



The First Optimum Performance Home™ interior design approaches and materials part VIII

Gary Reber

synopsis

- An important design element is the provision of daylighting, so that during daylight hours sunlight is the source of light instead of electric lighting.
- The Optimum Performance Home has been designed to optimize biophilic benefits, including connecting the home's occupants with nature to ensure optimum physical and psychological health.
- The design of room configurations was done in conjunction with daylighting opportunities, and took into account window, door, and skylight locations, and the arrangement of furniture and internal spaces within rooms.
- The Optimum Performance Home is a full-blown passive solar design with the glazing area, air circulation patterns, and use of thermal-storage materials carefully planned to harness sunlight to provide daylighting and controlled heat, and to channel breezes off the Pacific Ocean to provide fresh air ventilation.

Introduction

This is the eighth 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 its 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 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 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 extended to 16 pages and extensively covered the project scope. Thereafter, each issue has contained a part of the continuing series working through site planning and preparation; Low-Impact Development (LID); further refinements to the site plan and drainage design; The Sea Ranch Design Committee approval of the 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), and roofing; and the acoustical design of the dedicated Optimum Performance Home Theatre™ and rear-projection room.

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

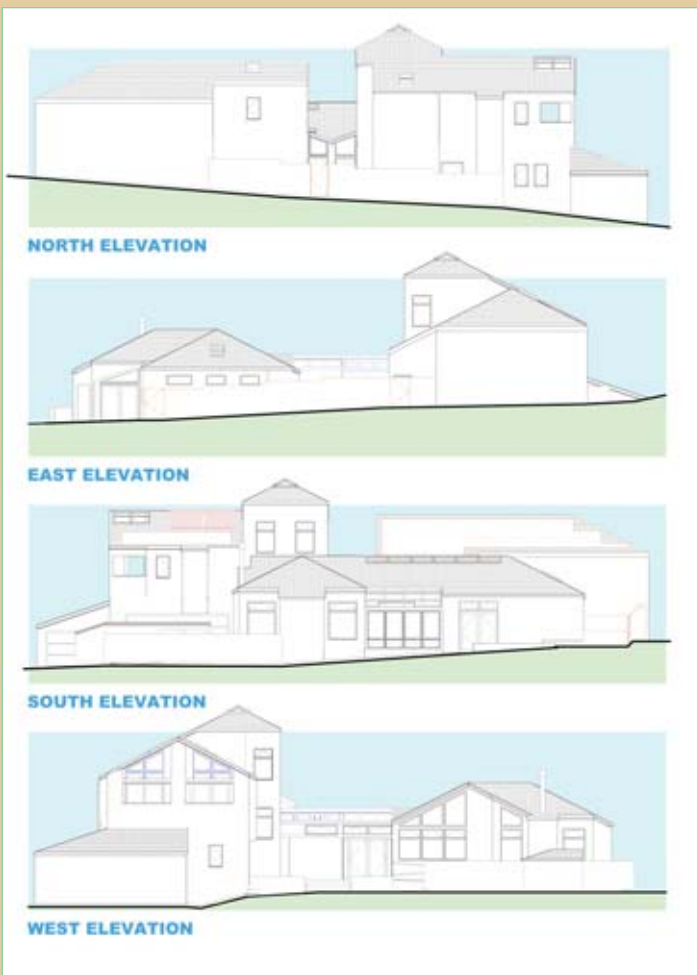
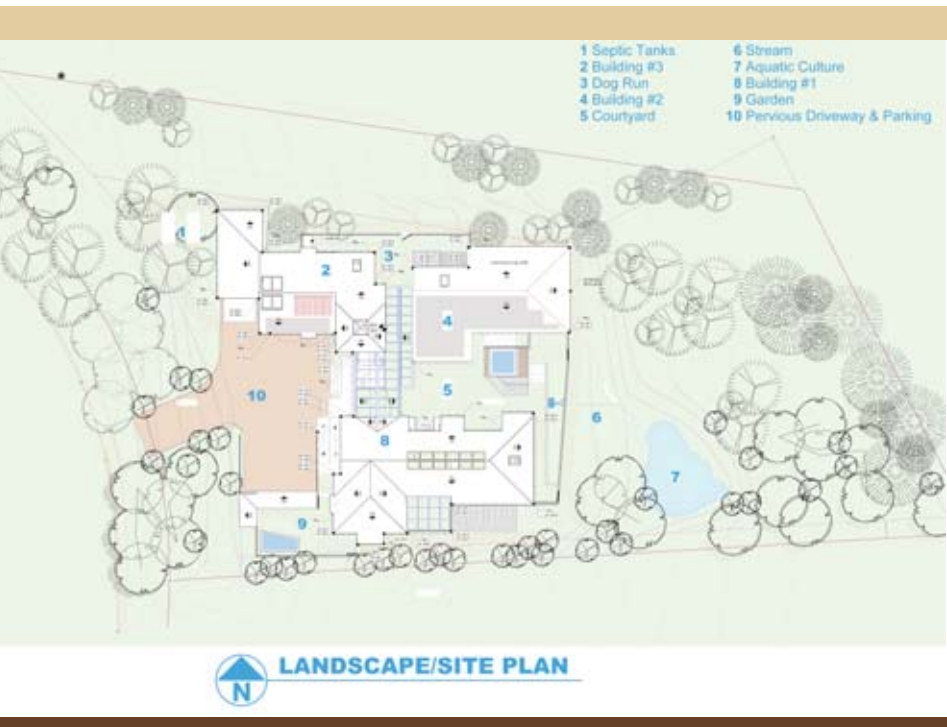
The necessary work to obtain the building permit, including further refinement of the structural and mechanical plans, has been completed. Final construction plans are now in the review process with the Sonoma County Building Department and Third Party Plan Check Review. Assuming no further delays, the issuance of permits, the commencement of construction, site grading, foundation, and mechanical infrastructure could start in late March or April 2007.

In this segment, the focus will be on windows and doors, skylights, vestibule and walkway design, solarium design, and floor treatment.

"The overall approach to the space design of the Optimum Performance Home was to consider occupant space needs and design from the interior out."



The Sea Ranch, Sonoma County, California



The elevations of the Optimum Performance Home at The Sea Ranch

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 holistic design, the house will serve as a home for many people and serve 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 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 from the ground up.

The home will also meet the guidelines and qualifications for the U.S. Department of Environmental Protection's ENERGY STAR®, the EPA's WaterSense, and the American Lung Association® Health House® programs. As well, the home will meet the "Green Points" program now being considered for adoption by Sonoma County and The Sea Ranch Association.

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

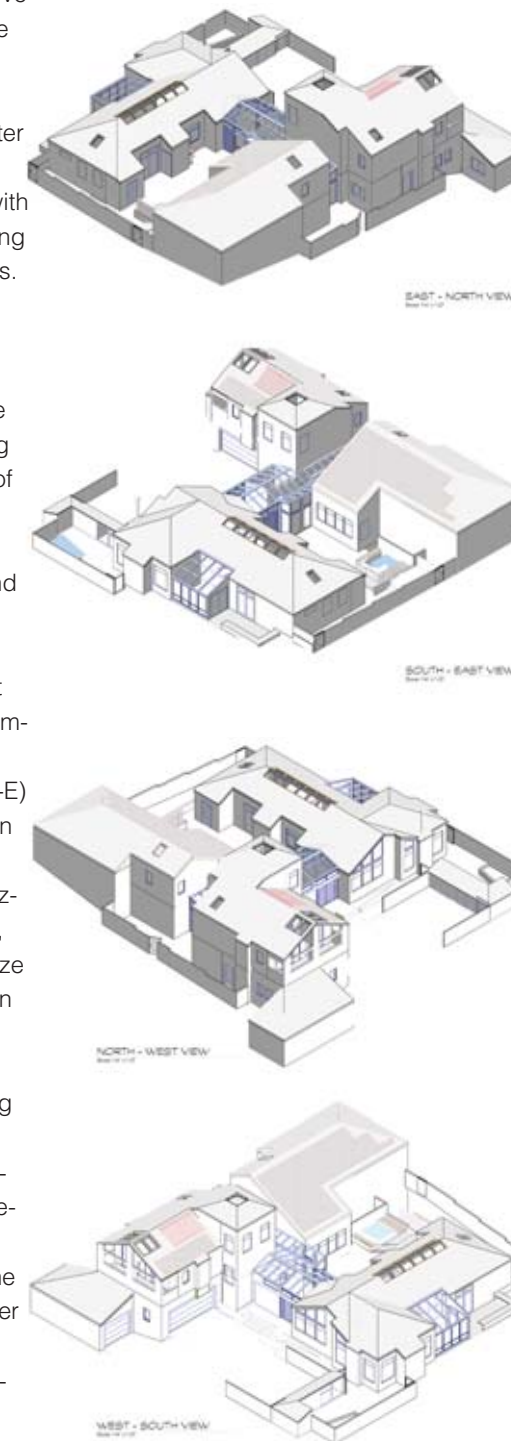
pollution and contamination from poorly designed or failing septic systems, and general land-use patterns that conserve and protect water resources within the overall ecosystem at The Sea Ranch. The water-efficient site plan and drainage design promotes "smart water use." And the overall design of the home will further cut its energy use with efficiency, and then meet the remaining needs with renewable energy sources.

Passive Solar Design

An important design element is the provision of daylighting, so that during daylight hours sunlight is the source of light instead of electric lighting. This can be accomplished with windows; doors; and traditional, specialized, and tubular skylights.

The design and implementation of these solutions are critically important to the successful passive solar performance of the Optimum Performance Home. The use of low-emissivity (low-E) window coatings combined with argon gas-filled glass in double- and triple-pane windows, as well as special glazings that result in little solar heat gain, are effective tools to employ to optimize passive solar design, otherwise known as a direct-gain system. The benefit sought with a direct-gain system is to optimize heat gain with sunlight during the day to warm spaces.

The foundations are high-mass six-inch-thick concrete slabs, and the interior walls are plaster-treated, which facilitate absorption of the heat into the floors and walls, which is released later throughout the evening to keep the home warm at night. Thus, heat retention should not be a problem with the home. Climate along the Pacific Ocean Sonoma County coastline at The Sea Ranch is mild, with lows typically not below 40 degrees and highs not exceeding 80 degrees. Glazing treatments will have to be carefully applied, so as not to cause an overheated interior



Four perspective views of the Optimum Performance Home at The Sea Ranch

environment. The daily ocean breezes will serve as a temperature valve, using the opening and closing of windows, doors, and skylights to moderate indoor temperatures and to provide fresh air ventilation.

Glazings that have a high solar heat gain coefficient (SHGC) generally will be desirable on windows and skylights facing south, while lower SHGC glazings will be desirable on the east and west. Hard-coat (pyrolytic) Low-E glazings provide higher SHGC values than the typical soft-coat Low-E glazings.

Biophilic Design

The Optimum Performance Home has been designed to optimize biophilic benefits, including connecting the home's occupants with nature to ensure optimum physical and psychological health. Biophilia is literally a love for nature, and it is rooted in human biology and evolution, thus supporting the argument for conserving nature. Exposure to nature produces positive outcomes on human health and healing, and significantly contributes to stress reduction. The biophilic design features of the home are intended to inspire interest in—and appreciation of—nature by all occupants, especially children, which in our case will be grandchildren and great grandchildren. Efforts have been made to put the home's occupants in closer contact with nature through the design of the three-building compound, landscape design, and interior design. (Please reference Julie Stewart-Pollack's articles entitled "Biophilic Design," which appeared in Issue 3, May/June 2006 and Issue 4, July/August 2006.)

The glazing design contributes to three biophilic attributes: dynamic natural light (rhythmical living light, patterns of brightness and shadow, sparkle), natural ventilation (movement of air, changes in air temperature, airborne scents), and prospect and refuge

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

The home's design encourages occupants to explore, discover, and learn from the complexities of nature. Extensive open, naturalized, and planted space surrounds the three-building compound to put occupants in closer touch with nature. Numerous windows and doors invite occupants to look out over the surrounding environment, including plants and water elements. The courtyard, green roof garden terrace, garden, balconies, and front porch entry extend the home's living and working spaces, exposing occupants to the aroma of the outdoors, including the smells of wildflowers in the spring and summer; temperature fluctuations; and the feel of nature along the Pacific Ocean coastline, Gualala River, and gently fringed Redwoods.

Natural Daylighting

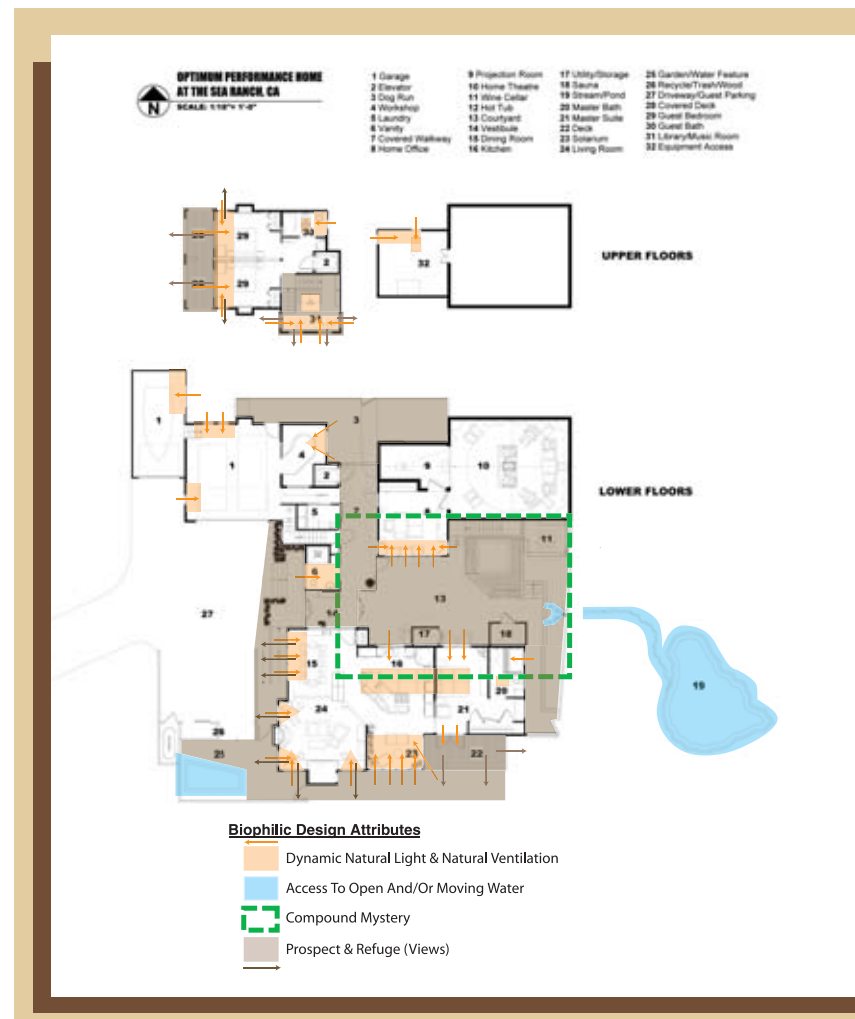
The overall approach to the space design of the Optimum Performance Home was to consider occupant space needs and design from the interior out. Thus, the design of room configurations was done in conjunction with daylighting opportunities. This took into account window, vision glass door, and skylight locations, and the arrangement of furniture and internal spaces within rooms. Thus, the design adheres to the idea of "human scale" sizing and the concept of a "not-so-big house," extensively advocated in books authored by architect Sarah Susanka and others.

Significant daylighting is provided with the placement of windows in the dining room and living room; the ridge skylight, which traverses the kitchen and the master bedroom suite; and the solarium, which floods the kitchen with daylight. Further, the French door locations in the master bedroom suite are opposite each other to facilitate excellent daylighting and fresh air ventilation. The master bath is supplied with daylighting with an operable skylight and window. Daylighting for the home office is facilitated by a wrap-around array of casement windows, with prominent exposure to the south. Each guest bedroom features sliding French doors and casement windows, which can provide fresh air ventilation as well as abundant daylighting. The guest bathroom features an operable skylight and a window for fresh air ventilation and daylighting. The library/home theatre/surround music room features daylighting and cross ventilation through casement windows and a pyramid skylight for daylighting.

The design element, which integrates the three-building compound into a holistic entity, is the glass-enclosed vestibule and walkway that provides exceptional daylighting and fresh air ventilation. And the guest vanity features an all-glass roof with an operable skylight and high casement windows facing west. As for the underground wine cellar, a tubular skylight will be fitted to the cellar's thick concrete ceiling, using a large-diameter reflective tube to bring in daylighting from the outside green roof garden terrace above.

This design approach ensures that during the daylight hours no additional electrical lighting will be necessary, thus optimizing the energy efficiency of the home and reducing energy consumption, as well as providing optimum physical and psychological health for the home's occupants. This design contributes to the home's ability to maintain critical life-support conditions in the event of extended loss of power.

Thus, the Optimum Performance Home is a full-blown passive solar design with the glazing area, air circulation patterns, and use of thermal-storage materials carefully planned to harness sunlight to provide daylighting and controlled heat, and to channel breezes off the Pacific Ocean to provide fresh air ventilation.



Pella® Designer Series® Windows And Doors

Not only are windows and doors functional and aesthetic elements of any home, they also can infuse a home with beautiful, natural light.

Since 1925, Pella® Windows and Doors have been known for quality craftsmanship and innovation. The company currently holds 57 product and design patents.

An important factor in the selection of Pella Windows and Doors for the Optimum Performance Home was Pella's commitment to purchasing wood from timber companies that practice responsible reforestation methods and utilizing manufacturing methods that minimize waste. Pella takes a comprehensive approach to environmental stewardship that maximizes recycling opportunities, reduces energy consumption, uses the latest in waste management strategies, and ensures that Pella products are made to last.

As a founding member of the National Fenestration Rating Council (NFRC) and volunteer partner in the Department of Energy's ENERGY STAR® program, Pella manufactures and promotes the use of highly energy-efficient products.

This translates to:

- About 80 percent of suppliers being third-party certified
- About 99 percent recycled or reused sawdust
- 95 percent recycled aluminum use in aluminum sash cladding
- 20 percent recycled glass use—the maximum recycled content, which still provides desired visual clarity

Overall, most Pella products have at least 20 percent recycled content.

Pella is also a member of the U.S. Green Building Council and offers products that contribute to recognition in the LEED for Homes program.

Pella quality extends to natural wood-frame interiors, which can be



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.

painted or stained to match a home's wood floors, ceilings, cabinetry, furniture, interior doors, and trim. Their wood frames provide a high insulating value, which will enhance the comfort of occupants who get next to a window, even on the coldest—or hottest—of days. In the case of the Optimum Performance Home, these features were critical elements in the home's interior. The wood interior frames of Pella products will be stained to match the rich environmentally friendly Kahrs® Pineau Oak hardwood floors and the warm matching solid and veneer Oak hardwood cabinetry in the home.

Pella windows and doors are available with low-maintenance exterior aluminum cladding for added convenience and protection from the elements. In the Optimum Performance Home, brown aluminum-clad exterior frames have been chosen with the additional protection of Pella EnduraClad® Plus finish. This finish is made with full 70 percent Kynar 500® resin, which ensures superior weatherability and longer-lasting protection against chalking, fading, corroding, and exposure to the sun's UV rays. Sash corners are joined three ways for superior strength using special metal fasteners, and to protect against salt air, high winds, driving rain, fog, and humidity—elements of The Sea Ranch environment. To help weather the harsh coastal environment, Pella offers an optional Seacoast Exterior Paint Finish

to provide even greater performance over time.

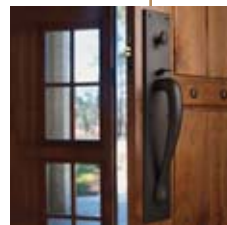
Pella Designer Series windows and patio doors have been selected for the home. The Pella Designer Series windows and doors uniquely feature exclusive between-the-glass window fashions, with a selection of colorful blinds, shades, and grilles tucked neatly between panes of glass—protected from dust and damage. Various options will be installed, including virtually transparent Vivid View® screens, which allow more light and more air into the home; cordless raise-and-lower between-the-glass blinds or fabric-pleated shades, including blackout shades; removable beveled wood grilles; and self-storing Rolscreeen® retractable insect screens. Pella Designer Series windows and patio doors featuring triple-pane glass are number one for energy efficiency among top national brands (Superior NARC U-values and SHGC ratings).

The variety of window styles will include awning, casement, custom trapezoid, and custom triangle. The Pella Designer Series patio doors will include double and single French, sliding French, and custom doors with snap-in, snap-out decorative glass panels.

U-values of Pella products are impressively low. U-value measures a window's ability to resist the transfer of heat. Pella low-E glass coatings help reduce heat transfer through the glass. Pella windows also reduce UV rays, as well as other light, that can fade or

Rocky Mountain Hardware

- Rocky Mountain Hardware is the finest-quality hardware available to homeowners today. Handcrafted for exceptional beauty and durability, each piece is cast in solid bronze and is available in a diverse palette of rich patina finishes applied by hand—without using powder coatings, paints, or lacquers.



VELUX® Skylights And Roof Windows

- VELUX® is the only manufacturer with all standard skylights meeting ENERGY STAR approval guidelines for all climatic regions of the U.S. VELUX remote-controlled venting electric skylights (Model VSE) are the ultimate skylight for natural daylighting, controlled fresh air ventilation, and eliminating condensation. VELUX also manufactures both a flexible and rigid Sun Tunnel™.



darken carpets, walls, and furniture. The low-E InsulShield® insulating glass selected for the home is energy-saving argon gas-filled. The application of triple-pane windows will further reduce outside noise by up to 80 percent for an extremely quiet interior environment.

Pella patented features include the SureLock® System and Unison Lock System for securing both the upper and lower locks with a single easy-to-use handle, integrated crank with fold-away handle, and a superior hinge design to ensure years of dependable performance. Pella's unique three-point locking system secures doors at the head, jamb, and sill for superior security. Pella French sliding patio doors are constructed with the sliding panel on the outside, so when wind blows against the door, it creates a tighter seal. Custom Pella low-E premium double French Endura Clad Plus patio doors will be installed at the vestibule and courtyard entrances, and two single French doors in the walkway, one to access the courtyard and the other the dog run. Two double French doors will be installed in the master bedroom suite. There will be a Pella double French sliding patio door installed at each guest bedroom location for access to the guest quarters' deck.

Pella offers, as an option, Rocky Mountain Hardware, the finest-quality hardware available to homeowners today. Handcrafted for exceptional beauty and durability, each piece is cast in solid bronze and is available in a diverse palette of rich patina finishes applied by hand—without using powder coatings, paints, or lacquers. Rocky Mountain Hardware will be installed on the collection of Pella windows and doors in the Optimum Performance Home.

VELUX® Skylights And Roof Windows

Over the past 60 years, VELUX® has been a world leader in the manufacturing of skylights and roof windows, and

they hold more than 300 patents in roof window and skylight design. VELUX is the only manufacturer with all standard skylights meeting ENERGY STAR approval guidelines for all climatic regions of the U.S.

Skylights and roof windows will help connect the home's occupants with nature to ensure optimum physical and psychological health. In application, they provide abundant daylight while visually expanding rooms in any style or size home. They also provide the aesthetic benefits of balanced natural light. And skylights and roof windows help to address other light-related health considerations, particularly for older adults. Researchers report that to accommodate the adaptation of the aging eye, the amount of light required for visual acuity doubles for each 13 years after the age of 20. More natural light equals better sight. Skylights and roof windows also will enhance the ability of the home's occupants to perform significantly better, whether preparing meals, reading, or doing productive work, in an environment that is lit with overhead natural light rather than artificial light.

Kitchens are especially prone to the effects of poor ventilation with large amounts of hot, humid air that is generated during cooking. Without natural light and ventilation, kitchens become dark, stuffy, airless spaces in which stale odors and heavy, humid air linger. A custom VELUX ridge skylight is designed to bridge the cathedral ceiling above the kitchen and master bedroom suite.

One panel in both the kitchen and master bedroom suite ridge skylight assembly will be a VELUX remote-controlled venting electric skylight (Model VSE) to provide fresh air ventilation.

All three bathrooms in the Optimum Performance Home will feature a VELUX remote-controlled venting electric skylight to provide natural daylighting and fresh air ventilation, and eliminate condensation. Their placement is designed to optimize ventilation and eliminate excess moisture—mold, mildew, and decay. With natural light from above, privacy is assured, plus there will be more wall space for storage or decorating (where windows would otherwise be).

A VSE skylight also will be installed in the boat garage and in the storage room over the dedicated home theatre's rear-projection room to provide natural daylighting and fresh air ventilation.

VSE venting electric skylights open and close quickly and quietly from anywhere in a room. The remote is a slimline design and can function to operate multiple skylights and sunscreening blinds. It is also programmable to close VSEs after a set time period. Additionally, rain sensors automatically close skylights during inclement weather.

VELUX also manufactures both a flexible and rigid Sun Tunnel™. A Sun Tunnel will be installed on the green roof garden terrace, extending down through the wine cellar concrete ceiling. The highly reflective, durably bonded interior coating will provide natural daylighting to this room without windows. The optional lighting kit will allow the Sun Tunnel to be a source of illumination at night. The exposed exterior dome features an unobtrusive low-profile design.

A specially designed VELUX pyramid skylight will be installed in the library/home theatre/surround music room.

VELUX's other impressive features include:

- Exterior Heat Control—The best protection for heat gain is an exterior HeatBlock™ awning that stops the heat before it hits the glass and penetrates the room.
- Weathertight Flashings—Prefabricated leakproof VELUX flashing system.
- Comfort Glazing—Standard on all VELUX skylights and roof windows to provide comfort on hot summer days and on cold winter nights.
- Interior Light Control—A huge assortment of blinds and shades are available to diffuse, adjust, or block out the light.

Sage Electrochromics, Inc.

- SageGlass® is an electronically tintable exterior glazing that provides glare control on demand, while preserving views. SageGlass is a multi-layer, thin-film tungsten-oxide coating that is as durable as low-emissivity coatings and does not degrade with exposure to UV light.

Lindal SunRooms



- Lindal sunrooms are built with the same high-quality materials as all Lindal Cedar Homes. A Lindal sunroom is engineered to provide a lifetime of trouble-free living. The sunrooms combine kiln-dried premium-grade Western red cedar with energy-efficient windows of the highest industry rating for their ability to prevent air and water infiltration under the toughest test conditions.

- Convenient Controls—Electric infrared remote-controlled systems. Rather than using plastic, VELUX skylights and roof windows exclusively use glass, which is more energy-efficient and more durable. Glass reduces external noise and won't discolor, leak, or allow drafts.

In the Optimum Performance Home, VELUX ComfortPlus™ glass will be used exclusively. This employs double-pane laminated glass construction with argon gas between low-E coated panes. This design will provide maximum protection from both heat gain and fading by controlling up to 83 percent of the sun's fade-causing rays. Also available is Electrochromic glass for select VSE sizes. The SageGlass® electrochromic layer allows glass to switch between a clear state and a dark state, making the glass electronically tinted. SageGlass is a multi-layer, thin-film tungsten-oxide coating that is as durable as low-emissivity coatings and does not degrade with exposure to UV light.

Additionally, skylights can be equipped with a Cellular shade, LightBlock™ shade, and/or a charcoal net cloth HeatBlock awning. The Cellular shade diffuses the light and increases energy efficiency up to 16 percent. The LightBlock shade is perfect for room darkening and for increasing energy efficiency up to 20 percent. Electric controls raise or lower the shade at the touch of a button. Other options include thermally coated pleated shades to diffuse the light and reduce UV fading, and to increase energy efficiency up to 12 percent. The thermally coated aluminum Venetian blind option provides optimal glare and light control to direct the light where desirable. This option also increases energy efficiency up to 12 percent.

The VELUX warranty covers 20 years on insulated glass seals, 10 years on the skylight, roof window, or Sun Tunnel, and five years on blinds, controls, and electronics.

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Vestibule, Walkway, And Solarium

Lindal SunRooms, a division of Lindal Cedar Homes, will fabricate the custom design for the vestibule, walkway, and solarium in the Optimum Performance Home. Founded in 1945, Lindal Cedar Homes has over 60 years of commitment to being one of the home building industry's leaders in quality building materials, design, and engineering.

Homeowners who decide to include a Lindal sunroom savor the untold light and luxury it brings to their homes. Lindal sunrooms are built with the same high-quality materials as all Lindal homes.

Like a Lindal Cedar Home, a Lindal sunroom is engineered to provide a lifetime of trouble-free living. The sunrooms combine kiln-dried premium-grade Western red cedar with energy-efficient windows of the highest industry rating for their ability to prevent air and water infiltration under the toughest test conditions. Made with state-of-the-art low-E argon-filled glass, the windows provide comfort, energy efficiency, and reduce fading of draperies and furniture fabrics. To best capture views, Lindal sunrooms include a hidden connector system, allowing large expanses of glass, uninterrupted by bulky exposed hardware. And the engineering strength of Lindal sunrooms meets or exceeds local building codes.

Engineered for a lifetime of trouble-free living, Lindal sunrooms feature:

- Patented Hidden Connector System—Each Lindal sunroom supports expanses of glass for uninterrupted views. The main framing members of the sunroom are constructed of clear, select, solid kiln-dried Western red cedar. On a post and beam room, the framing members are architectural-grade, horizontal, glue-laminated posts and beams.

- The Right Glazing Options—Lindal continually monitors the latest window glazing technologies for advances that stand the test of time. Thermal glass with a special low-E coating provides greater comfort and lower energy costs. A state-of-the-art glazing system bridges the glass panels and provides an airtight and watertight seal. Lindal dealers are trained to determine the correct specification and right amount of overhead glass that will work best for a specific situation.

The engineering for the vestibule, walkway, and solarium is designed to make the most of the site's exceptional views, light, and climate, while offering year-round comfort and livability. The structures are engineered and designed so that the moisture and condensation will escape and drain to the exterior. The drain design (on both the vertical glass and sloped glass) is critical for moisture and humidity to exit the spaces. Otherwise, within a short time, the wood-framing members will start to rot, and the insulated glass seals will fail. The interior FSC-certified wood will be finished to match the rich environmentally friendly Kährs Pineau Oak hardwood floors and the warm matching solid and veneer Oak hardwood cabinetry throughout the home. The exterior of the frame structure will consist of anodized aluminum, finished in the same brown hue as the Pella Window and Door exterior EnduraClad Plus aluminum-clad exterior frame finish.

Lindal High Performance vertical glazing carries a lifetime warranty, and the structure and horizontal glazing are warranted for 10 years.

Flooring

The design of the Optimum Performance Home incorporates both solid-surface flooring (hardwood, slate, tile, and polished concrete) and all-natural wool carpeting.

Solid-surface flooring is an excellent choice from an indoor air-quality standpoint. Slate flooring will be used at the entranceways to the home to minimize tracked-in contaminants and moisture. The slate flooring further serves as a design element to integrate the three-building compound. At the entryway, slate will be introduced as the primary flooring surface, both on the stairs, the ramp way, and the porch. As one enters the vestibule, the slate flooring will continue down the walkway and through to the courtyard. The entire courtyard will be surfaced with slate. As one enters the main residence, the slate surface will establish a main-use path separating the dining room, living room, and the kitchen, and serve as the flooring for the solarium. The kitchen will be surfaced with slate.

Hardwood flooring will be used for the dining room, and wool carpeting will be used for the living room, master bedroom suite, guest bedrooms, and the dedicated Optimum Performance Home Theatre and rear-projection room. The flooring for the master bathroom will be tile. Wool or cotton area rugs will be selectively positioned on the slate flooring and the hardwood floors, where a softer surface is desired.

Slate and non-slip tile are excellent surfaces for universal design applications, as they can provide a solid traction surface to help prevent a potential accidental trip or fall, and provide for easy wheelchair mobility should that ever be required. Noteworthy is that all surfaces will be perfectly level with each other. This is an important aspect of the home's universal design floor plan that eliminates any challenging physical barriers, such as steps, humps, bumps, edges, and uneven surfaces. Where steps are required at the home's entrance, a ramp is also provided as an alternative approach. The second story guest quarters and library/home theatre/surround music room are accessible by either stairs or a residential elevator. These stairs will be surfaced with hardwood. Both the interior stairs and the exterior entrance stairs will feature undernose low-energy use, 12-volt-powered diffuse amber light delineating each step for safety.

Kährs Hardwood Flooring

A mandatory requirement in the design of the Optimum Performance Home is for all wood used in the construction and finishing of the home to be certified by the Forest Stewardship Council (FSC). The sustainable forestry standards established by the FSC ensures that wood products come from well-managed forests, which are FSC-certified by independent, third-party organizations. Wood products derived from certified forest operations display certification stamps. (Please reference "Rainforest Alliance: Guide To Green Building Wood Sources," which was published in Issue 02, March/April 2006.)

Kährs is one of the oldest manufacturers of hardwood flooring, with a 150-year history. Based in Sweden, Kährs is one of the most innovative manufacturers of wood floors. Today, the Kährs Group is the largest wood-flooring manufacturer in Europe and one of the world's most modern industrial wood-processing companies.

In 1941, Gustaf Kähr invented the modern wood floor. Kähr owns the patent for the multi-layer engineered wood floor construction that today is the standard used in manufacturing all over the world. Engineered construction makes the floor stable, and the raw material can be utilized with greater environmental awareness. Kährs has been manufacturing quality multi-layered wood floors for more than 60 years.

Kährs Haywood Flooring



- Kährs is one of the oldest manufacturers of hardwood flooring with a 150-year history. The Kährs Woodloc® system, introduced in 2000, is the first glueless joint system in the world, which ensures perfect and fast installation, and resistance to subsequent damage. Kährs floors contain few chemical compounds and virtually no harmful chemical emissions, and meet all world formaldehyde emissions regulations.

Nature's Acoustics



- Whisper Wool™ is a floor underlay made from 100 percent sheep wool for laminate, engineered, and hardwood floors. It makes laminates sound deeper in tone, duplicating a more wood-like sound. Whisper Wool also prevents sound transmission through floors and walls. It also helps prevent squeaks in hardwood floors, thus making hardwood floors quieter than ever.

The Kährs Woodloc® system, introduced in 2000, is the first glueless joint system in the world, which ensures perfect and fast installation, and resistance to subsequent damage. The boards lock together mechanically with virtually invisible joints. This advanced and durable interlocking system tightens the joint as it installs and then locks the board in place. This ensures that gaps are minimized throughout the installation and for the lifetime of the floor.



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.



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).



Carriage House Garage And Barn Doors

- The Carriage House Door Company has crafted thousands of exquisitely designed overhead garage doors for discriminating customers across America. Every door in their Carriage House Collection offers the timeless beauty, authenticity, and quality of doors constructed a century ago, yet they have completely modern functioning.



Kährs floors contain few chemical compounds and virtually no harmful chemical emissions, and meet all world formaldehyde emissions regulations.

Kährs floors come in three varieties—1-strip, 2-strip, and 3-strip. Throughout the Optimum Performance Home, Kährs 1-strip hardwood flooring will be applied. Thus, the part of the board that you see and walk on, i.e., the wear layer, is sawn in one piece. Structurally, Kährs uses three-layer construction for a floor with minimal seasonal movements. The Kährs product range includes floors that can be installed by floating, nail-down (tongue-and-groove), and glue-down methods. Only float-in installations are acceptable for radiant heat subfloors, which is the case with the home's Uponor radiant floor-heating system. Through engineering, Kährs floors achieve the right balance between the different layers in each board—wear, core, and backing—and also the right dimension for each layer to ensure the perfect balance between the layers. And Kährs' method of woodcutting, known as plain sawn, is the same technique used for traditional 3/4-inch solid wood floors. The result is a much finer, more traditional wood grain that eliminates the splitting associated with peeled veneers. Furthermore, Kährs floors take full advantage of the entire wear layer on each plank. Kährs' 1/8-inch plain-sawn wear layer is fully compatible in thickness to a solid 3/4-inch strip floor wear layer. This is because sanding is only possible down to the tongue-and-groove in solid 3/4-inch floors. Kährs

guarantees that the solid top layer can be professionally sanded and refinished at least twice during its lifetime. A wide range of Kährs moldings and accessories—bases, T-moldings, reducers, slim bases, stair noses, and shoe moldings—are available to provide the finishing touch. Due to the exceptional quality and superb engineered construction, Kährs offers a 25-year wear-through warranty.

Kährs Pineau five-inch-wide wire-brushed Oak boards will be used in the Optimum Performance Home in the dining room, the staircase up through to the second-floor guest quarters hall, the library/home theatre/surround music room, and the home office.

A small amount of extremely durable UV-cured acrylic silk matte finish will be factory-applied to protect the wood, which will allow the natural beauty of the wood grain to be revealed. The finish resists most common household stains for up to 24 hours, and the finish will not yellow over time like conventional polyurethane finish.

The medium dark Kährs Pineau Oak is a style in the company's Castle & Cottage Collection, offering the authentic charm of classically refined traditional patterns. This will give a lot of wood feeling with all the natural characteristics of the wood exposed.

Whisper Wool™ Flooring Underlay

Nature's Acoustics is a floor underlay made from 100 percent sheep wool for laminate, engineered, and hardwood floors. It makes laminates sound deeper in tone, duplicating a more wood-like sound. Whisper Wool also prevents sound transmission through floors and walls. It also helps prevent squeaks in hardwood floors, thus making hardwood floors quieter than ever.

A moisture barrier is laminated to Whisper Wool to prevent condensation from contacting the installed flooring. Even under humid conditions, Whisper Wool is mold-proof. Antimicrobial treatment prevents mold, fungus, and bacteria growth if airborne spores are present.

Multi-part wool fiber is extremely resilient, long lasting, and will not break down. Wool also absorbs sound energy and mechanical impact energy, and provides thermal insulation. And wool fibers will not support combustion.

Whisper Wool will be installed under the Kährs Pineau Oak flooring throughout the Optimum Performance Home.

Evergreen Natural Stone Slate Flooring

As previously noted, slate flooring will serve as a design element to integrate the three-building compound. Slate surfaces will extend from the home's entrance through the vestibule and walkway, and to the outside through the courtyard area. Slate will also serve as a main use path separating the dining room, living room, and the kitchen, and serve as the flooring for the solarium and the kitchen.

The slate will be comprised of fine natural Vermont slate from the Evergreen Slate Company, Inc., the largest producer and supplier of slate in the U.S. Evergreen's 11 natural slate colors and textures afford many architectural effects, contributing to a building's appearance. Slate quarried for roofing and exterior surface stock is of dense, sound rock, exceedingly tough and durable. It is also fireproof and waterproof and resistant to climatic changes, with absolutely no disintegration. Evergreen slate has the highest designation for durability, in excess of 75 years.

The flooring slate will be Variegated Purple, a rich, unusually consistent textured natural slate.

The roof slate will be Evergreen Welsh Black, a rich, textured black natural slate.

Earth Weave Bio-Floor™ Collection Wool Broadloom Carpeting

Wall-to-wall synthetic or standard wool carpeting, while highly desirable as a surface in living rooms and bedrooms, has been known to have drawbacks because carpeting can be a significant source of indoor air pollution. Homeowners should be aware that synthetic carpeting off-gasses VOCs (volatile organic compounds) from the carpet itself, from the carpet pad, and from the adhesives used to glue it to the subfloor. In recent years, carpet manufacturers have attempted to address this adverse health condition, and the Carpet and Rug Institute (CRI) has established a testing and labeling program setting limits on VOC and formaldehyde emissions from carpeting. Carpeting with a Green Label Plus label offers a higher standard of indoor air quality. Unfortunately, the tested levels are not stringent enough to ensure healthy air within your home, as these carpets still contain almost 300 different chemicals.

In applications in a home—near entrances—pollutants, such as biological contaminants and toxins, can be tracked in from the outdoors and can become trapped in carpet, causing an unhealthy interior environment. A good preventative application is to install durable, removable

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New Century Coatings

- AgriStain's Soycrete for Fiber Cement uses soy ester technology, with better adhesion to concrete. The available hues mirror wood siding, and AgriStain can be applied direct to unprimed or primed fiber cement.



American Clay Earth Plaster

- American Clay Earth Plaster is a natural finish made from a unique combination of clays, aggregates, and natural pigments. American Clay Earth Plaster is nature's own substitute for cement, gypsum, acrylic, or lime plaster. This is the original earth plaster and is 100 percent natural, non-toxic, VOC-free, mole-resistant, moisture-controlling, non-fading, non-flammable, sound-absorbing, humidity-buffering, easy to use, sprayable, and easy to repair.



AFM Safecoat®

- AFM Safecoats are made with unique formulas that eliminate the aromatic solvents, heavy metals, and formaldehyde preservatives found in the typical paint or sealer. The result is a non-polluting coating that also acts as a sealer to help reduce off-gassing from the surface below.



Armstrong® WoodWorks Linear Ceilings

- Armstrong® WoodWorks Linear plank ceilings are available in nominal 4 1/2-inch and 6-inch modules, including 3/4-inch classic open reveal style with concealed clip system. The board planks are available in rich, natural wood veneers, with edge banding for superior quality and aesthetics.

mats at entryways to the home, to capture moisture and contaminants that would otherwise be tracked into the home. The design of the Optimum Performance Home has the garage, vestibule, and walkway serving as "mud-room" transitions before the actual entrance to the living spaces in the home. This design will minimize tracking moisture and contaminants into the home.

While natural-fiber carpets consisting of wool, cotton, and other textile fibers have low off-gassing, they still contain chemicals that are not desirable from an indoor air-quality standpoint. These chemicals are found in the adhesive used during backing, the dyes used in coloration, stain-protective treatments, and highly toxic pesticides/fungicides.

These conditions are not the case with the wool Bio-Floor™ Collection from Earth Weave Carpet Mills, Inc. The company manufactures the purest carpet available and is the only truly natural and sustainable

carpet produced in North America. Bio-Floor 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. The undyed naturally pigmented wool fibers and vegetable-dyed wool yarns are tufted into a cotton/hemp primary backing. The secondary backing is constructed using jute (a hardy earth-friendly fiber-producing plant) and is adhered with a natural rubber adhesive from the rubber tree. The complete absence of chemicals assures that the carpet will not affect indoor air quality through off-gassing of volatile organic compounds. And the carpet is completely biodegradable, so you have peace of mind that after its long useful life, it will return to the Earth from which it came. This is true sustainability and what a "green eco" carpet should be.

Untreated and undyed wool is the superior fiber choice for woven and tufted carpets. It is non-toxic, non-allergenic, and will not support bacterial growth. The high-moisture content of wool reduces static electricity and the risk of shocks. The fibers themselves help to regulate moisture in the air and actually take on moisture, as well as give off moisture as the environment changes humidity. This is what allows wool to be cool in the summer and warm in the winter.

Wool carpet also purifies indoor air of common contaminants like formaldehyde, nitrogen dioxide, and sulfur dioxide by locking contaminants deep in the core of the fiber. Wool carpets continually purify indoor air for up to 30 years. Another benefit of wool's naturally crimped shape is the formation of millions of air pockets that act as insulation to help regulate room temperature and reduce energy bills and absorb sound. Wool's high-moisture content and protein constituents make it naturally flame retardant. And wool carpets have other natural properties, such as resilience, resistance to 80 percent of all stains, and natural resistance to soil and dirt.

The Bio-Floor Collection is available in a variety of natural hues. As stated in Part VII, the hue for the home theatre and rear-projection room flooring will be a custom-dyed, Earth Weave irregular-looped, 44-ounce black Berber with all-natural 7/16-inch thick Enertia™ wool padding laid over the concrete floor surface. The living room and the three bedrooms in the home will be surfaced with irregular-looped 44-ounce Berber with all-natural 7/16-inch thick Enertia wool padding laid over the concrete floor surface. Unlike the required dyed carpet in

the home theatre and rear-projection room, this carpet will be undyed, with naturally pigmented wool fiber hues manufactured by Earth Weave.

Ceilings

Armstrong WoodWorks Linear Ceilings

The ceilings in the main house (Building One) will be surfaced with Armstrong WoodWorks Linear, as well as the guest bedrooms and library/home theatre/surround music room (Building Two) and the home office (Building Three). WoodWorks Linear plank ceilings are available in nominal 4 1/2-inch and 6-inch modules, including the 3/4-inch classic open reveal style with concealed clip system. The board planks are available in rich, natural wood veneers, with edge banding for superior quality and aesthetics. The veneer will be white oak



YOLO Colorhouse

- YOLO Colorhouse is a collection of environmentally responsible, nature-based, premium interior paints. YOLO Colorhouse paints contain zero volatile organic compounds and are durable and washable. The Earth Color Collection reflects the purity of Earth's color palette with a line of 43 warm, earth-based hues.

and stained to match the Kährs hardwood flooring.

Garage And Barn Doors

Carriage House Garage And Barn Doors

The Carriage House Door Company has crafted thousands of exquisitely designed overhead garage doors for discriminating customers across America. Every door in their Carriage House Collection offers the timeless beauty, authenticity, and quality of doors constructed a century ago, yet they have completely modern functioning.

Carriage House is designing special

fiber-cement doors to match the exterior look of the Optimum Performance Home and to transform our design ideas into doors of distinction that will add value to the home. All Carriage House custom garage doors complement the architecture of older homes as well as newly designed residences. Every detail, including the hardware, is chosen to fit seamlessly into the home's overall design and style.

Unlike the old doors that swung, folded, or slid open, Carriage House uses the heaviest gauge hardware available and the latest technology in automatic openers. Their exceptional workmanship ensures reliable performance and low maintenance.

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Advanced Floor Products, Inc.

- Advanced Floor Products' RetroPlate™ is an attractive, durable, finished concrete slab polishing process. The company has pioneered the process of grinding, polishing, and chemically hardening (densifying) concrete by combining European stone grinding and polishing technology with concrete hardening and densifying agents.

Carriage House is also designing and fabricating the three custom barn doors—one at the entrance to the home, which slides and locks off the vestibule entrance; one that serves as the door to the workshop; and one that serves as the door to the laundry room or the ramp to the garage.

The custom barn doors are being designed in perfect harmony with the home's architectural style. Exceptional workmanship, superior woods, and professional hardware are standard features on all of Carriage House custom wooden barn doors.

Polished Concrete Flooring

Advanced Floor Products, Inc. has developed RetroPlate™, an attractive, durable, finished concrete slab polishing process. The company has pioneered the process of grinding, polishing, and chemically hardening (densifying) concrete by combining European stone grinding and polishing technology with concrete hardening and densifying agents. In the process, large diamond-wheel grinders remove between 1/16- and 1/4-inch of the concrete floor surface. Consecutively, finer-grit grinding and polishing wheels achieve a fine polish (up to 3,000 grit). During the polishing process, sodium silicate is applied. This absorbs and reacts with the calcium hydroxide in the concrete to form calcium silicate hydrate, which crystallizes within the concrete matrix. The resultant concrete surface is highly durable, easy to maintain, free of VOC emissions, and more light reflective.

The garage floors in the Optimum Performance Home will be finished using the RetroPlate process.

Flooring And Siding Stains

New Century Coatings' AgriStain technology under the Soycrete for Fiber Cement brand name will be used on the fiber-cement siding manufactured by James Hardie Building Products, Inc. Fiber-cement exterior sidings are durable, attractive alternatives to traditional wood composite, redwood, cedar, vinyl, brick, or stucco sidings. AgriStain uses soy ester technology, with better adhesion to concrete. The available hues mirror wood siding, and AgriStain can be applied direct to unprimed or primed fiber cement.

Soycrete is also designed to color concrete. The key to the great performance of Soycrete is penetration. Using natural by-products of corn, sunflowers, or soybeans coupled with a water-based acrylic technology, AgriStain (Acric-Soy) for Concrete will be used to effectively penetrate and seal the concrete slabs and garage floors.

AgriStain TimberSoy for Wood is just like traditional Minwax or Ace solvent stain in application but without the smell and toxicity. That's because AgriStain TimberSoy is bio-based and cleans up with soap and water. AgriStain TimberSoy accentuates grain definition equal to all solvent stains and can be sealed with water or solvent topcoats. It can be applied without wearing gloves because it softens the skin naturally like many hand lotions. It will be applied to exterior FSC-certified IPE decking outside the master bedroom suite, the guest bedrooms, and the hot tub decking.

All AgriStain technologies are composed of renewable resources with a bio-based content >70 percent for stains and 25-35 percent bio-based content for sealers. All AgriStain technology products are <25 g/l VOC.

American Clay Earth Plaster

The interior walls and selected ceilings of the Optimum Performance Home will be finished with American Clay Earth Plaster, a natural finish made from a unique combination of clays, aggregates, and natural pigments. American Clay Earth Plaster is nature's own substitute for cement, gypsum, acrylic, or lime plaster. This is the original earth plaster and is 100 percent natural, non-toxic, VOC-free, mole-resistant, moisture-controlling, non-fading, non-flammable, sound-absorbing, humidity-buffering, easy to use, sprayable, and easy to repair. Three unique finishes and 52 lush standard colors are available, as well as unlimited custom colors. Loma is a smooth finish that creates a soft, even finish. Porcelina is super-smooth for a more polished appearance. And Marittimo features a seashell aggregate to produce a uniquely smooth, yet faceted effect—a natural sheen with additional hardness.

The Original Earth Plaster by American Clay Enterprises mechanically bonds to properly primed stable and dry substrates, including masonry, cement, stucco and plasterboards, gypsum, lime basecoat or base Earth plasters, and even painted walls.

AFM Finishes

Many of today's building materials and coatings are loaded with toxic chemicals. They contribute to the problem of indoor air pollution and chemical

sensitivity through a process of evaporation called off-gassing. This is true, even for so-called "environmental zero-VOC coatings," which can still contain toxic ingredients not prohibited by any government regulation.

For over 20 years, AFM (American Formulating and Manufacturing) Safecoat® finishing products have been helping people create healthy environments without sacrificing beauty or durability. Several non-toxic AFM paints, stains, and sealers, which perform as well or better than their toxic counterparts, will be used throughout the Optimum Performance Home, including AFM Wallboard Primecoat HPV (wallboard primer), AFM MetalCoat Metal Primer (corrosion-resistant film primer), and AFM Safecoat Paint (free of chemical additives). AFM Safecoats are made with unique formulas that eliminate the aromatic solvents, heavy metals, and formaldehyde preservatives found in the typical paint or sealer. The result is a non-polluting coating that also acts as a sealer to help reduce off-gassing from the surface below.

American Formulating and Manufacturing has received SCS Indoor Advantage™ Gold certification

for its Safecoat primers and paints—Safecoat Polyureseal BP, Acrylacq, Acryglaze, Mexeseal, and Durostain.

Indoor Advantage certification is administered by SCS (Scientific Certification Systems) of Emeryville, California. The certification relies on data collected through small chamber testing, which allows manufacturers to examine a product's individual components. Indoor Advantage Gold meets USGBC LEED criteria for EQ4.5, EQ4.1, and EQ4.2, as well as standards for California 01350 and the Collaborative for High Performance Schools.

The Indoor Advantage Gold program has the added benefit of being health driven; it is based on Chronic Reference Exposure Levels set by the California Office of Environmental Health Hazard Assessment, rather than Total VOCs and Threshold Limit Values (TLVs) used by other certification organizations.

An alternative to the AgriStain for Wood stain previously referenced is AFM's Naturals Oil Stain, a slow-drying, no-sheen stain made with selected natural ingredients with excellent color properties. AFM Naturals Oil Wood Stain helps prevent grain raising and exhibits good color stability.

YOLO Colorhouse

YOLO Colorhouse is a collection of environmentally responsible, nature-based, premium interior paints. YOLO Colorhouse paints contain zero volatile organic compounds and are durable and washable.

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The Earth Color Collection reflects the purity of Earth's color palette with a line of 43 warm, earth-based hues. These hues are organized into seven user-friendly color groups—Leaf, Grain, Stone, Clay, Air, Water, and Petal.

YOLO Colorhouse exceeds Green Seal environmental standards for VOCs and other ingredients. Green Seal provides science-based environmental certification standards that are credible, transparent, and essential for end users to make responsible choices that positively improve quality of life.

Selected applications of YOLO Colorhouse zero VOC paint will be used throughout the Optimum Performance Home. With zero VOC content, YOLO paint does not contribute to the depletion of the Earth's ozone layer, as do other conventional latex paints made with solvents that evaporate easily at room temperature and produce poor indoor air quality.

Next

As stated in past articles in this series, the design review process itself has no doubt weighed us down over this unexpectedly long period of time—four years. But now that the Design Committee has granted final approval, the project is moving forward in a hastened manner so that commencement of construction can, hopefully, begin in late March or April 2007, subject to avoiding any serious rainstorms.

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The next series of articles will continue to focus on particular design elements and on each stage of construction, the design approach taken, and the technologies and building systems and 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 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 field. Gary can be reached at 951 676 4914 or gary@ultimatehomedesign.com.

Architectural Illustration & Photo Credits

Ronald Devesa is an architectural illustrator, based in Santa Rosa, California. He specializes in architectural rendering and CAD drafting using AutoCAD, Autodesk VIZ-Maxwell, and Photoshop. He is a member of the American Society of Architectural Illustrators. Samples of his work can be viewed at www.geocities.com/rldesva. Ronald can be reached at 707 849 3500 or rldesva@sbcglobal.net.

Scott Simpson is a pilot and aerial photographer. His company is West Of One, based in Gualala, California. Scott resides at The Sea Ranch and provided the aerial photos depicted in this article. Samples of his work can be viewed at www.westofone.com. Scott can be reached at 707 785 9445 or scott@westofone.com.

Product Information

- Advanced Floor Products / Retro Plate System, P.O. Box 80533, Provo, Utah 84605, 801 812 3420, www.retroplatesystem.com
- American Clay Enterprises, 2601 Karsten Court SE, Albuquerque, New Mexico 87102, 866 404 1634, www.americanclay.com
- American Formulating and Manufacturing (AFM), 3251 Third Avenue, San Diego, California 92103, 800 239 0321, www.safecoat-paint.com
- Armstrong Wood Industries, 2500 Columbia Avenue, Lancaster, Pennsylvania 17603, 877-276 7876, www.armstrong.com
- Carriage House Door, 1421 Richards Boulevard, Sacramento, California 95814, 916 375 0575, www.carriagedoor.com
- Earth Weave Carpet Mills, Inc., P.O. Box 6120, Dalton, Georgia 30722, 706 278 8200, www.earthweave.com
- Evergreen Slate Company, Inc., 68 East Potter Avenue, Granville, New York 12832, 518 642 2530, www.evergreenslate.com
- James Hardie Building Products, 26300 La Alameda, Suite 250, Mission Viejo, California 92691, 800 348 1811, www.jameshardie.com
- Kahrs, 940 Centre Circle, Suite 1000, Altamonte Springs, Florida 32714, 407 260 9910, www.kahrs.com
- Lindal SunRooms/Cedar Homes, P.O. Box 24426, Seattle, Washington 98124, 206 725 0900, www.lindal.com
- Nature's Acoustics, 80 Old East Road, Chatsworth, Georgia 30705, 706 422 8660, www.naturesacoustics.com
- New Century Coatings, 4320 East San Remo Avenue, Higley, Arizona 85236, 602 625 8925, www.agristain.com
- Pella Corporation, 102 Main Street, Pella, Iowa 50219, 641 621 1000, www.pella.com
- RetroPlate—Advanced Floor Products, Inc., P.O. Box 80533, Provo, Utah 84605, 801 812 3420, 888 942 3144, www.retroplatesystem.com
- Sage Electrochromics, Inc., One Sage Way, Faribault, Minnesota 55021, 507 331 4848, 877 724 3321, www.sage-ec.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
- YOLO Colorhouse, 1001 SE Water Avenue, Suite 140, Portland, Oregon 97214, 503 493 8275, www.yolocolorhouse.com

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