luxrail™ underlit handrails on both sides of the ramp. This garage ramp will facilitate grocery unloading, especially with use of a grocery handcart, while a hand truck can be used for large items. The ramp also will aid wheelchair or stroller/baby carriage use. While wheelchair users need ramps to get in and out of buildings, ramps can also assist other people regardless of age or strength. The half-height wall with window into the workshop is designed for use as a temporary standing-height shelf for packages in addition to providing safety. The top of the ramp levels off to provide a wide entrance space to the laundry room. A bench seat will be provided, which allows one to drop off groceries and other items, or to sit down.

- **Stairs:** The set of stairs leading to the guest bedrooms, bathroom, and library/home theatre/surround music room will feature treads 11 inches deep so that one's entire foot can rest on the stair. The treads will be 36 inches wide. Stair risers will have a height of 7 inches. The Kährs Oak hardwood stairs will have a visual differentiation at the nose of each stair to help visually guide climbing or descending the stairs more safely. The interior staircase will be well lit on both walls and above the floor at each landing, and have two short runs to reduce injuries from falls. The staircase is in close proximity to the Otis® Gen2 elevator off the vestibule walkway, and is centrally located within the home and near the entrance.

- **Handrails:** io Lighting's Luxrail underlit handrails will be provided on both sides of the interior staircase and to the wide sloped walkway ramp to the garage—and exterior staircases down to the below-ground wine cellar. The handrails will extend beyond the bottom step for stability.

- **Elevator:** An energy-efficient and stylish Otis Gen2 residential elevator will provide lift service to the second-floor. The elevator will provide access to the guest bedrooms and library/home theatre/surround music room for people who cannot, or don't want to, use the stairs. The new forward technology, developed by the Otis Elevator Company, is environmentally-friendly and has Otis' unsurpassed reliability and a smooth quiet ride. This

new state-of-the-art "green" model reduces energy usage, creating a savings for homeowners. This new Otis model will be released to market in 2008.

- **Clearance:** All interior doorways will be at least 36 inches wide for easier access and a more spacious feel. Accessible routes will be provided throughout the home, including around three sides of the beds in the bedrooms. The hallways will be able to accommodate a range of ambulatory devices to make it easier to move big items in and out of the home and to let wheelchairs or walkers pass through.

- **Pocket Doors:** The home is designed with extensive use of Holzkraft® Custom Wood sliding pocket doors, which disappear inside the walls. Johnson Hardware®'s Model 2000 superior-quality, structurally strong pocket door hardware and frames will be used to assure long-term durability. The Model 2000 Pocket Door Frame can hold an impressive 300 pounds of door weight and can accommodate a door panel depth of 1-3/4 or 1-3/8 inches, with sizes for doors up to 5 feet wide by 9 feet high. Pocket doors provide more space, especially in small rooms. The door openings will be 42 inches wide to allow for a 6-inch-wide portion of the door to be always exposed, resulting in a clear 36-inch-wide fully open pathway in and out of rooms. On each side of the 6-inch-wide portion a solid bronze cast handcrafted large "D" handle by Rocky Mountain Hardware will be mounted. The entry pocket doors to the two guest bathrooms will feature full-height mirrors.

- **Hardware:** All door handles by Rocky Mountain Hardware will be levers, or "D" designs, to provide easy door opening while holding keys, bags, or children. Lever door handles make opening doors easier when you are carrying groceries or children, and reduce the stress on joints in the fingers and wrists. The Leviton and Monster IlluminEssence light switches and AMX whole-home controls are designed for people with poor hand strength and poor vision. In fact, the handle and control designs are better designed than knobs or standard switches, and they make it easier for everyone to operate.

- **Laundry Room:** The ENERGY STAR®-qualified Whirlpool® Duet® HT® (High-Temperature) Fabric Care Family front-loader washer and dryer feature large waterdrop-shaped doors for easier loading of bulky items. Both the washer and dryer sit atop 15.5-inch drawer pedestals, an ergonomic

Earth Weave Carpet Mills, Inc.



- Broadloom Bio-Floor sustainable carpet is made with 100 percent undyed naturally pigmented wool fibers and yarn with no synthetic glues, no moth proofing, and no stain protections or chemicals of any type, which assures that the carpet will not affect indoor air quality through off-gassing of volatile organic compounds (VOC).

EarthSource Forest Products Ipé Decking



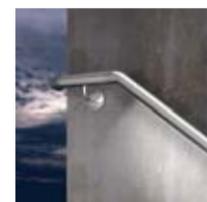
- EarthSource Forest Products FSC (Forest Stewardship Council)-certified Ipé decking will be used for the master bedroom suite deck and the guest bedroom decks. Ipé is perhaps the hardest wood available and is extremely durable and ideal for outdoor decking applications.

Pella® Windows And Doors



- Pella Windows and Doors have been known for quality craftsmanship and innovation. Their EnduraClad® Plus and Seacoast Exterior Paint finishes ensure superior weatherability and longer lasting protection against chalking, fading, corroding, and exposure to the sun's UV rays. Pella quality extends to natural wood-framed interiors, which can be painted or stained to match a home's interior décor.

Luxrail™ Underlit Handrails



- io Lighting' Luxrail™ underlit handrails facilitate added safety while maneuvering stairs.

Otis® Gen2 Residential Elevator



- Gen2's new forward technology, developed by the Otis® Elevator Company, is environmentally friendly and has Otis' unsurpassed reliability and a smooth quiet ride. This new state-of-the-art "green" model reduces energy usage.

Holzkraft® Custom Wood Doors



- Holzkraft® custom stain-grade wood doors will be used throughout the interior of the Optimum Performance Home and as the entry door to the wine cellar. Stile and rail construction methods produce crisp, clean lines that are architecturally correct.

Johnson Hardware®

- Johnson Hardware®'s Model 2000 superior-quality, structurally strong pocket door hardware and frames will be used with Holzkraft Custom Wood doors to assure long-term durability.



Rocky Mountain Hardware

- Rocky Mountain Hardware is specified for all of the exterior Pella® Designer Series® doors, and specified for all interior Holzkraft® wood doors and the wine cellar door. Handcrafted for exceptional beauty and durability, each Rocky Mountain piece is cast in solid bronze and is available in a diverse palette of rich patina finishes.



Whirlpool® Duet® HT® Washer And Dryer And Fabric Freshener

- The Whirlpool® Duet® HT® (High Temperature) Fabric Care Family front-loader washer and dryer will handle the heavy-duty laundry chores. A Fabric Freshener will remove odors and relax wrinkles without chemicals or detergents.



Iron-A-Way® Universal Design Ironing Station

- The laundry will be equipped with an Iron-A-Way® Universal Design hideaway ironing station (Model AL-42). This professionally designed center will adapt to everyone in the household and exemplifies the possible changing needs of the homeowner over the course of a lifetime.



solution to help reduce bending, stooping, and arching. Both the washer and dryer will be topped with an uninterrupted 5-foot-wide scratch- and chemical-resistant matted work surface to provide convenient counter space for sorting and folding up to four loads at once. A Whirlpool laundry tower features a convenient retractable hanging rod for an at-hand drying solution for freshly washed items or clothes right out of the dryer. Two drawers accommodate wholesale-size detergent bottles and boxes, along with other small items such as stain sticks, dryer sheets, and cleaning supplies. Also provided is a pullout supply tray to store everything from bleach pens to pocket change.

Also featured is an Iron-A-Way® Universal Design hideaway ironing station (AL-42). This professionally designed center will adapt to everyone in the household—comfortably meeting the needs of the person

who prefers to stand while ironing or one who will be seated.

There will be a bench in the laundry room, which will allow a person, even one using a wheelchair, to easily put laundry into the front-loading washer, and take it out and put it into the dryer.

In order to prevent flooding of the laundry floor in case washer hoses break, there will be a drain.

- **Bathrooms:** All bathroom and shower spaces will be constructed with non-slip tile surfaces and equipped with floor drains.

- **Showers:** All showers will have hand-held shower fixtures with flexible extensions and adjustable rods, and overhead lighting.

- **Grab Bars:** Special blocking in all the bathrooms provide for flexible grab bar installation in the final phase of construction. Architecturally and aesthetically designed 500-pound support textured grab bars will be positioned around toilets, tubs, and showers. Amber LEDs will light below selected grab bars to provide sufficient light for navigating at night, but not too much to startle a person from sleep. Custom fitted grab bars will be positioned along selected kitchen countertop areas.

- **Bathroom Telephones:** Telephones will be placed within reach of the toilets, tubs, and showers.

- **Toilets:** All Kohler® toilets throughout the home will be the Comfort Height™ style with Kohler bidet elongated toilet seats elevated 17 to 18 inches off the floor for easier seat entry/exit. Thus, seats will be about 2 inches higher than the standard toilet fixture.

- **Wheelchair Bathroom Access:** All bathroom spaces are designed for use by a disabled person or a person uneasy on their feet. Additional floor space with a 5-foot turning space allows maneuverability. Anti-scald Kohler single-lever faucets can be operated with a single hand or elbow.

- **Linen Storage:** Large linen Cope Closet Concepts ventilated hardwood shelves of various heights will provide convenient storage space.

- **Bathroom Mirrors:** Mirrors will be set on the backsplash of each vanity and pedestal lavatory to provide perfect reflection when sitting or standing.

- **Master Bedroom Bath:** The master bedroom suite's bathroom will feature a roomy walk-in/roll-in/curbless shower and Kohler Escale® BubbleMessage™ bath (K-11343-GCR) with a flat ledge bench where one can sit and easily slide over into the tub. A Kohler Symbol™ Roman bath filler and full-spray hand-held showering units (K-

18486-4 CP/K-18492-CP) will provide optimum flexibility and accessibility while showering or bathing.

The Master Bedroom Kohler Escale Bathroom Suite vanity (K-18598-F29) and makeup vanity (K-18597-F29) will be 32 inches off the floor with knee space beneath, should one want to sit up against the basin or makeup vanity while performing beauty and cleaning routines, or reverse seating for washing one's hair. A Kohler Symbol (K-19480-4-CP) single-lever handle will control hot and cold water.

- **Guest Vanity:** The main floor guest vestibule vanity bathroom will feature Kohler's Wellworth® pedestal lavatory (K-2293) for universal access. A Kohler Fairfax® single-control lavatory faucet (K-12183-CP) will complement the Wellworth lavatory. An ADA-compliant one-piece Sterling®/Kohler OC-S-63 Series 6206 (62060103) roll-in shower module will also be featured with integrated L-shaped designer grab bars and fold-up seat to accommodate family members or guests with special needs, or just for convenience. The low-profile threshold provides for easy wheelchair access.

- **Second-Floor Guest Bath:** The second-floor guest bathroom will feature a universal design Sterling Accord™ barrier-free whirlpool and bath module with integral Kohler showerhead (76141110-LH) and L-shaped designer grab bars. A Kohler Devonshire® pedestal lavatory (K02288/K-2294-4) and Devonshire wide-spread lavatory faucet with lever handles (K-393-4) will accommodate the universal basin needs of guests, including those in a wheelchair.

- **Mobile Bath Cabinets:** Base cabinets in the bathrooms will be on locking casters so that they can be rolled away if needed.

- **Closets:** Closets will feature future-proof adjustable shelves to accommodate the reach capabilities of different occupants and thus, are adaptable to changing needs. Fine, handcrafted ventilated hardwood shelving by Cope Closet Concepts will be used in the bedrooms and the kitchen pantry. Häfele® pull-down wardrobe lifts will be featured in the bedroom closets. Automatic closet and pantry lighting will be featured throughout.

- **Closet Shelving:** Multiple height closet shelves and rods will be positioned to increase usable storage space. Holzkraft closet doors will be mirrored on both sides to enhance spaciousness and provide enhanced dressing.

- **Kitchen Cabinets:** The bottom shelves of wall-



Kohler® Highline™ Pressure Lite™ Toilet

- The Kohler® Highline™ Pressure Lite™ (K-3519-T) 1.1 gpf two-piece toilet features an elongated bowl with a generous water surface and a Comfort Height™ design providing standard, chair-height seating, which complies with ADA height requirements.



Kohler® C3™-200 Bidet Toilet Seat

- A Kohler® elongated toilet seat with bidet functionality and in-line heater (K-4709 C3™-200) will be fitted to the Highline™ Pressure Lite™ toilet (K-3519-T). C3 toilet seats use the naturally soothing quality of water as a refreshing, hygienic alternative to toilet tissue, and offer cleanliness, comfort, and convenience for all users.



Kohler® Escale® BubbleMassage™ Bath

- The bath featured in the master bedroom suite will be a Kohler® Escale® BubbleMassage™ bath with chromatherapy (K-11343-GCR).

Kohler® Symbol® Bath Filler & Shower Assemblies



- A Kohler® Symbol® Roman bath filler, hand-shower, and rise tubes in polished chrome (K-18486-4 CP/K-18492-CP) will complement the Escala® BubbleMassage™ Bath.
- The shower installation will feature two Kohler® Symbol® Rite-Temp™ valve trims (K-T18489-4 CP/K-306-KS-NA) and two

Symbol 5-1/2-inch diameter single-function showerheads (K-18493-CP), plus an overhead, oversized Vivacia Rain showerhead (K-10121-CP/K-7396-CP) will be fitted to the shower ceiling.



Kohler® Escale™ Bathroom Suite

- The Kohler® Escale™ Suite 48-inch vanity with cutout in Engineered Wenge (K-18598-F29) and Escale vanity top/basin in white (K-19034-1-0) with Escale mirrors in Engineered Wenge (K-18595-F29) will be the centerpiece of this bathroom. A Kohler Symbol™ single-control faucet in polished chrome (K-19480-4-CP) will complement the organic design elements of this beautiful and aesthetic suite of bathroom fixtures. Also featured is an Escale makeup vanity (K-18597-F29) and a bench in Engineered Wenge (K-18596-F29).

mounted kitchen cabinets will be 48 inches from the floor to allow better reach access. That amounts to 15 inches above the rounded corner Silestone® countertops and 14 inches between countertop and bottom of kitchen cabinets. Cabinets and cupboards will be equipped with Rev-A-Shell® sliding drawers to reduce the amount of or need for

Kohler® Wellworth® Pedestal Lavatory & Fairfax® Faucet

- A coordinated white Kohler® Wellworth® Pedestal Lavatory (K-2293) and Fairfax® single-control lavatory faucet (K-12183-CP) will complement the Wellworth toilet.



Sterling®/Kohler® OC-S-63 Series Roll-In Shower Module

- Made from solid Vikrell material for strength, durability, and lasting beauty, the Sterling® module is designed with a low-profile threshold for easy wheelchair access. The ADA-compliant roll-in shower meets the home's universal design and adaptability design requirements.



Sterling® Accord™ Barrier-Free Bathing Module

- A universal design Sterling® Accord™ barrier-free whirlpool and bath module in white with integral Kohler showerhead (76141110-LH) and diverter bath spout (K-389-CP) will be featured in the guest bathroom.



Kohler® Devonshire® Pedestal & Centerset Faucet

- A Devonshire® pedestal (K-2288) and 27-inch pedestal lavatory in white (K-2294-4) also will be featured. The lavatory will be fitted with a Devonshire wide-spread lavatory faucet with lever handles (K-393-4).



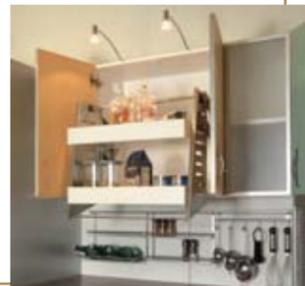
Cope Closet Concepts

- Closets will feature fine, handcrafted, ventilated hardwood shelving and cabinetry by Cope Closet Concepts. The company crafts closet systems that have the warm richness and luxurious grain of 100 percent hardwood shelving, while providing efficient space organization.



Häfele®

- Häfele® pull-down wardrobe lifts will be featured in the bedroom closets. Häfele Bio-Fix™ pull-down shelf mechanisms will be installed in selected upper kitchen cabinets to allow easy pull-down access to items stored on top shelves.



reaching and bending. Häfele Bio-Fix™ pull-down shelf mechanisms will be installed in selected upper kitchen cabinets to allow easy pull-down access to items stored on top shelves. A spacious floor-to-ceiling accessible pantry will provide easy access to pantry-stored food and portable kitchen appliances. The Cope Closet Concepts ventilated hardwood shelves will be deep and adjustable.

- **Kitchen Appliances:** Kitchen appliances will be installed to optimize reach and function capability in the kitchen, alcove nooks, and outdoor courtyard. KitchenAid Architect Series II appliances all feature ergonomically designed front-mounted knobs and push-button electronic controls, plus extra deep handles for easy gripping, even while wearing an oven mitt. Appliance edges are beveled and seamless for safety and ease of cleaning. The Wolf Range Company low-profile Japanese Teppan-Yaki-style 36-inch-wide stainless steel griddle also features large ergonomically designed front-mounted knobs.

A natural gas/propane cooktop is preferable because one can easily see what burners are on and their intensity, thus minimizing the potential for hand burns. Electric cooktops have the disadvantage of having to read electronic control settings to determine heat levels, especially on induction cooktops. Furthermore, electric cooktops have their controls on top instead of on the front, which provides easier control, especially for someone seated.

- **Ovens:** Cooktops and ovens will be positioned for functionality and easy accessibility. The controls will sit at the front of the two cooktops, one a KitchenAid® professional style Architect Series® freestanding 36-inch-wide stainless steel Dual Fuel convection range with Steam Assist (KDRP767RSS) oven and the other a Wolf Range Company professional 36-inch-wide stainless steel griddle (AGM36).

- **Microwave Oven:** The KitchenAid Architect Series II 30-inch-wide built-in microwave combination oven will be mounted with visually large front push-button controls at no higher than 48 inches above the floor. A KitchenAid Architect Series II 30-inch-wide warming drawer (KEWS105S) will be built-in just below the microwave combination oven.

- **Dishwasher:** The front button-controlled KitchenAid Architect Series II ENERGY STAR-qualified 24-inch-wide dishwasher (KUDU03ST) will be raised 9 inches off the floor to make loading and

unloading the dishwasher easier.

- **Refrigerator:** The shelves of the large 48-inch-wide built-in side-by-side KitchenAid Architect Series II refrigerator (KSSC48QT) will slide in and out, and the refrigerator will feature door-accessible Sylvan Source (M-600) ultra-pure drinking water and ice dispenser (see Issue 9, May/June 2007).

- **Kitchen Sink:** The Kohler Verity® (K-3086) 33-inch-wide stainless steel under-counter apron-front farmhouse kitchen sink has a compartment depth of 8 inches. A removable under-sink storage cabinet, with locking casters, will provide knee space under the sink if needed. This movable cabinet will feature a cutting board top, which can facilitate a number of food preparation functions. A Kohler Avatar (K-6350-VS) kitchen faucet, featuring an ergonomically designed protruding single-control front lever handle and pullout sprayhead will be mounted 17 inches back from the front of the sink apron for easy access reach. Even the plumbing for the kitchen sink is off-set to accommodate ease of accessibility for people in a seated position (see Issue 9, May/June 2007).

- **Countertops:** Kitchen countertops fabricated with Silestone Quartz Gemstone will feature pullout cutting boards and will be designed so that everyone in the family, no matter what limitations they may have, has a workspace that optimally fits them. The multi-height kitchen counter system will provide a variety of countertop heights to match different people's preferences as well as different types of kitchen tasks. Thus, when everyone wants to help with dinner, grandchildren, children, and guests feel comfortable assisting. Most countertops will be 35 inches from the floor with one at 30 inches from the floor, and will be fitted with grab bars. The lower countertop will have a rollout cabinet and cart and when removed will provide enough knee space under the counter to pull up a chair or wheelchair. At the bottom of the counter cabinets will be 9-inch-high indented toe-kick areas. The wall-mounted oven will be positioned at a height so that when the oven door is open, it will line up with the countertop for ease of taking baked items out of the oven and then putting them on the counter.

- **Kitchen Island:** The kitchen island countertop will also be 35 inches high. A KitchenAid Architect Series II 27-inch-wide built-in double-drawer refrigerator (KDDC27TTS) and a Series II 24-inch-wide



Rev-A-Shelf®

- Rev-A-Shelf® sliding pull-out drawers and shelves will be fitted to cabinets and cupboards to reduce the amount of or need for reaching and bending.

KitchenAid® Architect® Series II Kitchen Appliances

- KitchenAid® Architect® Series II ovens, microwave ovens, warming drawer, refrigeration, dishwasher, and kitchen hoods will be featured in the main residence kitchen, guest bedroom nook, home office nook, and outdoor courtyard kitchen. These appliances are designed for universal ease of operation.



Silestone® Leather™ Countertops

- The food preparation countertops throughout the Optimum Performance Home in the kitchen, guest bedroom alcove, home office, wine cellar, and outdoor courtyard will be Silestone® Tigris Sand Leather™ Quartz by Cosentino.



built-in wine cellar (KUWS24RS) with 46-bottle capacity and dual-temperature zones will be featured. Next to the Wolf Range Company griddle will be a Kohler Undertone™ small rounded under-counter 5-1/2-inch-deep kitchen sink (K-3338) equipped with a Kohler Avatar® single-control kitchen faucet with pullout sprayhead (K-6350-VS). The sink and faucet will be positioned for easy reach (see Issue 9, May/June 2007).

The non-glossy Silestone Tigris Sand Leather™ countertop finish is non-reflective to prevent glare created by light sources.

A minimum of 5 feet of clear space between built-in kitchen appliances and the island countertop edges will allow maximum maneuverability access to the spacious kitchen interior, as well as adequate circulation for party socializing.

Wolf Range Company Griddle

- A low-profile Japanese Teppan-Yaki-style 36-inch-wide stainless steel griddle (AGM36) made by the Wolf Range Company will be a feature of the kitchen. The 1-inch-thick polished steel griddle plate provides infinite heat control per 12 inches of width. The griddle will be used for exhibition cooking when entertaining guests.



UltraGlas®

- A custom-designed UltraGlas® architectural counter will be integrated into the kitchen island and serve as the eating surface for the counter space below the Wolf Range Company Japanese Teppan-Yaki-style griddle.



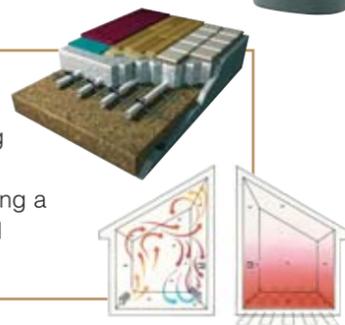
NuTone® Central Vacuum System

- A NuTone® Central Vacuum System will be featured in the home to help maintain healthy interior air quality. NuTone's central vacuum power units feature a space-saving sleek oval-shape design, internal sound suppression system, and a status light on the hose handle and power unit, which indicates when the VX™ unit's bag or canister is full and needs emptying.



Uponor® Radiant Floors

- Warm water circulates under the floors throughout the Optimum Performance Home using Uponor's durable, flexible, and resilient crosslinked polyethylene AQUAPEX tubing, providing a comfortable, even heat without stirring up dust and pollutants.



Opposite the kitchen along the island countertop will be a counter to accommodate up to six seated guests for casual dining and viewing of the exhibition cooking performed on the Wolf Range Company professional low-profile Japanese Teppan-Yaki-style griddle. The eating surface will be fabricated by UltraGlas® and located 29 inches off the Bedrosians slate floor. The decorative and functional thick kiln-formed embossed glass counter and backslash will follow the contour of the island from end to end. This seating arrangement is fully universal design compliant.

Underneath the island countertop facing the counter seating area will be cabinets with Rev-A-Shelf rollout shelving to make it easier to maneuver large and infrequently used items in and out as well as stored dishes.

• Guest Bath And Home Office Alcoves:

The compact kitchen/refreshment nooks in the guest bedroom and home office alcoves are designed with the same attention to ideal countertop height with optimized faucet sink and microwave reachability.

• Healthier Living:

The home's exterior will be tightly constructed to optimize the quality of the interior environment and protect infants, asthmatics, seniors, and other at-risk segments from common airborne pollutants, such as dust, pollen, and pet dander, and toxic, allergenic, and hazardous contaminants. Natural air changes, supplemented by mechanical means, will be facilitated with the location of the Pella windows and doors to allow cross-ventilation. The design provides proper ventilation, air mixing, and pollutant dilution throughout the home without compromising heating, cooling, or energy-efficiency solutions in the home, or the phenomenal quietness of the home. The all-green-built home will emphasize the use of natural materials and non-toxic finishes in its interior construction and will be less likely to

become contaminated by Volatile Organic Compounds (VOCs).

A NuTone central vacuum system will remove 100 percent of the contacted dirt and allergens from the living areas to a collection receptacle at the base of the motor located in the garage. No air will be blown into the rooms to stir up dust because the system's motor is outside the living areas (see Issue 9, May/June 2007).

The home will also be mold, insect, and fire resistant throughout. According to the U.S. Environmental Protection Agency, molds produce allergens, (substances that can cause allergic reactions), irritants, and, in some cases, potentially toxic substances (mycotoxins). The smoke alarms and Uponor fire sprinkler system will be integrated into the home's electronic control of lighting and sound to optimize inhabitant safety.

An Uponor zoned radiant floor-heating system will turn the entire first and second floors into primary, low-temperature heat sources that deliver radiant energy evenly across each room to its occupants and surrounding objects, but not the ambient air, resulting in a significantly healthier interior environment.

The design approach described in this article can make any home future-proof and adaptable to a family's changing needs while providing added value. It epitomizes the idea of building a home for life.

For more information on universal design, please visit the Center for Universal Design's Web site at www.design.ncsu.edu/ and read back and future issues of *Ultimate Home Design*.

Next

This continuing series of articles will focus on particular design elements, as well as each stage of construction, the design approach taken, the technologies and building systems, and further, the materials used to create the first Optimum Performance Home. **UHD**

The Author

Gary Reber is the President of Ultimate Home Design, Inc. and the founding Editor-In-Chief and Publisher of *Ultimate Home Design*®, The Optimum Performance Design & Build Resource For Environmentally Enhanced Lifestyle Living™. He is also President of WSR Publishing, Inc, which publishes *Widescreen Review*®, The Essential Home Theatre Resource™. His diverse background in

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several fields includes an undergraduate, graduate, and postgraduate university education in architecture, community planning, and economic development planning. For years he was a consultant on community and economic development planning. For the past 15 years he has been an editor and publisher of magazines in the consumer electronics and architectural fields. Gary can be reached at 951 676 4914 or gary@ultimatehomedesign.com.

Product Information

- AMX Corporation, 3000 Research Drive, Richardson, Texas 75082, 800 222 0193, www.amx.com
- Bedrosians, 4285 North Golden State Boulevard, Fresno, California 93722, 559 275 5000, www.bedrosians.com
- Broan-NuTone, 926 West State Street, Hartford, Wisconsin 53027, 800 548 0790, www.nutone.com
- Carriage House Door, 1421 Richards Boulevard, Sacramento, California 95814, 916 375 0575, www.carriagedoor.com
- Cope Closet Concepts, 1117 South Big A Road, Toccoa, Georgia 30577, 800 809 2423, www.copeclosetconcepts.com
- Cosella-Dörken Products, Inc., 4655 Delta Way, Ontario, Canada L0R 1B4, 905 563 3255, www.cosella-dorken.com
- Cosentino North America/Silestone, 13124 Trinity Drive, Stafford, Texas 77477, 281 494 7277, www.cosentinousa.com
- Dimension One Spas, 2611 Business Park Drive, Vista, California 92081, 800 345 7727, www.d1spas.com
- EarthSource Forestry Products, 1618 28th Street, Oakland, California 9460, 510 208 7257, www.earathsourcewood.com
- EverGreen Slate Company, Inc., 68 East Potter Avenue, Granville, New York 12832, 518 642 2530, www.evergreenslate.com
- Finnleo Sauna & Steam, 575 East Cokato Street, Cokato, Minnesota 55321, 800 346 6536, www.finnleo.com
- Häfele America Company, 3901 Cheyenne Drive, Archdale, North Carolina 27263, 336 434 2322, www.hafele.com/us
- Holzkraft Industries, LLC, 28206 Commercial Avenue, Barinton, Illinois 60010, 847 381 7670, www.holzkraft.com
- io Lighting, 370 Corporate Woods Parkway, Vernon Hills, Illinois 60061-3107, 847 735 7000, www.ioighting.com
- Iron-A-Way, 220 West Jackson, Morton, Illinois 61550-1588, 309 266 7232, www.ironaway.com
- Kähns, 940 Centre Circle, Suite 1000, Altamonte Springs, Florida 32714, 407 260 9910, www.kahrs.com
- Kingsley-Bate, Ltd., 7200 Gateway Court, Manassas, Virginia 20109, 703 361 7000, www.kingsleybate.com
- Kohler Company, 444 Highland Drive, Kohler, Wisconsin 53044, 920 457 4441, www.kohler.com
- LE Johnson Products, Inc./Johnson Hardware, 2100 Sterling Avenue, Elkhart, Indiana 46516, 800 837 5664, www.johnsonhardware.com
- Leviton, 2222-222nd Street SE, Bothell, Washington 98021, 800 877 0190, www.levit.com
- Monster Cable, 455 Valley Drive, Brisbane, California 94005, 415 840 2000, www.monstercable.com
- Natural Cork, 150 Connector 3, Dalton, Georgia 30720, 800 250 6690, www.naturalcork.com
- Otis Elevator Company, 10 Farm Springs Road, Farmington Connecticut 06032, 860 676.6000, www.otiselevator.com
- Pella Corporation, 102 Main Street, Pella, Iowa 50219, 641 621 1000, www.pella.com
- Rev-A-Shelf (RAS), 2409 Plantside Drive, Jeffersonton, Kentucky 40299, 800 626 1126, www.rev-a-shelf.com
- Rocky Mountain Hardware, 1030 Airport Way, P.O. Box 4108, Hailey, Idaho 83333, 888 788 2013, www.rockymountainhardware.com
- RSF Fireplaces/Industrial Chimney Company, 400 J-F Kennedy, St. Jerome, Quebec J7Y 4B7 Canada, 450 565 6336, www.icc-rsf.com
- TrendSetter Industries, Inc., 818 Broadway, Eureka, California 95501, 800 492 9276, www.trendsetterindustries.com
- UltraGlas, Inc., 9200 Gazette Avenue, Chatsworth, California 91311, 800 777 2332, www.ultraglass.com
- Uponor North America, 5925 148th Street West, Apple Valley, Minnesota 55124, 800 321 4739, www.uponor-usa.com
- VELUX America, Inc., 104 Ben Casey Drive, Fort Mill, South Carolina 29708, 888 838 3589, www.VELUX.com
- WaterFurnace International, Inc., 9000 Conservation Way, Fort Wayne, Indiana 46809, 800 222 5667, www.waterfurnace.com
- Wayne-Dalton Corporation, 4400 River Green Parkway, Suite 220B, Duluth, Georgia 30096, 678 417 0115, www.wayne-dalton.com
- Whirlpool Corporation/KitchenAid, 2000 M-63 North MD 3201, Benton Harbor, Michigan 49022, 800 253 3977, www.whirlpool.com
- Wolf Range Company, 10405 Westlake Drive, Charlotte, North Carolina, 28273, 800 366 9653, www.wolfrange.com

Home For The Next 50 Years

Remodeling For Aging Baby Boomers Demonstrates Universal Design In Arts & Crafts Detailing

John P. S. Salmen, AIA

synopsis

One of the keys to designing homes that meet the needs of people with a variety of abilities is to design things so that they are flexible.

The number one safety hazard that older people face is trying to negotiate level changes within the home, steps at the entry, stairs between floors, and curbs to step over into the bath or shower.

Introduction

Nearly empty-nesters and approaching age 50 with the rest of the baby boomers, my wife and I designed and built the "Home For The Next 50 Years." We chose to renovate a craftsman bungalow in a historic district, turning it into a universally designed home that preserves its historic context. We attempted to carefully consider the universal design implications of every element and space while keeping in mind the actual users—our family and friends.

I've spent a lot of time, professionally and personally, thinking about homes and how they can meet the needs of their residents, especially my needs (and the needs of my family) as I grow older. One of the keys to designing homes that



meet the needs of people with a variety of abilities is to design things so that they are flexible. This can mean everything from selecting cabinets with adjustable height shelves to designing rooms that can be easily converted for different uses over the years as needs and families change (bedroom to studio to guest bedroom, for example).

About The House

We selected and purchased this home/site because of its location, small size, and state of disrepair, making it a good candidate for the dramatic changes it underwent.

We chose this site because of its proximity and easy walking or rolling access to the Washington Metro, shops, services, and my office. The location facilitates a low-energy lifestyle with community support to foster aging-in-place.

The historic main entry, with its two sets of steps and a front porch, will remain, but the new main entrance was moved to the corner of the first floor nearest to the driveway and public sidewalk, making it more accessible to all. A raised bed garden along the entry driveway/sidewalk provides an accessible-height garden while helping to mask the grade level change necessitated by the new entry. A GrassPave driveway provides automobile and rolling access to the garage while allowing ground water to nourish the property's trees and plants. The rear entry to the second floor (main living level) provides access via an accessible bridge and patio from the new garage with attached wood-working shop and gardening area.

The first floor of the house has a guest bedroom and fully accessible bath attached to a second guest bed-



(Left) New accessible entry to lowest level, first floor. (Center) Guest Bath Dual-Height Accessible lavatories. (Right) The European shower and adjacent tub with continuous grab bars and moveable seat provide alternative bathing choices to allow everyone access.

room/studio/living area that can accommodate two kids, a visiting family, an aging parent, or a personal assistant's apartment. The bathroom's dual-height lavatory provides accessible options for standing and seated users.

The family room and kitchen are at the rear of the second floor with northern and southern views toward the back and side yard gardens. The kitchen, designed by Jane Langmuir, AIA, has many adaptable, accessible, and labor-saving features including: accessible appliances, a variety of counter heights, unique storage systems, rolling carts, and built-in accessible eating nook and island counter.

The front of the house has a double-duty "library," which can be a home office or dining room. The fully accessible powder room on this floor features a dual-height concrete lavatory/sink. The front porch was made accessible by eliminating a 4-inch step at the door to the library.

The laundry, with an accessible shower and sauna, can be found at the top of the stairwell on the third floor. My wife's "fiber studio" is in the front of the house while the master bedroom and bath (with roll-in, stained concrete slab



(Left) The dramatic cherry stairwell with craftsman details in the handrails, newels, and columns provides grippable surfaces while the adjacent elevator provides access to the second and third floors for people who cannot, or don't want to, use stairs. (Center) Kitchen island with various height counters beyond. (Right) Powder room concrete dual-height lavatory.

"I've spent a lot of time, professionally and personally, thinking about homes and how they can meet the needs of their residents, especially my needs (and the needs of my family) as I grow older."

shower and cherry grab bars beside the side-access toilet) are in the rear. A small accessible balcony off the master bedroom provides rain and snow protection for the kitchen entry below. The number one safety hazard that older people face is trying to negotiate level changes within the home—steps at the entry, stairs between floors, and curbs to step over into the bath or shower. Eliminating level changes is very difficult

in existing homes and almost impossible to do it beautifully and without major compromises, unless there is a major renovation. The result is that most homeowners decide to sell the house rather than make the changes.

After spending over 20 years studying how people age (as an architect specializing in barrier-free design), I've learned that one of the most stressful aspects of aging is having to relocate when you're elderly because your original home is no longer safe or easy to use. We look forward to living in this house for the next 50 years of our hopefully long, but probably partially limited, lives. **UD**

The Author

John P.S. Salmen, AIA, is a licensed architect who has specialized in barrier-free and universal design for over 25 years. He is the President of Universal Designers & Consultants, Inc. in Takoma Park, Maryland and publisher of *Universal Design Newsletter*.

John is a prominent expert in the technical aspects of the Americans with Disabilities Act and an international leader in the emerging field of Universal Design. John has written several books including: *Accessible Architecture*, *The Do-Able Renewable Home*, *Accommodating All Guests*, and *Everyone's Welcome*. He has presented hundreds of Universal Design and accessibility seminars and key-note addresses throughout North America and the Pacific Rim. These presentations have presented technical criteria in layman's terms.

Universal Design

Universal Design is "The process of imbedding choice for all people in the things we design." Recognizing that:

- Choice involves flexibility, and multiple alternative means of use and/or interface;
- People include the full range of people regardless of age, ability, sex, economic status, etc.; and
- Things include spaces, products, information systems, and any other of the other stuff that humans manipulate or create.

For instance, a no-threshold, roll-in shower works not only for someone who uses a wheelchair, but also for a walking person, especially if they are stumbling around late at night or early in the morning. By the same token, the multi-height kitchen counter system provides a variety of counters heights to match different people's preferences as well as different types of kitchen tasks (kneading bread is easiest at the lower counters, while decorating a cake is easier at one of the higher counters.)

Home For The Next 50 Years Features

Exterior

- 1:20 (5 percent) slope drive entry
- Raised flower beds along drive for easy maintenance.
- Covered main entry with ample maneuvering space and bench
- Grass Pave - ecological driveway
- Sub-metered outside water
- Accessible path between garage and house via sloped bridge

- Easy-to-use "closed fist" sink, tub, and shower faucet hardware, as well as on cabinets and doors.
- Modular/removable base cabinets with oversize toe space
- Handheld shower on adjustable rod and pin
- Soaking tub recessed into floor to provide easy wheelchair transfer height
- Clear floor space for side access to tub
- Automatic motion-sensing night light
- Time-delayed automatic off for exhaust fan

First Floor

Entry

- Full-length entry door view window
- No-step entry threshold
- Automatic lock released from house phones

Hallway

- Concrete floors for low maintenance and easy roll-ability
- Elevator in public area serving all three levels with emergency phone
- Lever hardware on all doors
- Grippable handrails on both sides of stairs
- Stair tread to riser ratio for easy stepping
- Stair runner bevels tread nosing and eliminates tripping hazard
- Dimmable, programmable stairwell sconce lights that turn on automatically as you approach.

Guest Bath

- Roll-in no-threshold shower
- Bi-level lavatories
- Tub/Shower grab bars with adjustable seat
- Side grab bar at toilet
- Side access to toilet

Guest Bedroom

- Dual-height closet rods
- Accessible route to both sides of bed
- Direct access to guest bathroom
- Southern light orientation and view to year round Bonzai Well
- Drapery controls within kid reach
- Remote-controlled overhead fan
- Remote-controlled TV
- Simplified Smart House Lighting
- Full-length mirror in guest bedroom

Sound Studio/Second Guest Bedroom

- Direct access to guest bathroom
- Mechanical service for future kitchenette
- Whole-house audio system controls in accessible locations throughout the house

Second Floor

- No-step threshold to front porch
- No-step threshold to rear patio
- Quarter sawn Red Oak Hardwood Floors
- Solid hardwood cherry trim in Green & Green craftsman style that darkens with age to contrast with the floors and walls.

Powder Room

- Bi-level multi-purpose concrete sinks with wheelchair clearance
- Modular/removable base cabinets with oversize toe space
- Accessible faucet and cabinet hardware
- Automatic light in pantry
- Adjustable-height pantry storage shelves
- Side-access toilet
- Solid hardwood cherry grab bar/towel rail

Kitchen

- Solid hardwood cherry accessible-height island eating counter and corner nook pedestal table
- Modular/removable base cabinets with oversize toe space
- Solid hardwood cherry grab bar/towel rails
- Multi-height soapstone countertops for different tasks and people
- All appliances (and controls) within reach range
 - Dish drawer—dishwashers
 - Refrigerator drawers and low freezer
 - Wall oven and warming drawer
 - Front control burners, electric grill
 - Front control exhaust fan switch
- Cabinet front disposal controls
- Trash/recycle/compost drawers in pull-out cart
- Tea/toaster cart with removable solid hardwood cherry tray top
- Low-positioned HVAC and security controls
- Family room bench/hearth at accessible height
- Remote controls for all audio/video equipment

Library

- Accessible work stations with adjustable keyboards
- Accessible cabinet hardware
- Lateral file drawers within easy reach of wheelchair users
- Accessible meeting table

Third Floor

Laundry

- Stained concrete non-slip waterproof floors
- Roll-in shower with handheld shower and grab bars (can accept shower seat)
- Hinged-bar shower curtain
- Accessible sauna controls
- Accessible sauna door and bench
- Front-loading clothes washer and dryer
- Front-mounted lever faucet sink
- Grab bar towel rail
- Accessible-height towel rods and clothes pegs
- Base cabinet with oversize toe space and accessible drying rack

Master Bedroom

- 3-foot-wide clearance on both sides of bed
- No-threshold accessible door to accessible rear deck/emergency exit.
- Adjustable-height hi/low clothes storage

Master Bath

- Waterproof hydro-chromatic concrete floor
- Shower has a no-threshold entry through wheelchair-width, self-closing, double-swinging glass door
- Accessible double-swinging Shower Door
- Adjustable-height handheld showerheads and deluge shower.
- Accessible cabinet hardware
- Integrated toilet/washlet-bidet
- Accessible-height refrigerator drawers for fresh fruit, cold water, and medications.
- Full-height mirrors on pocket doors
- Accessible-height towel bars

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summer, reducing the need to cool the house at the level a conventional home requires. The roof system also prevents snow and ice from building up on the roof in the winter, which further reduces heating costs.

The Deltec roof also has an overhang, which keeps out solar energy from the high summer sun and allows solar energy in during the winter when the sun is at a lower angle.

"One of the reasons why we are such believers in the Deltec system is that we used to live in a house that was approximately 1,300 square feet. Our electric bills ranged from \$120 to \$250 a month," Kim, a Deltec homeowner from Magnolia, Texas, said. "Our Deltec home is almost 4,000 square feet (around three times the size of our old house) and our electric bill averages around \$120 to \$130 per month. The Deltec home is the best construction you can find."

In addition to the effective design of the homes, the construction method Deltec uses when building homes also contributes to energy conservation. Homes are constructed panel by panel and then shipped off to the building site. Each panel is constructed so they fit

together so precisely that air drafts are limited.

"We're real good at making sure that happens," Schlenk added. "We ship homes all over the world so we have to be sure the pieces fit together perfectly."

In addition to being a huge energy cost saver, Deltec homes provide numerous other benefits. Among the more important ones is the ability to withstand hurricane-level winds.

As storms battered homes in 2005, Deltec-built houses were able to fight off the winds and survive with no structural damage.

"After Hurricane Katrina we contacted all of our homeowners that were in her path," Schlenk said. "None of the homes suffered any structural damage. Any damage was limited to either minor cosmetic damage or a few missing roof shingles."

Besides the functional features that make these homes so appealing to homeowners, the houses also have an unmatched visual appeal. The unique design and flexible floor plans allow owners to build their dream home. The plentiful windows frame the spectacular views whether the house is in the mountains or on the water.

"Our design allows the homeowner to customize their home, including having windows where they want," Schlenk said. "There are not many designs that can capture a view the way a Deltec home can. When you consider all of the benefits that our design offers-high wind resistance, energy efficiency, design flexibility and overall quality, and high curb appeal-we feel that we can offer our customers the perfect home."



Controlling Moisture Within The Home

Scott Young

(Insulating The Crawl Space And Basement)
THERMAX™ polyisocyanurate insulation consists of a glass-fiber-reinforced polyisocyanurate foam core laminated between aluminum foil facers.



synopsis

-  Good water management practices in construction are important.
-  Uncontrolled water vapor and air leakage can put water where we you don't want it—inside the walls.
-  In addition to weakening the home's structure, moisture can contribute to the development of mold, mildew, wood rot, and odors.
-  Moisture problems stem from three sources—bulk water intrusion, air leakage-borne issues, and diffusion of water vapor.

Introduction

From wind energy to hybrid cars to low-energy homes, everyone and everything seems to be “going green.” In the residential building sector specifically, much focus has been given to making the home more energy efficient. But it's also important to pay attention to a home's moisture-resistant capabilities.

Moisture: A Serious Problem

Moisture problems are a nationwide concern affecting many homeowners and builders, as moisture can impact the home and the health of its occupants, whether the water comes from leaks or condensation. As we move through seasonal changes and face potential weather-related challenges, homeowners are realizing the importance of keeping their home dry and insulated.

“Builders are increasingly more aware of the importance of good water management practices in construction,” said Chris Mathis, a building scientist and President of MC Squared in Asheville, North Carolina. “From the bulk water

management of rain, sleet, and snow to the moisture vapor management associated with air leakage and diffusion, builders know that water sources must be well managed to minimize the risk of problems later on.”

Uncontrolled water vapor and air leakage can put water where we you don't want it—inside the walls.

“Water vapor moves from the humid side of the wall toward the dry side, and from the warm side toward the cooler side,” said Doug Garrett, CEM, President of Building Performance and Comfort, Inc. “In other words, it moves from high concentrations of moisture and heat downhill toward areas of lower concentrations of each. When it reaches a surface cool enough to cause condensation [below the dew point of the air], it condenses.”

In addition to weakening the home's structure, moisture can contribute to the development of mold, mildew, wood rot, and odors. Increasingly, health ailments such as allergies and asthma are being blamed on poor indoor air quality caused by mold. According to the U.S. Environmental Protection Agency, molds produce allergens (substances that can cause allergic reactions), irritants, and, in some cases, potentially toxic substances (mycotoxins).¹

This isn't just a headache for the homeowner, but for the builder, as well. Overall, the building industry spends approximately \$9 billion each year repairing and litigating damages from water and moisture.²

“Moisture-related building problems represent the single largest warranty/callback cost for U.S. builders,” said Garrett.

Identifying The Problem: Common Sources

Moisture problems stem from three sources—bulk water intrusion, air leakage-borne issues, and diffusion of water vapor—in order of priority and magnitude.

According to Garrett, the common sources of moisture include:

- Inadequate or incorrectly installed flashing
- Incorrect or sloppy installation of insulation, leading to cold areas in walls, attics, or basements
- Air leaks carrying moisture into the house
- Poor roof design
- High indoor humidity exacerbated by inadequate ventilation
- Wall constructions that prevent or prohibit the ever-present moisture vapor from drying out
- Poor HVAC sizing and installation including over sizing of equipment and leaky air ducts
- Poor soil grading that directs water toward the foundation/basement

The key to controlling moisture in the home is preventing it

from becoming a serious issue in the first place. Fortunately, there are steps you can take to protect the home against moisture and its damaging effects.

Insulated Sheathing

Used successfully in millions of homes nationwide, insulated sheathing is a leading home building product for both energy and moisture management. Insulated sheathings maximize heating and cooling efficiency while reducing the potential for moisture.

For the best protection, install a rigid insulated sheathing like STYROFOAM™ extruded polystyrene insulation from Dow, as it offers high moisture resistance. Unlike wood, foam sheathings resist water absorption and provide insulating and water control to help reduce the potential for water-related

“Moisture problems are a nationwide concern affecting many homeowners and builders, as moisture can impact the home and the health of its occupants, whether the water comes from leaks or condensation.”

problems.

“Insulated sheathing can control the possibility of water vapor condensing in the walls by keeping the wall too warm for condensation to occur,” said Garrett.

Insulated sheathing is easy for builders to install in new home construction. For remodelers, it is applied over the old siding and its rigid panels provide a smooth, level surface for mounting new siding.

Sealing Problem Areas

Water vapor is a gas, and like air in a balloon, can very slowly diffuse, or leak, through an apparently solid wall. Most water vapor enters the wall cavity via air leaks—through holes around windows, electrical boxes, gaps around chimneys and recessed lights in insulated ceilings, and unfinished spaces behind cupboards and closets.

Openings can easily be sealed with a foam sealant.



GREAT STUFF™ PRO foam sealants expand to take the shape of cracks and voids, forming a permanent barrier, helping to “air tighten” the entire home. And in addition to minimizing leaks, using a foam sealant like GREAT STUFF™ PRO helps to constrict pathways for insects and cut down on noise pollution. Visit www.insulateyourhome.com for more information.

A Weather Barrier

Weather barriers help manage bulk water while allowing moisture vapor to pass through, promoting the regular drying of the wall system. They also help in a builder's overall air leakage-control strategy. Applied over exterior sheathing and around windows and doors, WEATHERMATE™ Weather Barrier Solutions from Dow create a complete exterior water management solution for better protection from the elements.

A continuous housewrap is an important

(A Weather Barrier)
Applied over exterior sheathing and around windows and doors, WEATHERMATE™ Weather Barrier Solutions from Dow create a complete exterior water management solution for better protection from the elements.

layer of defense. The tough, tear-resistant wraps form a continuous membrane to guard against air and moisture. Additionally, using construction tape over seams will reduce air leakage even further. STYROFOAM WEATHERMATE Plus housewrap enables water vapor behind the housewrap to escape the exterior, thereby helping the wall dry from the inside out.

To divert water away from openings, use a flashing product. This will help to create a weather-resistant seal around openings like windows and doors.

“Building science has taught us that using a housewrap without sealing the seams and flashing the windows is just a waste of good labor and materials,” remarked Garrett.

Insulating The Crawl Space And Basement

A home's foundation is an essential part of the total home environment, so it is not surprising that the way the basement or crawl space is finished—and

(Insulating the Crawl Space or Basement)
A well-insulated basement or crawlspace, with proper ground water management, can reduce a builder's risk of water-related problems from below.



(A Weather Barrier)
To divert water away from openings, use a flashing product. This will help to create a weather-resistant seal around windows and doors.

insulated—is key to the performance and comfort of the entire house. In both cold and warm climates, a well-insulated and air-sealed basement or crawl space, with proper ground water management, can reduce a builder's risk of water-related problems from below.

Using a product like THERMAX™ polyisocyanurate insulation, which is a non-structural, rigid board insulation, can make this process even easier. It consists of a glass-fiber-reinforced polyisocyanurate foam core laminated between aluminum foil facers. The glass-fiber reinforcement, along with chemical modifications, contributes to improved fire performance and enhanced dimensional stability. A continuous poly vapor barrier also helps protect the bottom and sides of the crawl space from water, air, and vapor penetration.³

“Over the last fifteen years, I have fixed countless damp, musty, moldy crawl spaces and basements using the applied building science, sealed and moisture-managed crawl space/basement methodology,” said Garrett. “The crawl spaces and basements are great after the renovation, they smell clean and fresh, and the air is as dry as it is in the house.”

Conduct Inspections

For homeowners, inspecting the home regularly for indications and sources of indoor moisture will help prevent unnecessary moisture intrusions.

Carefully inspect the following:

- Hot Water Heaters—Over time, these appliances may rust or develop cracks, and the resulting leaks can be very costly. Check your water heater for rust and deterioration every year. Check the drain pan for water and ensure that the drain line for the overflow pan is not clogged. If your water heater is an open-combustion device, make sure the exhaust vent is properly sealed and that the vent is unblocked all the way to the outside.
- A/C Drain Lines—Damage can occur when the line that

drains condensation from the evaporator coils becomes clogged and water overflows from the drip pan. To prevent this, periodically check the drip pan for standing water. Consider an annual inspection or service call to reduce the build up of algae and mold in the drain line. Better yet, install a float switch in the secondary drain pan under your unit. This is a really inexpensive, easy addition.

- Appliance Hoses—Broken hoses are among the most common causes of water damage. Regularly inspect hoses and hose fittings on washing machines, ice makers, and dishwashers for kinks, cracks, or other evidence of deterioration. Replace standard rubber washing machine hoses every two to five years, or more frequently if they are showing signs of wear.⁴

- Caulking—Inspect the caulking around all windows, doors, decks, and penetrations on the home. Remove all of the old, shrunken, or dried caulk and replace it with new, high-quality caulk to maintain this primary outside water seal.

Conclusion

In conclusion, moisture problems can be kept in check by having a good understanding of the problem and by paying careful attention during construction. Considering a home's moisture-resistant capabilities, along with its energy-efficient qualities, can decrease homeowners' costs and give the homebuilder a competitive advantage. **UHD**

The Author

Scott Young is Global Director for Dow Building Solutions Energy Efficiency Portfolio. The Dow Chemical Company is a diversified chemical company that harnesses the power of innovation, science, and technology to constantly improve what is essential to human progress. More information about Dow can be found at www.dow.com.

1. <http://www.epa.gov/mold/moldbasics.html>
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3. http://southface.org/web/resources&services/publications/technical_bulletins/CI-Crawlspace%2000-774.pdf
4. http://www.tdh.state.tx.us/beh/iaq/protecting_your_home_from_mold.html

Green Building Strategies For Renovation Projects And New Homes

Brandy LeMae



synopsis

“High-performance” describes design strategies that optimize the solar potential of the site, employ energy-efficient equipment, and incorporate building techniques for super-insulated structures which are easy to heat and cool.

“Green design” refers to environmental strategies based in conservation and waste reduction as well as the health and comfort of the occupants.

“Sustainability” refers to renewable resources that are used in a fashion which ensures the quality of life for future generations.

Introduction

Growing up in Lyons, Colorado, my husband, Joseph Vigil, and I both lived in homes that typified the small hometown atmosphere. As I well remember, these quaint houses can also be drafty, cramped, and inefficient. Building and remodeling using high-performance and green measures can help residents cut utility costs and create healthier homes.

Let’s begin with a few definitions. The expression “high-performance” describes design strategies that optimize the



Insulating Concrete Forms (ICFs)

solar potential of the site, employ energy-efficient equipment, and incorporate building techniques for super-insulated structures which are easy to heat and cool. The term “green design” refers to environmentally-friendly strategies based in conservation and waste reduction as well as the health and comfort of the occupants. The word “sustainability” refers to renewable resources that are used in a fashion which ensures the quality of life for future generations.

Tips For Green Building With Sustainable Materials

From foundation to landscaping, smart choices can make the difference in an environmentally-friendly home. Insulating concrete forms (ICFs) can be used in the building’s foundation and walls. This combination of concrete and polystyrene foam creates a structure that will stay cooler in summer and warmer in winter, saving on energy costs. Furthermore, ICFs create an effective barrier against noise, insects, and mold.

Rather than building with traditional wood studs, structural insulated panels (SIPs) can be used to build floors, walls, and roofs. SIPs consist of rigid foam insulation between two panels of oriented strand board, or fiber cement panels, providing a more uniform insulation coverage area. Like ICFs, this high-

“Creating a green building is not just about energy efficiency; it is also about recognizing the repercussions of our current practices on the world as a whole.”

performance system helps maintain indoor temperature.

Today’s marketplace includes a multitude of products made with such things as recycled plastic or glass bottles. Builders may now choose carpeting, drywall, plastic lumber for decking and outdoor furniture, cotton and cellulose insulation, paint, roofing materials, structural steel, and glass tiles, all with high-recycled content. Using both recycled content and salvaged building materials reduces the burden on our landfills. In addition, using rapid-growth resources such as sisal or bamboo gives the home a more natural appearance without the environmental impact of other products.

Protect Your Indoor Air Quality

Chemicals, outdoor pollutants, and mold can create health hazards in the home. The principles of green building ensure that solvent-free adhesives and water-based, formaldehyde-free interior paints and sealers are used in the building. The result is a new home with fewer chemical vapors and odors. In addition, the alternative products used in the foundation and framing prevent moisture penetration, reducing the possibility of unseen mold colonies taking root in the home’s structural materials. This, coupled with a good ventilation and air circulation plan, guarantees that the indoor air will be as clean and fresh as possible. Concrete, bamboo, or tile flooring will prevent dust, pet dander, and fibers from building up in the air. An unattached garage will reduce the amount of auto exhaust that enters the house. Careful planning will result in a new home that is comfortable, pleasant, and safe for the whole family.

Save On Energy Costs With High-Performance Building

A thoughtful and coordinated construction project can ensure great savings in the long run. Energy efficiency and conservation should be incorporated into each building plan.



Structural Insulated Panels (SIPs)

ing and cooling methods, “cool roof” materials that are light or reflective, adequate insulation in all areas of the house, well-sealed and connected duct work, and energy-efficient electrical appliances. As energy costs rise, these considerations and more will help homeowners keep costs down while reducing the impact on the environment.

Intelligent Design

Green building is about smart and effective use of resources, energy, and water. Creating a green building is not just about energy efficiency; it is also about recognizing the repercussions of our current practices on the world as a whole. Construction should use resources wisely. The more self-sustaining, sturdy, and efficient our homes are, the more likely we are to enjoy a healthy and beautiful Colorado. **UHD**

The Author

Brandy LeMae, with her husband, Joseph Vigil, own VaST, a high-performance and green architecture studio. Brandy is dedicated to fine design that incorporates sustainability and energy efficiency. She is a Leadership in Energy and Environmental Design (LEED®) Accredited Professional and holds a Green Building Certificate from Colorado State University (CSU). Brandy takes a holistic approach to projects, identifying sustainable alternatives at every stage with an eye toward creating buildings that meet the users' needs while decreasing the overall impact on the environment. Brandy LeMae and Joseph Vigil can be reached at 303 442 3700 or www.VaSTarchitecture.com.

Products and strategies should include high-performance windows, daylighting and efficient electric lighting, low-flow faucets and toilets, and tankless or solar hot water systems. Home solar power systems are particularly suited to Colorado's sunshine, and homeowners can often find themselves with a surplus of energy that can feed the utility grid rather than feed off of it.

Other efforts toward energy efficiency include natural heat-

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Lighting Control Offers Sensible Energy-Saving Solutions



Occupancy Sensor

Peter Hoagland

Today's Systems Are Affordable, Easy To Use, And Provide Many Valuable Benefits

Green is in and everyone is looking for affordable ways to save energy in and around the home while also helping the environment. Since lighting can represent as much as 25 percent of your electrical bill, it's an excellent place to start. Among the most effective and enjoyable options to save energy is with a lighting control system. Today's lighting control products can pay for themselves over the life of the system while providing additional benefits of comfort, convenience, and security.

Dimmers

Among the simplest, most cost-effective ways to trim your electric bill is with a dimmer. By allowing you to reduce lighting levels when you simply don't need as much light, this really adds to your bottom line. How much? Simply dim your lights by 25 percent and you pocket 20 percent in electricity savings. Dim lights by half and you increase your savings by 40 percent.

Dimming not only reduces energy consumption, but significantly extends the life of your bulbs. Dimming lights by 50 percent not only saves nearly that much in energy but the bulb life is extended twenty times. As an added convenience, this also decreases the amount of times you need to change

your bulbs. And because a dimmer can control the amount of light you want, it also eliminates the need for costly three-way bulbs. Though dimmers cost more than a conventional toggle switch, the installation costs are the same.

Another ingenious energy-saving device is the occupancy sensor which combines hands-free switching with energy savings. Typically installed in areas such as a bathroom, walk-in closet, or garage, occupancy sensors turn lights on when a room is entered and off when it is vacated. Best of all, they do it automatically and even when people forget to turn off the light. Occupancy sensors can be set to manually turn on and, like dimmers, are relatively inexpensive to install and come in a variety of colors.

What About Fluorescent Lighting?

Today, incandescent bulbs represent 85 percent of all light bulbs used in residential applications. Though fluorescent lights have been around since the 1930s, they have never been as popular in homes as incandescent lighting due to higher initial cost, harsh white light, and poor color rendering. Fluorescent technology has made great strides, however, and represents an increasingly popular lighting option due to lower operating costs, improved performance, and extended bulb life.

The compact fluorescent light (CFL) is an especially popular option for homeowners for general lighting that will be on for several hours per day. Some CFLs are not dimmable while those more costly types require more costly lighting control options. Even when dimmed, some find the harsh white light not as pleasing as that of the warm amber glow of an incan-

"Today's lighting control products can pay for themselves over the life of the system while providing additional benefits of comfort, convenience, and security."

descent. The best of both, a perfect balance? Using lower wattage halogen incandescent lamps can offer energy savings from standard incandescent lamps in addition to the color and ambience of a dimmed incandescent.

Therefore, the most effective lighting control systems utilize incandescent, halogen, and fluorescent bulbs for the best combination of energy savings and convenience.



The following are key points about lighting control systems and energy savings:

- Dimmers can save significant amounts of energy while providing ambience
- Dimmers can greatly extend bulb life. Fifty percent power extends bulb life 20 times
- Occupancy sensors offer additional savings plus wonderful convenience
- Affordable systems can pay for themselves in reduced energy costs

You can learn more about saving energy with lighting control products through the Home Lighting Control Alliance (HLCA). The Home Lighting Control Alliance is a self-funded, member-driven consortium of leading lighting control manufacturers, systems integrators, and industry support organizations. Its sole purpose is to promote the awareness, value, and benefits of lighting control products for residential applications.

Current partners in the Home Lighting Control Alliance include: AHA Design, Automated Outlet, CEA, Centralite Systems, Control4, Crestron, Echelon, EH Publishing, ETC, Exceptional Innovation, FulTech Solutions, Good News Electric, HAI, Home Logic, Leviton, Lightolier Controls, LiteTouch, Low Voltage Systems, Pass & Seymour, RL Johnson Construction, S&S Electric, Somfy Systems, Square D, Vantage Controls, WattStopper, and Worthington Distribution.

For more information visit www.homelightingcontrol.org. **UHD**

The Author

Peter Hoagland has had a successful career in audio that spans more than three decades. Peter has been involved in nearly every facet of the consumer electronics business. As one of the industry's leading experts in marketing communications and media relations, Peter is Director of the Home Lighting Control Alliance (www.homelightingcontrol.org).

synopsis

- A lighting control system can save energy.*
- Dimming lights not only reduces energy consumption, but significantly extends the life of bulbs.*
- The occupancy sensor is an ingenious device, which combines hands-free switching with energy savings.*
- Fluorescent technology represents an increasingly popular lighting option due to lower operating costs, improved performance, and extended bulb life.*

BUILDING HOMES

The "Clean And Green" Way: American Lung Association Health House

Robert Moffitt



synopsis

New, energy-efficient homes can be created with the specific aim of reducing indoor air pollutants such as mold, radon, combustion gases, and volatile organic compounds (VOCs).

Keeping water out of living areas has been the goal of every builder since the Stone Age, but only recently has the link between moisture control and indoor air quality been established so clearly.

Building to Health House tough guidelines is more expensive—it adds about three to five percent extra to the cost of the home, on average, and it requires a significant investment in builder and subcontractor training.

"Health House" Origins

As the "green home" building movement continues to penetrate all levels of the residential construction market in the United States, one program that arose from an unlikely parent organization has evolved a unique niche of its own.

The American Lung Association "Health House" program began in 1993 as a one-time experiment of the American Lung Association of Minnesota to see if a new, energy-efficient model home could be created with the specific aim of reducing indoor air pollutants such as mold, radon, combustion gases, and volatile organic compounds (VOCs). News of the project spread

quickly, and within a few years the American Lung Association program was training builders and overseeing the construction of "Health Houses" from Anchorage, Alaska to Tampa, Florida.

Jerry Orr, retired CEO of the American Lung Association of Minnesota and a founder of the Health House program, said the program's goals were lofty from the start. "We set out with the intention of changing the way homes are built in America," he said. "We incorporated all we knew about the newly emerging field of building science, which redefines a house as not just a collection of building materials, but as a complex, interactive system. To the best of our knowledge, we were the first program designed for occupant health as well as energy efficiency and sustainability."

Water Is The Enemy

Keeping water out of living areas has been the goal of every builder since the Stone Age, but only recently has the link between moisture control and indoor air quality been established so clearly. Mold and mildew problems immediately come to mind, but relative indoor humidity levels also are a major factor in controlling dust mites, a microscopic animal found in many homes that is linked to asthma attacks and allergies. Keeping the indoor humidity at 50 percent or below prevents dust mites from breeding, and also proves inhospitable to another old, unwelcome house guest, the cockroach, another pest that causes respiratory problems for millions of Americans.

Homes built to American Lung Association Health House guidelines use the following components to manage water:

- Capillary breaks at the cement slab, as well as where every different wall structures join
- Basement foundation waterproofing
- Walls and ceilings are air-sealed and air-tight, using advanced building techniques
- Appropriate building techniques for each of the four major building climate zones
- A continuous ventilation system that is designed to operate year-round

Training Builders

One of the first products of the Health House program was a set of written, formal guidelines on how to build a healthier, energy-efficient home. As the program expanded beyond Minnesota, the guidelines were modified to include techniques for building in a wide variety of climate zones.

"We decided from the start that these guidelines would not be prescriptive, unlike most building codes," said Steve Klossner, technical advisor for the program and a nationally

known expert on healthy building techniques. "We don't tell builders which particular product they have to use in a Health House, but instead create a pathway they can follow using many of the same materials and vendors they are comfortable with."

That said, becoming a Registered Health House Builder is not easy, and only a fraction of the thousands of builders trained by the American Lung Association program ever go on to successfully build a "Health House." While the program did not keep a count of all the homes built in its early years, Klossner estimated that there are about 2,000 homes in the United States built to the tough guidelines. There are also sister programs in Canada and Australia, also using the "Health House" name.

Becoming A Health House Builder

To become a Registered Health House Builder, builders must first:

- Complete a two-day training program (HVAC contractors are also recommended to attend).

"We incorporated all we knew about the newly emerging field of building science, which redefines a house as not just a collection of building materials, but as a complex, interactive system."

- Sign an agreement and pay a fee of \$2,500 per home (to cover inspection costs). Builders building 50 or more homes or who participate in programs such as ENERGY STAR®, Building America, or Environments For Living, pay \$1,750 per home.

- Provide information on the project via a Web-based tracking form.
- Pass two independent site inspections—one during the framing/foundation stage, and the second after HVAC rough in.

- The completed structure must pass a final performance test, which includes a calibrated blower door test, a duct tightness test, and indoor air pressure measurements.



All of the wall insulation and electrical boxes are sealed before drywall is installed, making every Health House very air-tight and energy efficient. Mechanical ventilation and filtration complete the whole-house system.



A color-enhanced image of a dust mite, an indoor allergen and asthma trigger found in almost every American home. Keeping indoor humidity levels below 50 percent inhibits their spread inside the home.

practices, has now set up its own guidelines and program. Builders who follow Health House guidelines now earn points in Built Green Colorado and EarthCraft House programs. The U.S. Green Building Council is now expanding its LEED® (Leadership In Energy & Environmental Design) program into residential construction under the banner LEED for Homes.

Major corporations such as Honeywell, 3M, and Hearth & Home Technologies have seen the value of associating their name with the American Lung Association Health House program and have become educational partners. With funding assistance from its partners, the Health House program has been able to greatly expand its awareness and participation among builders, the media, and homeowners.

The Health House program reached another turning point last year when the Sacramento division of D.R. Horton, the nation's highest volume home builder, became California's first registered Health House builder. Less than two years after it entered the Northern California and Nevada market, approximately 360 new homes had been built to the Health House guidelines in sub-

urban Sacramento and near Reno, Nevada. Another "Health House Community" is planned for the Twelve Bridges development near Lincoln, California.

Building to our tough guidelines is more expensive—it adds about three to five percent extra to the cost of the home, on average, and it requires a significant investment in builder and subcontractor training. In the end, however, the builder and subcontractor will have built a healthier, energy-efficient, high-performance home that sets them apart from others. Builders will get fewer callbacks and homeowners will have lower energy bills and a healthier indoor environment for themselves and their families.

It's just the right thing to do. **UHD**

The Author

Robert Moffitt is the Communications Director for the American Lung Association Health House program. Based in Saint Paul, Minnesota, the Health House program is the national residential indoor air program for the American Lung Association, a health charity that has been improving peoples' lives, one breath at a time, for more than 100 years. Moffitt is frequently interviewed on indoor air issues in major media outlets such as the *Washington Post*, *Business Week*, and the *Associated Press*. He is the author of a number of articles on residential indoor air quality and energy efficiency in building and health trade journals. Robert can be reached via e-mail at robert.moffitt@alamn.org.

After all inspections have been passed, recorded on the tracking forms, and signed off by the Health House staff, the builder and the home are listed on the program Web site (www.HealthHouse.org) and can use the program's logo for a one-year period for marketing purposes. The "Registered" builder aspect of the program is new and not retroactive, so only about a dozen or so builders are listed.

Changing Attitudes Seen

Since the program began with a single project in Minnesota, attitudes about healthier, more energy-efficient homes have changed. The National Association of Home Builders (NAHB), which once scoffed at green building

The sun is shining.
The wind is blowing.
The energy is plentiful.

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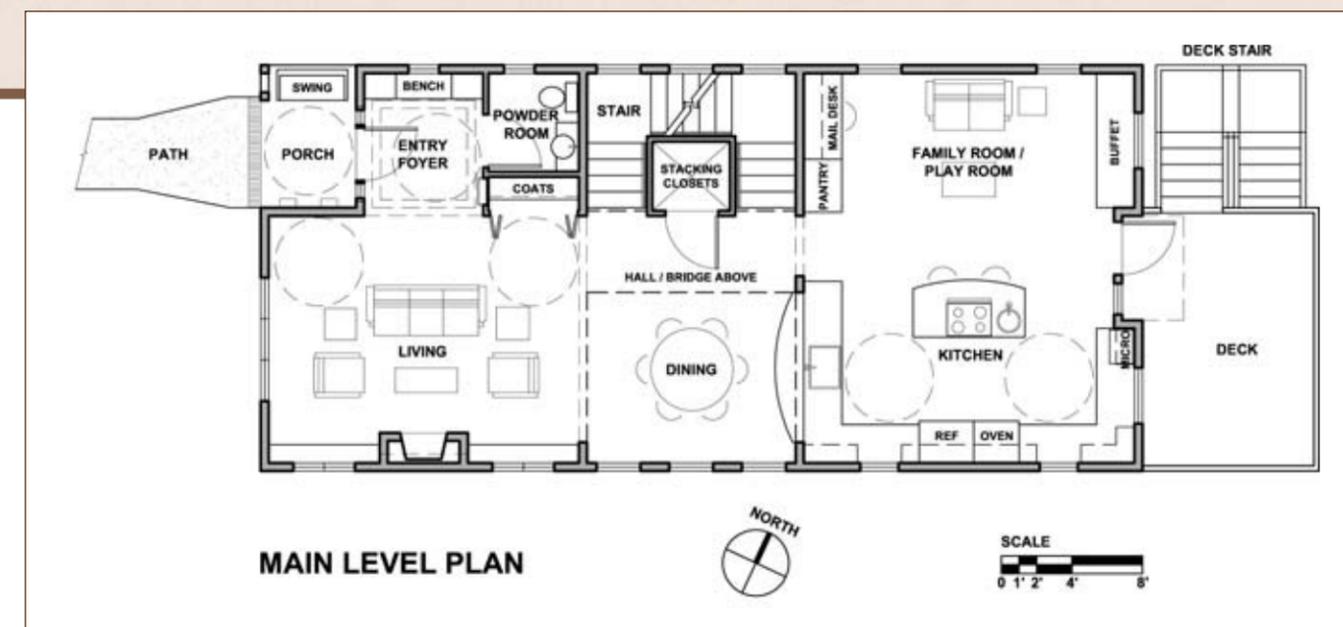
Find out how to use it
in the next issue of

ULTIMATE HOME DESIGN
The Optimum Performance Design & Build Resource
For Environmentally Enhanced Lifespan Living

Housing In Response To The Human Life Span

a test house in Seattle's Green Lake neighborhood

Emory Baldwin, AIA



synopsis

- The life-span design applies "The Principles Of Universal Design" and flexibility so that it could allow for the various changes that people are likely to experience over the course of their lives.
- One intent was to ascertain what features would be expensive or inefficient in terms of cost or space, and also to try to discover any hidden problems with universal design features.

Background

A number of trends in our society contribute to a growing incompatibility between people and their housing. The average household composition in the United States is becoming increasingly varied as our society becomes more diverse. The traditional household makeup has expanded to include elderly relatives, caregivers, and unrelated adults. The rapidly aging American population and longer life expectancies are leading to a greater number of people with physical disabilities. Additionally, housing prices are high for new buyers, while many empty nesters have more space than they need. Unfortunately, conventional housing stock generally does not respond to these problems.

Such trends demand a new approach to designing environments, which would better accommodate peoples' chang-

ing situations and their varying abilities. By designing flexibility into homes from the beginning, it is possible to reduce one's need to move to a new home and also prevent an elderly person's premature move to an institution. By designing a home's layout and structure to allow for a number of varied floor plans, it may be easily modified when the need arises. This approach would reduce potential remodeling costs and waste, increase the marketability of the home, and contribute to more stable and sustainable communities.

Intent

My aim was to design a new house for my growing family that would demonstrate "The Principles of Universal Design," life-span design, and flexibility, so that it could allow for the various changes that people are likely to experience over the course of their lives. The project was intended to prove that the above concept can be built economically and aesthetically, so that it would be appealing to the mass population and be within reach financially of the average family. It was essential to prove that the home could be easily built by a typical contractor. Another intent was to ascertain what features would be expensive or inefficient in terms of cost or space, and also to try to discover any hidden problems with universal design features.

As a model home, it would be available for others to visit,

by appointment, so as to educate other designers, owners, and builders.

Process

The following guidelines were developed and incorporated into the design of the home, to make it flexible enough to support a person throughout his or her life span:

Location Near Amenities

The feasibility of a home designed for one's lifetime depends in large part upon the nearby location of a range of amenities that would provide services and opportunities for recreation. Such amenities would include medical clinics, pharmacies, grocery stores, activity centers, libraries, schools, parks, and public transportation. The availability of in-home services, such as home delivery of groceries, house visits by health care workers, special transportation, house cleaning, maintenance, and repair, would also be extremely helpful to elderly persons, people with disabilities, or people with busy careers. Access to friends, family, and society is important as well.

Distinction Between Primary And Secondary Functions

Separate the core spaces from those that are only needed temporarily, so that secondary areas may be visually defined and

differentiated from the primary homeowner's realm. This separation also works to create privacy between primary and secondary areas.

Varying Amounts Of Secondary Space

The amount of space that a household requires changes over time. By allowing the dwelling to be divided in a number of ways, the primary occupant can rent out or rezone space as needs evolve.

Private Outdoor Space

The primary and secondary parts of the dwelling should each have their own private outdoor space. Such a space should provide privacy not only from the street and alley, but also from other parts of the building. We included a private patio for the basement.

Private Entrance For Accessory Area

Both work areas and accessory apartments should be accessible without entering the zone of the primary homeowner.

Central Vertical Circulation Core

Both the stairway and the dedicated vertical shaft (stacking closets which can be converted into an elevator) should be centrally located within the home, and near the entrance. The two means of vertical circulation should be closely associated with each other, so that one is not further away or more difficult to access than the other.

Areas For Future Expansion

The inclusion of a sunroom, courtyard, attic, or basement provides the option for future inward expansion. The incorporation of such unfinished spaces in the original design makes future additions less expensive and raises the value of the dwelling.

Flexible Layout

Living arrangements and needs change over time. Allow the building to be flexible so that the layout may be easily changed, and an area can be used for different functions over time.

Minimization Of Load-Bearing Walls

Use a post-and-beam, or structural panel, system in order to maximize the level of flexibility of the building. Large areas of load-bearing wall inhibit the building's ability to change over time.

Construction

The construction of the house took 10-1/2 months (3-1/2 months more than the contractor's estimate). Although we lived next door to the construction site, it was still challenging at times to keep on top of the contractor, especially when I needed to be out of town for some reason. The contractor

generally did a good job on the house, but a few items had to be re-done in order to meet the correct design intent. Some mistakes were made (such as plumbing for the kitchen sink being in the wrong place) which reduced the extent to which the house was universally designed. However, most things turned out according to plan, by my careful checking of the work as it progressed.

Design Overview

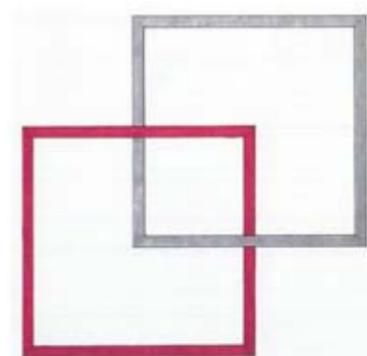
The home is an "urban infill" project in the Green Lake neighborhood of Seattle, Washington. It is a three-story house including a finished basement. The home is designed to pro-

"By designing flexibility into homes from the beginning, it is possible to reduce one's need to move to a new home and also prevent an elderly person's premature move to an institution."

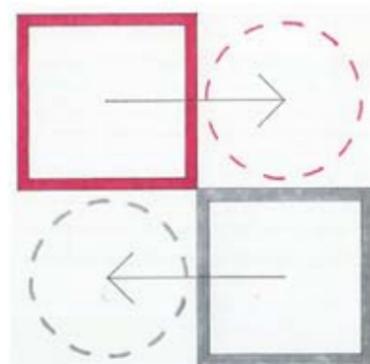
mote "aging-in-place" and is an urban response to the otherwise suburban ranch-style house. Both the main floor and the finished basement (which is designed as a mother-in-law apartment) are accessible. (The main floor is accessible from the front sidewalk, while the basement is accessible from the rear alley.) All doors throughout the house are wide (3 feet) for enhanced maneuverability, and the house has many universally designed features throughout, including level thresholds at all exterior doors, and curbless showers. All bathrooms in the house have base cabinets on casters that roll away when not needed. This allows accessibility for people in a seated position. Three stacking closets are framed, sized, and wired for a future elevator so that the house can accommodate the resident's changing needs and abilities down the road. The upper level of the stacking closets is currently used as a "reading nook" for bedtime stories. A large vertical open space connects the dining room of the main floor with the bridge of the upper floor. The bridge, in turn, connects the master suite with the children's bedroom area.

Detailed Description Of The Home

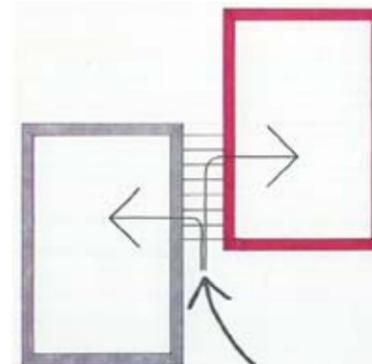
To make up for the frequent gray Seattle weather, we made the house seem light and welcoming, by implementing a three-pronged approach:



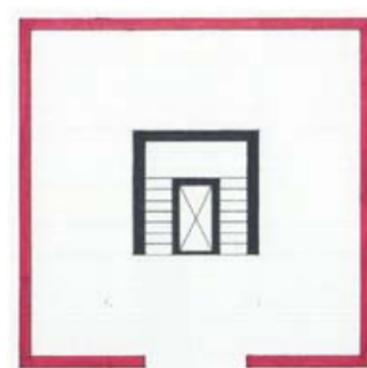
Distinguish Primary and Secondary Functions



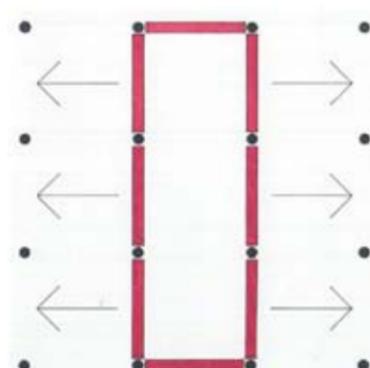
Private Outdoor Space



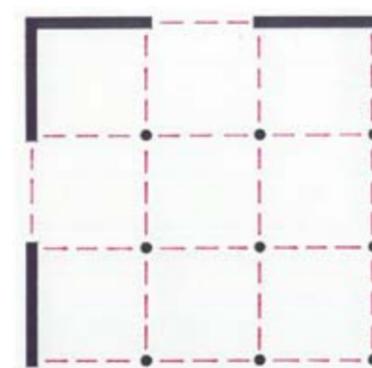
Private Entrance for Accessory Area



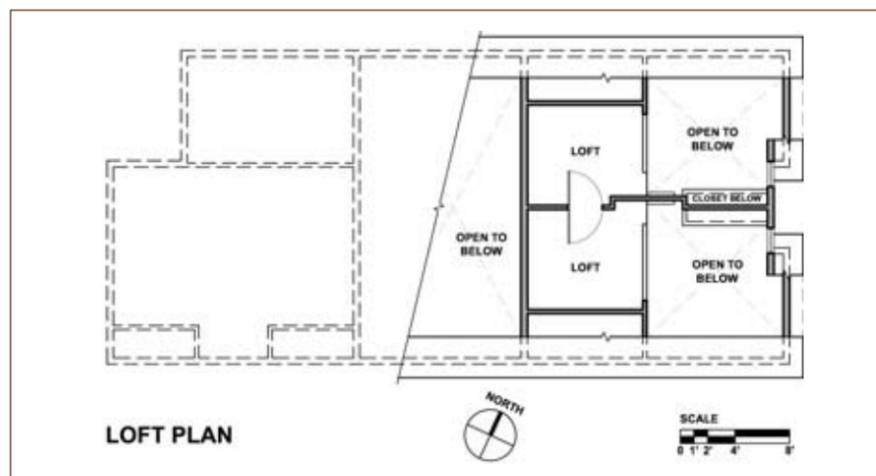
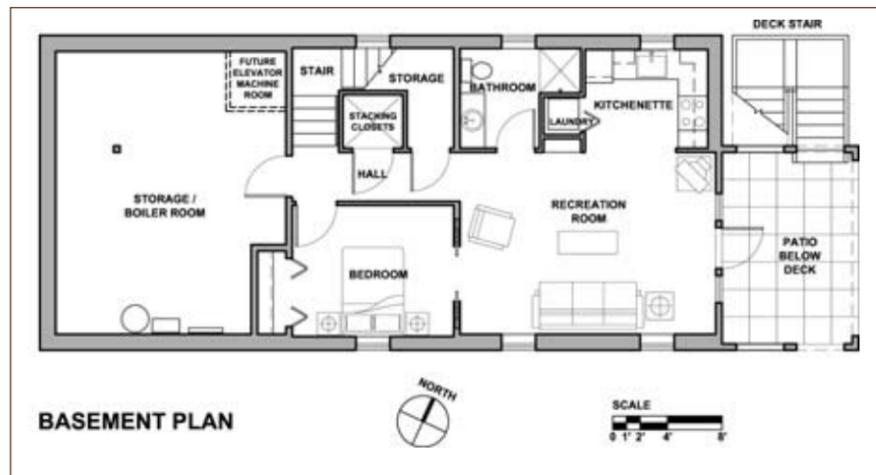
Central Vertical Circulation Core



Flexible Layout



Minimization of Load Bearing Walls



1. Incorporating many windows for natural lighting, and carefully positioning them to allow for maximum privacy from the neighbors. We also put in several interior windows, to borrow light from other rooms.

2. Using bright, cheerful paint colors on the walls.

3. Adding extra light fixtures, both to give us ample levels of lighting when needed, and also to give us flexibility in which kinds of lighting we can have on, depending on the situation.

Although our lot is narrow (only 33 feet, 6 inches wide), the house feels spacious due to its open layout. We created a center “hub” with a high vertical space over our dining room to enhance the sense of openness. It has also made it easier to communicate with people between floors. Additionally, we added adjoining lofts looking over the girls' bedrooms. A door between them has locks on both sides so that both girls have to agree to have it open.

Recognizing that our needs will change over time, we have created flexible spaces. For example, the basement is designed to be a comfortable mother-in-law apartment. However, it is currently used as a large home office and exercise room, and we plan to use it as a recreation room when the girls are older. The structure of the open space is designed to accommodate another room, if it is ever needed in the future. The room adjacent to the kitchen is currently a play area, but in the future it can be used as a family, music, or dining room.

Features

The following universal design features are included in the house:

- Level paths from both street and alley
- No threshold entries at all exterior doors: Good for wheelchairs, walkers, canes, strollers, and unsteady legs
- Fold-down package shelf at front door (This is handy when carrying bags)
- Three-foot wide doors throughout (with maneuvering space beside most doors)
- Lever handles on all doors: Easy to open with closed fist, or while holding key, bags, or children
- Loop handles on all cupboards (easy to open with closed fist)
- Pull-out drawers in cupboards and pantry
- Open plan layout for enhanced maneuverability and communication
- Reduced hallway lengths
- Wide hallways (42 inches wide

and 52 inches wide at the two short halls that were included)

- Low-pile carpeting, with no loose carpets (to reduce tripping hazards)
- Radiant floor heating: Avoids obstacles, reduces burns, good for allergies, and nice even heat
- Stacking closets, for future elevator: Walls framed and wired per manufacturer's recommendations
- Floor structure of closets is removable, independent from the rest of floor
- Elevator pit built into foundation
- Short runs of stairs (wrapping around elevator) to reduce injuries from falls: This is good for everyone, especially toddlers and elderly persons
- Structure sized to allow future room to infill open space above dining room: Allows future flexibility
- Wider clearances in kitchen (5 feet wide)
- Most kitchen storage in base cabinets, in drawers, and pull-out shelves
- Lower oven with racks lining up with countertop (and controls at 4 feet A.F.F.)
- Accessible countertop microwave
- Induction cooktop (electro-magnetic): Smooth surface for easy movement of pots and pans. Surface does not get too hot (safe for children, the elderly, etc.)
- Veggie sink adjacent to cooktop, with pull-out spray for filling pots with water
- “Floating” vanities in all bathrooms, supported by in-wall bracket system: Roll-away base cabinets on locking casters allow option for extra storage
- TOTO Washlet bidet seats on toilets, with outlets near rear of all toilets
- Lights over all showers
- Curbless showers, with offset controls for caregivers
- Handheld showers on adjustable rods
- Blocking in all bathroom walls for future grab bars
- Lowered thermostats throughout the house, with large numbers for easy viewing

The following universal design features were intended, but later deleted either due to cost, poor product selection, or the contractor's misunderstanding:

- Accessible kitchen sink with removable base cabinet on rolling casters
- Raised toe-kicks at kitchen cabinets
- Side-hinged oven
- Outlets are higher than typical, but not as high as intended

Sustainable Materials

The main level has wood flooring made from the off-cuts of engineered beams, a sustainable and affordable alternative to hardwood or bamboo flooring. The stability of this flooring

material works well with our radiant floor heating.

Used playground tiles under the deck were made from recycled tires which provides a soft-enough surface for falling on, but also a firm enough surface for a tricycle or wheelchair.

Our kitchen's backsplash was made from chalkboards salvaged from a local high school.

Other materials include Hardiboard siding, Trex decking, and water-efficient TOTO toilets.

Results

We believe the finished house is a good example of an urban solution for an “aging-in-place” home. Our family uses all of the spaces well, and as they were intended. Some of the things that we like particularly best about the house are features that may seem intended for a person with a disability, but that make our lives easier as well. For instance, the gently sloping path to our front door (and the low threshold there) make it easy to push our children's strollers inside, and also makes it easier for my wife's grandparents to visit. The stacking closets are currently used as extra-deep storage, and work well for stowing strollers without needing to collapse them. The upper level of the stacking closets is used as a “reading nook” for bedtime stories, and has been designed to be semi-open until the elevator is needed in the future.

Conclusions

Generally, universal design features did not cost us too much more money. Lever handles, wider doors, and low-threshold entries have negligible cost. Spaces were planned to be very open, thus reducing the length of any hallways. The areas where extra cost was noticed were at the kitchen and bathrooms, as we had expected. Both were bigger, therefore adding immediate cost over a typical residential solution. Bathrooms required tile floors in order to allow for a seamless curbless shower. Kitchens required more real estate in order to make the oven, cooktop, and microwave accessible. Also, the way that cooking appliances are priced, we ended up paying at least twice as much to have the cooktop and oven separated, rather than buying them together as in a standard arrangement.

Overall, however, the additional direct cost for incorporating universal design was about \$9,000 (2 percent of the total construction cost). The house could have been reduced in size in order to reduce the total cost, but our personal preferences led us to the layout of the house as it now stands. **UD**

The Author

Emory Baldwin is an architect specializing in “aging-in-place” residences. He graduated with a Masters in Architecture from the University of Washington in 1997, where he wrote his master's thesis on “Housing In Response To The Human Life Cycle.” Since then, he has been designing a range of residential projects, primarily senior housing and multi-family mixed-use developments. Emory and two of his colleagues have recently started their own architectural firm (ZAI Inc.), which focuses on universally designed residential environments that are flexible in plan so that they can accommodate the changing physiological and socio-economic changes that people are likely to experience over the course of their lives.

HOMES THAT NURTURE sustainable lifestyles

Gary Reber

synopsis

What can be surmised as America becomes more diverse in household composition is that the baby boomer population, no matter what the makeup, will be the largest market for consumer goods and services, and for new homes that meet their particular needs for sustainability.

Within nine years, nearly 100 million Americans will be senior citizens, but for those without the financial means, they will be relegated to conventional homes that do not meet their physical needs.

There is no disputing that designing and building homes and remodeling existing homes for sustainable lifestyles will become our country's greatest housing challenge.

Changing Demographics

The traditional family has been losing its share of the total American population makeup for some time now. Even though the 1950's singular image of family life was popularized with *Leave It To Beaver* and *Father Knows Best* television shows, the fact is that only 43 percent of all households in 1950 were made up of families with children. Still, this family unit was the single largest family type at the time and took center stage in the media and with companies who marketed their products and services.

The 1960s brought change when the divorce rate started to climb. Then, in the 1970s, as divorce rates accelerated and "baby boomers" delayed getting married and having children longer than any other generation, the traditional family began to rapidly lose share.

According to Eric Belsky, Executive Director of the Joint Center for Housing Studies at Harvard University, in 1980, a mere 27 years ago, the traditional family share of married couples with children was 31 percent of all households; a 12 percent decrease from the 1950s. Childless couples accounted for 30 percent of all households. In the 1990s, not only did the traditional family lose first place as the most prevalent household type to childless couples, but also the remarriage rate steadily declined and the median age for first-time marriages steadily increased. As a result, by the year 2000, people living alone captured second place with traditional families falling to third place.

What we now have is a more diverse America with the prospect in 2020 that the traditional family could constitute as few as two in ten households. Childless couples and people living alone are projected to account for 30 percent as the baby boom ages. Another 20 percent will be a mix of single parents and unmarried household heads living with related and/or unrelated others.

What can be surmised as America becomes more diverse in household composition is that the baby boomer population, no matter what the makeup, will be the largest market for consumer goods and services, and for new homes that will meet their particular needs for sustainability. In nine years, 70 to 80 million Americans will turn 65 years old, while people age 65 and older already number 35 million. This means that within nine years nearly 100 million Americans will be senior citizens. But for those without the financial means, they will be relegated to conventional homes that do not meet their physical needs. According to a report issued by the Joint Center for Housing Studies, 90 percent of all homeowners age 70 and older currently live in such homes. And the AARP, formerly the American Association of Retired Persons, reports that nearly one-quarter of those 65 and older will have difficulty getting around within their homes in the next five years.

The Caregiver Boom

According to a 2004 study conducted by the National Alliance for Caregiving (NAC) and the AARP, at present nearly 45 million Americans within this baby boomer population are caring for ailing adult family members; more than 60 percent of these caregivers are women. More than 26 million caregivers work, and the majority of female family caregivers are working-women, often with children under 18. They are pulled on the one hand by the demands of aging parents and on the other by the needs of dependent children. As the baby boomer population ages the demand for caregiving will dramatically increase. The home environment plays a critical role in the mental and physical health of both caregivers and care recipients.

Disabilities, Obesity, And Diabetes

Furthermore, there are currently 54 million people with disabilities. This situation is a pull on our society.

The building industry has neglected to address these issues in the design and building of homes. The statistics are alarming when coupled with our rapidly aging population. One in five people will incur a disability sometime in their future. Obesity and diabetes also are diseases that require home features to facilitate and ease day-to-day living. All in all, this is a sad, if not depressing, scenario that our nation and building industry needs to address.

New-Targeted Market

Aging baby boomers will soon constitute the new-targeted market for homebuilders. A recent study by the National Association of Home Builders (NAHB) and Countrywide Home Loans suggests that about 60 percent of baby boomers plan to relocate for retirement, creating a potentially lucrative market that builders want to target. They are not interested in moving to traditional retirement communities. A significant number will consider retirement age as an opportunity for a new start on life. Many who have invested in their homes do not want to move just because they are older. Increasingly, baby boomers will demand homes or home modification that will allow them to "age in place" and that can be adapted to fit their changing needs as they grow older so they can remain in their homes for as long as possible. According to the study, one-fourth of homebuyers 50 and older are paying more for the home they plan to retire in than they did for previous homes.

"...the baby boomer population, no matter what the makeup, will be the largest market for consumer goods and services, and for new homes that will meet their particular needs for sustainability."

The demand for homes with sustainable lifestyle features will increase along with social services in their communities, such as in-home chore work or transportation services, and will allow baby boomers in their prime to remain in their homes. This also will drive planners to design livable communities, based on the Principles of Universal Design that promote community involvement and interaction. These communities will encourage independence and contributions of older people and allow older people to age with dignity and purpose.

As a majority of the American population ages, the idea of designing homes that optimize "independent living" will take hold in a major way. One of the missions of *Ultimate Home Design*® magazine is to advocate building Optimum Performance Homes™ that facilitate longer-term independent living for the elderly while optimizing the live/work home environment so that people can be stimulated to be as productive

as possible for as long as possible (see the article entitled, "The First Optimum Performance Home: Universal Design Architecture"). This is what "successful aging" is all about. This means that homes need to be designed that minimize overburdened tasks and stress.

With retirement age at 65 years old and increasing demands for workers to take early retirement, there remains upwards of 20-plus years of productive after-retirement life. Why? Life expectancy is now 79 years old and older for those who treat themselves well. Thus, designing homes that stimulate sustainable lifestyles will become a dominant interest driving the demand for housing in the future. Homeowners of all ages will have an increasingly greater interest in doing activities at home and having rooms and spaces to accommodate these activities. After all, more and more people will have free time to engage in new careers and pursuits. Homes designed for sustainable living will nurture an explosion in home office-based enterprises facilitated by the Internet. The two or three decades ahead for baby boomers are likely to be viewed as a second life, with seniors pursuing their hobbies, exercising, volunteering, or operating a home-based business.

There is no disputing that designing and building homes and remodeling existing homes for sustainable lifestyles will become our country's greatest housing challenge. The reality is that the typical American home today does not work for our aging population. Our elders increasingly are struggling with barriers to living in their present homes that young and healthy people do not find challenging. These barriers become a source of never-ending frustration for the elderly and their caregivers. In the end, many simply give up on their natural drive for independent living and reluctantly move into an elder home or institution with assisted care. The building industry needs to address this eminent challenge now and prepare for a huge market of baby boomers who within the next nine years will create the demand for homes with universal design features. Smart home builders will not only provide for such lifestyle design features to optimize independent living but will also incorporate healthier green build materials and energy-saving approaches to achieve "zero-energy cost" home operation, water conservation and minimized environmental impact, and comprehensive whole-house integrated electronic automation control features that enhance sustainable lifestyles. As we move into the 21st century, we must expect more from our homes than ever before. The home designs we advocate in *Ultimate Home Design* will become the home building choice of the future. Such "age-friendly" homes are designed to be accessible and usable by people of all ages and all abilities.

While, at the present time, a cost premium is associated with universal sustainable home design, the overall added

cost should not exceed 10 to 15 percent of the costs associated with conventional home construction. The rewards are reaped immediately as livability is tremendously enhanced and, if designed optimally, 30 percent or more in annual energy cost savings will result. Thus, in a short time, the added initial expenditure will pay for itself, and the home will add extra years to the homeowner's quality of life. Can anyone disagree with the notion that most people will value the additional investment in order to be able to live an active and productive life feeling independent and well?

Baby boomers pioneered the electronic age of convenience, independent thinking, and unlimited possibilities. They will want their homes to work for them so that they can "age in place" and continue to be productive. They will want to live longer and healthier, in order to avoid potential institutionalization. These older, health-conscious boomers will demand more from their homes than builders are presently delivering. Because they have been spending and will increasingly spend more time at home, they will want features such as a home office; a large kitchen to entertain their families, friends, and guests; a dedicated home theatre, music room, or combination multimedia entertainment room; a library study; a workshop; an art studio; meditation room; workout space; steam room and/or sauna; workshop; or a solarium, greenhouse, and/or garden. They will want to provide enough room in their homes for their extended families so that when the whole family gets together, everyone can be together for as long as possible. The new trend among aging baby boomers is to use the money from the sale of their homes to build the home they have always wanted. This home can be smaller or much bigger, depending on personal needs and requirements, and have more amenities. Undeniably, the baby boomer generation wants to fully enjoy their retirement years and create mini-retreats with their new homes.

Now Is The Time

Now is the time for America's architects, architectural designers, interior designers, lighting designers, electronic lifestyle integrators, builders, and developers to embrace a new dynamic philosophy of home design that meets the needs of people of all ages and all abilities while adopting building practices that promote independent living and environmental and lifestyle sustainability. Such an "ultimate home design" approach will produce Optimum Performance Homes for the 21st century. **UHD**

The Author

Gary Reber is the President of Ultimate Home Design, Inc. and the founding Editor-In-Chief and Publisher of *Ultimate Home Design*, The Optimum Performance Design & Build Resource For Environmentally Enhanced Lifestyle Living". He is also President of WSR Publishing, Inc, which publishes *Widescreen Review*, The Essential Home Theatre Resource".

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The Interior Design Process

Part I: Synthesizing Sustainability, Universal Design, And Technology

Julie Stewart-Pollack, ASID, IDEC

synopsis

 *The Optimum Performance Home will be a “high performance building,” in which all systems work together to reduce significantly its environmental impact, provide maximum energy and resource efficiency, reduce maintenance and capital costs, and increase the occupants’ comfort and health.*

 *The interiors of the first Optimum Performance Home will embody and integrate three basic functional concepts: sustainable design, universal design, and innovative technology.*

Quality Interior Design

Readers of *Ultimate Home Design*® are following the development of the first Optimum Performance Home™ from its beginning as a bold idea combining sustainability and universal design with innovations in technology, to its completion as a dynamic, beautiful, and comfortable family home. We are learning about this process through a series of articles from the owner/designer’s perspective describing the challenges and opportunities involved in such an ambitious and innovative project. Upon completion, the first Optimum Performance Home will be a LEED® for Homes (Leadership In Energy & Environmental Design) certified showcase of some of the most advanced, innovative, functional, and beautiful aspects of sustainable, universal design.

This article focuses upon the considerations and processes for the overall design and development of the interiors of the first Optimum Performance Home. Quality interior design plays a significant role in the overall goals for and success of any home, but it is absolutely essential to successfully meeting the extensive and ambitious goals for this home. Far from

being limited to the stereotypical practice of “decoration” narrowly defined by the choice of colors, furnishings, fabrics, surfacing materials and finishes, quality interior design involves also a holistic understanding of the context of the entire design—from the site, to the structure, to the systems, to the most intimate experience of the home—the interiors. This approach provides maximum benefits for the homeowners and the environment.

Functional Design Concepts

The Optimum Performance Home will be a “high performance building,” in which all systems work together to reduce significantly its environmental impact, provide maximum energy and resource efficiency, reduce maintenance and capital costs, and increase the occupants’ comfort and health. To achieve these goals, the interiors of the first Optimum Performance Home will embody and integrate three basic functional concepts: sustainable design, universal design, and innovative technology. Each of these three functional concepts has distinct advantages, and they also pose some potential challenges in implementation. Great care has been taken to ensure that these three functional concepts are designed to enhance the experience of living in the Optimum Performance Home. However, often we find that sustainability, innovative technologies, and universal design elements are applied with little consideration for how they will be experienced by homeowners. But, our “experience of environments”—how they make us feel and react, and how well they support our physical and psychological needs—is every bit as important a consideration for the interiors as is the number of square feet or the layout of spaces.

In fact, considerations for how we will actually experience our homes should precede and guide all other decisions. For example, when we decide to build an environmentally responsible home, we are committing ourselves to a learning process and lifestyle change that connects us with our homes in ways rarely imagined. Beyond the typical functional requirements and desired amenities we all have of our homes, by choosing to live a more environmentally responsible lifestyle we discover opportunities to experience how deeply our lives affect and are affected by the world both inside and outside the walls we build. If the interior design fails to take advantage of this opportunity, the home will never be truly sustainable.

The Challenges

Designing for sustainability using the LEED for Homes rating system will certainly increase energy and resource efficiency, improve indoor air quality, reduce waste and the over-

all environmental impact of the construction, operation, and maintenance of a home over its increased life span. However, some critics have pointed out that LEED fails to consider the ways in which sustainable design can also enhance quality of life issues such as increased productivity, and overall health and well-being.

Similarly, designs that incorporate state-of-the-art technologies can provide enhanced convenience, entertainment, and safety to a sustainable home. But research has shown that if the technology overwhelms the design or fails to be user-friendly, people may reject it or simply won’t use it.

The third functional concept, designing for universal accessibility and use, enhances the safety, adaptability, and comfort of people in their environments for their full life span. Universal design is often described as “human-centered design” in which the experience of the user is central to all decisions. But universal design also relies heavily on science, medicine, and technology to create products that accommodate a broad range of personal needs and abilities. As discussed in previous articles in this publication, universal

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design must enhance the users’ sense of control, independence, and self-reliance through the use of improved product design and elimination of physical barriers.

The challenge for each of these functional design concepts is to integrate them seamlessly into the home so that the homeowners can effortlessly enjoy their diverse benefits as a natural part of their daily lives.

Aesthetic Approaches: Biophilic Design And Quality Over Quantity

Sustainable design focuses on environmental sustainability; universal design focuses on social sustainability; and technology helps make them both possible. The interiors must integrate these three components in such a way that the over-

all experience of living in the home is enhanced. The result should not reflect or perpetuate stereotypes but rather be an example of true quality-of-life design.

Biophilic Design

The interiors of the first Optimum Performance Home are designed using the concept of Biophilia: the human need for nature. I have defined and discussed biophilic design in previous articles in *Ultimate Home Design* as an important approach to creating environments that enhance our physical and psychological health and well being by providing for direct and indirect experiences with nature. The argument for biophilic design is compelling. Research indicates that we need to experience and interact with nature as a central part of our lives to enjoy a variety of benefits including improved physical skills, concentration and memory; increased productivity; relief from stress and mental fatigue; as well as enhanced aesthetic and spiritual experiences.

Biophilic design is an excellent (and natural) way to meet the challenges of combining sustainable, universal design qualities with the technologies of a "digital home" in a life-enhancing, aesthetically pleasing environment. This approach represents the new design paradigm that seeks to create environments that are healthy for the planet and for people of all ages by understanding our deeply rooted human-nature connection. Because biophilic design is based upon the universal, inherent needs we have as human beings to experience nature as a vital part of our lives, it is essential to integrate biophilic design attributes into all aspects of the design from site to structure to interiors.

Biophilic design attributes are elements and qualities of the physical environment that connect us to the physical, psychological, and cognitive benefits resulting from direct experiences with nature. Dynamic natural light and ventilation, access to open and/or moving water, frequent opportunities for spontaneous interaction with nature, sensory connections with nature, and the use of fundamental natural forms and local natural materials are biophilic design attributes that provide physical links with nature in the home. Symbolic links that appeal to our genetically based affiliation and association with nature and the essential sense of meaning we attribute to the natural world are also important biophilic design attributes. They include concepts of environmental complexity and order, a sense of mystery, and prospect and refuge (strategic viewing conditions from a position of safety and security). These physical and symbolic attributes were discussed in-depth as they applied to the first Optimum Performance Home in the July/August 2006 issue of *Ultimate Home Design* (Issue 4) and they will be illustrated and discussed further in future articles as the home is completed.

Quality Over Quantity

A complimentary aesthetic approach to biophilic design is the design principle described by architect and author of *The Not So Big House* series of books and contributor to *Ultimate Home Design* Sarah Susanka as "quality over quantity." This design principle embraces the sustainable idea of reducing resource and energy use by designing a smaller overall "footprint" for the home (i.e. fewer square feet). It also emphasizes the need to fully inhabit our homes by designing flexible, adaptable spaces rich in detail and meaning so that no space is wasted, no space is unused, and all spaces are special.

Susanka provides guidelines to achieve a smaller-is-better design that include biophilic design attributes such as dynamic, natural light and visually/physically connecting interior spaces to exterior spaces. The intimate experience of our homes is greatly enhanced by combining biophilic design attributes with this quality-over-quantity approach. The interiors of the first Optimum Performance Home are designed with intricate details inspired by and similar to those found in nature that fascinate us and connect us with the larger world.

Privacy Needs

Unless we design smaller homes with careful consideration, they often fail to provide for the diverse privacy requirements a family has over time. Privacy, the ability to control how much and what types of interactions we have with others, is central to achieving a high quality of life. People of all ages, all backgrounds, and all cultures require privacy to maintain physical and emotional well-being. But achieving privacy it is not a factor of square feet; it is a factor of good design.

The book I co-authored, *Designing For Privacy And Related Needs*, discusses the diverse needs for privacy we experience in all environments, including our homes and throughout the stages of life. Our privacy needs indeed do change as we age. Therefore, any universal home design must be responsive to these changes. But because we tend to equate the ability to achieve privacy with more space, we also tend to equate larger homes with more rooms as being more private. The reality usually is: more space is simply more space, and often these voluminous spaces actually provide less privacy than well-designed smaller spaces.

Designing for privacy requires interior features that 1) provide spatial hierarchy (a sequences of spaces that progress from less to more private); 2) create circulation paths that connect but do not pass directly through private spaces; 3) delineate "thresholds" (places of transition) between public and more private spaces; 4) provide stimulus shelters (places

to retreat such as alcoves and window seats within larger rooms; and 5) design opportunities for prospect and refuge (a vantage point from which to view your surroundings relatively unobserved). These interior features subtly but effectively provide adaptable, flexible conditions for privacy that are integrated seamlessly into the overall design of the first Optimum Performance Home.

The Process

Once the functional design concepts and aesthetic approaches have been fully defined, the process of designing the interiors becomes a focused effort involving many individuals. Designing the interiors of any home is a collaborative process between the interior designer, other design professionals involved with the project, and the homeowners. But, as qualified, experienced interior designers know, the interiors are not a separate element of the home, but rather an integrated component of the entire exterior/interior environment of which the home is a part. Creating a successful interior environment for a sustainable, universally accessible, technologically innovative home requires research and education about products and processes as well as an integrated design approach. It also requires a commitment to a changed and enhanced lifestyle.

Determining Owner Needs And Requirements

The challenge is to develop interiors that incorporate the homeowners' functional and aesthetic requirements while also allowing them to fully experience the enhanced lifestyle of their high performance home. For the first Optimum Performance Home, this challenge involves meeting the multi-functional requirements of an environment that serves as a family gathering place, home office, state-of-the-art home theatre, and intimate retreat—all within a series of sustainable, healthy, adaptable, supportive, and beautiful spaces in a stunning Pacific Coast natural setting.

Research And Education (Products, Processes, Technology)

The process begins with research and education. Sustainable products, processes, and technologies are changing and advancing rapidly—as are universal design and home technology products and processes. To be better informed about these changes and innovations, homeowners and their design professionals should attend some of the related design industry conferences, seminars, and workshops held each year throughout the United States and Canada. For example, a wealth of sustainable design informa-

tion is now available to everyone from the United States Green Building Council's gigantic annual GreenBuild international conference, to local and state sustainable design conferences, to workshops and seminars offered by colleges and universities.

Some sustainable design events are directed specifically to design professionals, while others cater more to the general public. The annual West Coast Green conference in San Francisco is the largest residential green building event in the country, combining three days of professional level training courses, seminars, and networking for design and building professionals with a full day for the general public including entry level training and keynote speakers. As a designer, I have found the USGBC's annual GreenBuild conference and the annual EnvironDesign conference to be excellent sources for design professionals. Optimum Performance homeowner, Gary Reber suggests also the National Green Building Conference, The Green Building Conference, GreenBuild Expo, Pacific Coast Builder's Show (PCBC), Solar Power 2007, the Sustainable Living Fair, AltBuild, SolFest, and the National Association of Home Builders Building for Boomers & Beyond: 50+ Housing Symposium.

Numerous magazines, newsletters, and books for design professionals provide in-depth, state-of-the-art information about sustainable and universal design, and home technologies. The United States Green Building Council's Web site: www.usgbc.org provides excellent information on all aspects of green design and building—from new commercial construction to homes, including access to the LEED suite of rating systems. The Center for Universal Design (CUD) is a research center that provides information, technical assistance on most aspects of universal design. CUD evaluates, develops, and promotes accessible and universal design in housing, commercial and public facilities, outdoor environments, and products. Their Web site is www.design.ncsu.edu/cud/index.htm. A must attend conference and trade show is the Custom Electronics Design and Installation Association (CEDIA) Expo and CEDIA Lifestyles Expo, where one can learn about leading-edge home electronics and electronic system integration.

Integration With Other Design Professionals

Successful sustainable design rarely is achieved by using the conventional, sequential relay-race model for design and construction in which each design professional does his or her part of the work and then passes it off to the next design professional. This traditional process of design and construction isolates professionals from each other, from the interdependent details, and from the larger goals of the project. Because every aspect of a building affects, and is affected

by, every other aspect, the approach to the design must be highly collaborative and multi-disciplinary.

The term "integrated design" refers to a design process that brings together all key members of the project team to work together across disciplines throughout the process from beginning to end. The goal of this process is to achieve high-performance buildings that provide multiple synergetic benefits at a lower cost. Participation from all design and construction specialties including architecture, engineering, lighting design, electronic lifestyle, interior design, landscape design, and construction is essential to the success of an integrated design approach. When all key players work together at key points in the design process, each part of the design is evaluated from multiple perspectives producing more efficient and effective design solutions.

Integrated design ensures that all decisions about the interiors that affect the interiors of a sustainable home are never an afterthought but rather are central to the overall design. The result is a beautiful, comfortable, energy and resource efficient, healthy, life enhancing home for the entire span of the homeowners' lives.

Next

Future articles about the interiors of the first Optimum Performance Home will examine how biophilic design is achieved through interior elements and other components chosen and designed via the integrated design process. **UD**

The Author

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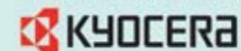
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