

# The First Optimum Performance Home™

## fire risk mitigation part XI



Gary Reber

Architectural Illustration By Ronald Devesa



The Sea Ranch, Sonoma County, California  
Aerial Photo Courtesy Scott Simpson

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; kitchen, bath, and home fixtures; and universal design architecture.

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 has been completed. Final construction plans have been approved by the Sonoma County Building Department. Six permits have been issued: site plan, landscape plan, septic system, geothermal bore holes, grading, and building. Commencement of construction with initial site grading, foundation, and mechanical infrastructure is scheduled for early September 2007.

In this issue, the focus will be on the fire safety features of the home.

### 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 modern building products and methods can make life safer, more comfortable, and more enjoyable. The science of optimum performance homes concerns itself with 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 permanent residence that allows its occupants to age in place.

The high-performance building systems to be employed are designed to exceed building code requirements, and resist natural disasters more effectively than a code-minimum house. Built with stronger building materials and superior techniques, the home will be safer, allowing homeowners greater peace of mind. 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.

In addition, 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. It also will meet the requirements of the National Association of Home Builders' (NAHB) Model Green Home Building Guidelines, the Sustainable Buildings Industry Council (SBIC) Green Building Guidelines, and the "Green Points" program. Sonoma County and The Sea Ranch Association are now considering this program for adoption.

Furthermore, the home's design will be the subject of a case study analysis presentation before the Custom Residential Architects Network (CRAN), Full Spectrum Practice Convention

**"The Fire Protection Plan documents the ways in which the Optimum Performance Home has been designed and will be built to minimize and mitigate the potential for loss from wildfire exposure."**

### synopsis

**The home design embraces traditional fire safety measures, including multiple Uponor fire sprinklers, smoke detector alarms, PEARL® Protected permanent escape and rescue ladders, and evacuation plans to get out of the house, but applies new technologies that make it possible to save the home as well as its occupants by preventing a fire before it starts.**

**Whether or not a fire engine and crew visits a home in wildfire conditions depends mostly on the homeowner's preparation—how the home is built; what plants surround it; the access to reach it; if water is available that can be tapped by fire engines.**

- There are four major areas, which have been addressed to build a wildfire-safe home:**
- Exterior walls will be heat- and fire-resistant so as to resist both combustion and radiant heat transfer to the interior.
  - A Class A fireproof structure will prevent ignition.
  - Exterior projections will be fire resistant.
  - Careful selection and maintenance of vegetation around the home to prevent pass-along ignition.

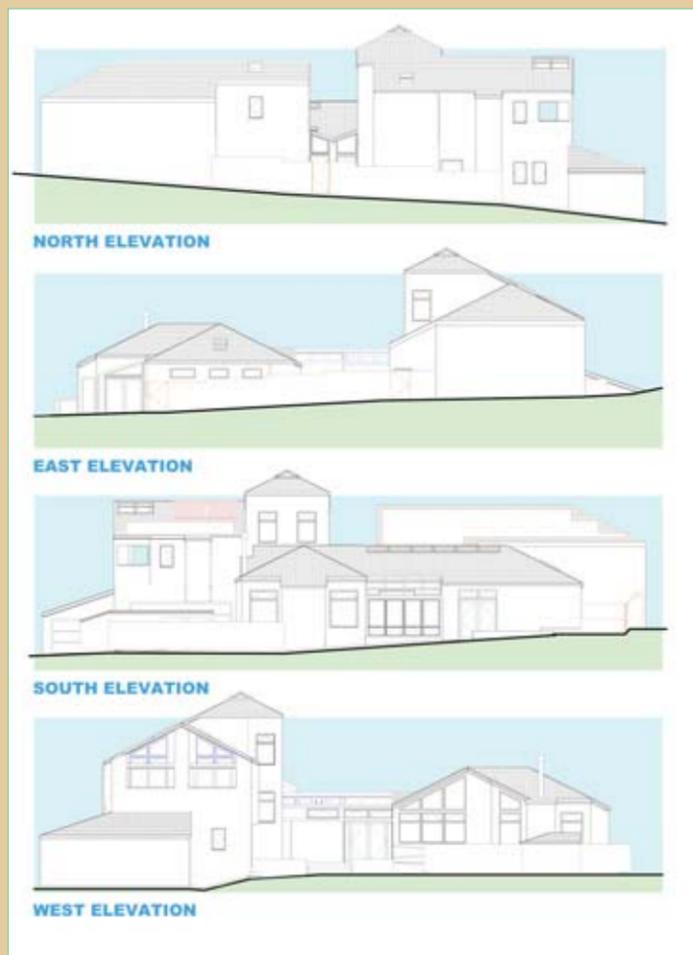
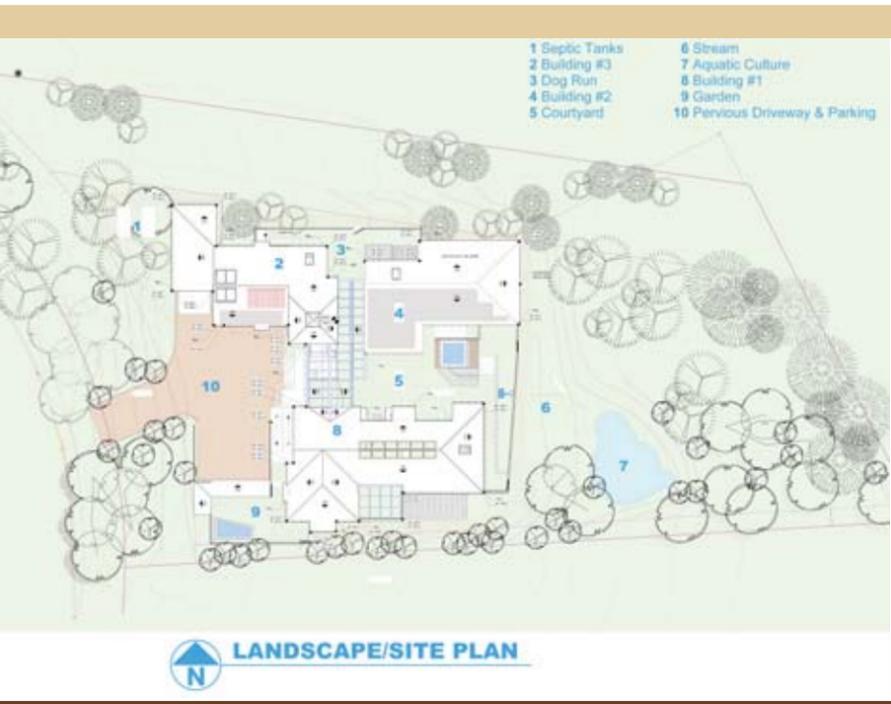
### Introduction

This is the eleventh 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



The elevations of the Optimum Performance Home at The Sea Ranch

of the American Institute of Architects on October 20, 2007 in Chicago, Illinois.

The home is also a case study of the California Energy Commission in terms of energy-efficiency applications and an advanced 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.

### The Setting

The Sea Ranch is an internationally renowned 5,000-acre environmentally protective residential development situated within a pastoral and forested coastal enclave and nature preserve approximately 110 miles north of San Francisco, California. This stunning development, now celebrating its 42nd anniversary, straddles a ten-mile stretch of Highway 1, ending at the northern tip of Sonoma County and the south bank of the Gualala River.

The Sea Ranch is widely regarded as a unique and remarkable residential development. During the 1960s and 1970s, The Sea Ranch was at the forefront of environmentally responsible development. It was conceived and designed by architects and landscape architects who wanted to provide a harmonious mixture of custom homes and pristine natural Northern California landscape in oceanfront, meadow, and forest environments. In fact, The Sea Ranch concept and its architecture are recognized in schools of architecture around the world, and it is frequently used for case studies in environmental and architectural design. The first condominium complex to be built on the southern coastal bluffs of The Sea Ranch is now a registered national architectural site.

Single-family development occupies approximately 2,500 acres without border-line fences or other visible delineation of property lines. The remaining acres are permanent green-scape commons and nature trails for walkers, bicyclists, and equestrians.



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man has interrupted this natural cycle of fire. So many homes have been built in wildland areas that fires are no longer free to do their job and consume dead brush and fallen trees, and open up travel routes for wild animals.

Most wildfires start in windy conditions and create more wind of their own. Wind at The Sea Ranch, and along the Pacific coast, is a natural occurrence. "Controlled burns," once an option, are today too difficult and are rarely attempted. Instead, there has been a huge buildup of flammable vegetation and unhealthy trees, densely tangled and too crowded, with no room to flourish, due to missed cycles of normal wildfires. This means that future wildfires will burn more intensely and will do much more damage than wildfires of the past. Future wildfires will have to be vigorously fought to protect home development. Given this scenario, it is imperative that homeowners and their communities learn to live with wildfires and take action to protect themselves and the environment from their unwanted consequences.

In the early years of The Sea Ranch, the landscape was rather bleak and barren, except for areas of new-growth redwood and Douglas fir established after logging of the old growth and during the start of development. Early on, fire danger was not perceived as a high risk because fuel load was minimal, and the long grasses on the meadows were maintained with controlled burns.

Unfortunately, during those early years, the developer, Oceanic California, Inc., planted some 400,000 non-native shallow-rooted Monterey and Bishop pines, now referred to as "the pine plantations." Far too many survived, growing much too close together. The resulting unnatural "forest" now blankets the hillside sections east of Highway 1 along the entire ten-mile length of The Sea Ranch, leaving only a smattering of meadows and bare hillsides. The dense vegetation and trees, all roughly the same age and height, make perfect fuel for a wildfire. The west side of Highway 1 remains as a meadow without any forest, where natural grasses are the predominant ground cover. There, "signature" but decadent flammable cypress hedge-groves grow along the bluff perpendicular to Highway 1. These decadent and easily ignitable pine plantations, and other proliferating trees, already present in the hills are continuing to age and deteriorate at the same rate, producing a grave fire danger.

Viewed with this historical perspective, the

vegetation east of Highway 1 is "on steroids," and much of the man-created unnatural forested areas have not been managed for fire safety in the 42-year history of The Sea Ranch. Add to this flammable mix the presence of over 1,700 wood-constructed homes, and it is clear that The Sea Ranch is in present danger of a wildfire with sufficient fuel to be devastating.

Granted, the people who want to live at The Sea Ranch are seeking "rural living" away from the cities and know full well the consequences should a wildfire occur. Yet, reasonable people, including those engaged in designing and building homes for full-time living see the need for a greater effort to mitigate the fire danger, especially in the forested areas.

Since its inception, The Sea Ranch has required all houses to be built of redwood or cedar. Only five years ago did the Design Committee first begin to permit fiber-cement siding. Class A fire-resistant roofing such as composites, stone slate, and metal are permitted as well.

The Sea Ranch CID is set up such that each property owner has an equal share ownership in the common areas, the bulk of which are the forested areas and meadows. The governing CC&Rs dictate that the Association maintains ALL the commons in good condition, as does state law. But, in fact, the Association has neglected to maintain the forested commons since the inception of The Sea Ranch.

The Sea Ranch is defined as located within a designated Wildland-Urban Interface. The Sea Ranch contracts with CalFIRE, formerly the

California Department of Forestry and Fire Prevention, to provide all community fire protection. The state operation is located at the fire station on Annapolis Road and is within a 75-second drive to the planned home's site. A fire hydrant is located near the road curb within less than 100 feet to the south of the site. The Sea Ranch Volunteer Fire Department is located at the fire station off the northern end of Highway 1. Both stations are also located in a Very High Hazard Severity Zone. And because the community is isolated with long travel times for out-of-area resources, fire suppression resources are very limited should a wildfire occur, at least in the initial stages of the wildfire.

CalFIRE is responsible for enforcing California's Public Resource Code (PRC) 4291 within The Sea Ranch development. The booklet, *Living With Fire In Sonoma County* ([www.firesafesonoma.org/living\\_with\\_fire.htm](http://www.firesafesonoma.org/living_with_fire.htm)), outlines the standards and guidelines that Sonoma County fire agencies are using when "advising" homeowners about defensible space. Currently, a focused effort is underway to inspect lots with homes, but there is no plan to address

Each home is custom designed by an architect/architectural designer following site-specific design guidelines and is situated off a private road network without curbs, sidewalks, or streetlights. The Sea Ranch is a very unique residential development woven into a tapestry of buildings and nature and committed to environmental preservation. The development includes 2,288 lots for single-family custom homes, with 544 remaining to be developed (1,744 already developed and 27 under construction).

The Sea Ranch is managed by The Sea Ranch Association, a Common Interest Development (CID) with an elected volunteer Board of Directors, and supported by numerous volunteer committees. All development on The Sea Ranch is subject to design review and the approval of a Board-appointed autonomous Design Committee. The Design Committee is presently comprised of architects and landscape architects. A legal set of Covenants, Conditions, and Restrictions (CC&Rs) govern the development and are designed to protect The Sea Ranch concept.

### Fire Risk Mitigation History

Before the land was The Sea Ranch, Native Americans and ranchers often set small fires to help nature out and to improve their food sources, rangeland, and hunting. But after the turn of the 20th century,



the issue of undeveloped lots or the Association-responsibility commons.

In 2002, The Sea Ranch Association funded the Fuels Management Plan (FMP). While the FMP has had the laudable goals of increasing fire safety and has shown some effectiveness in reducing risks on both the immediate west and east sides of Highway 1, it has not received sufficient funding to fulfill all of its goals. Nor has the FMP reduced any significant amount of fuel load on The Sea Ranch. But then, it wasn't designed to do such. It was primarily designed to increase the safety of passage along roads and to slow down a non-crowning fire. Still imperative, however, is that decadent vegetation and trees be thinned in the forested areas, so that in the event of a wildfire, the fire won't burn as hot and consume as much acreage.

Aside from the FMP, The Sea Ranch Association at this time has no comprehensive program or any annual budget to reduce the number of decadent trees, undergrowth, and vegetation in the meadows to prevent the spread of forests.

One of the important aspects of PRC 4291 and the associated Forest Service Guidelines is that they emphasize the requirement for a 100-foot defensible space around structures but limit the homeowner's responsibility to the property line if it is less than 100 feet away. Homeowner implementation of PRC 4291 requires that homeowners obtain approval for vegetation removal from the Design Committee and the Department of Design, Compliance & Environmental Management

(DCEM). However, the CalFIRE-required reviews and approvals for defensible space vegetative maintenance should now override this layer of bureaucracy. But whether this will happen is yet to be determined. CalFIRE may issue notices warning of potential dangers but they will not provide enforcement. They intend for their notification process to be only "educational" at this time, and they have no staff or budget for enforcement.

The costs of providing for defensible space at The Sea Ranch can be divided into three categories:

- Lot owners for their own developed private property areas as defined by PRC 4291
- Lot owners for their undeveloped private property areas as provided for by CC&R Section 3.02 (d), which states that the owner is responsible for maintenance in a fire-safe condition
- The Association for restricted private and adjacent common areas, as provided for by CC&R Section 5.04 (d), which states that the Association shall be responsible for maintenance of common and restricted private areas [which is approximately 60 percent of The Sea Ranch and includes most

of the hazardous acreage, including the fire chimneys and the deteriorating pine plantations].

The Sea Ranch Association has created yet another volunteer study group, the Fire Safety Task Force (FSTF), which has been directed to further study and define fire risks. It will seek additional ways to improve fire safety, and monitor the Fuels Management Plan for maximum effectiveness. The 18-month effort is expected to recommend fuel-load and vegetation management measures. Eventually, the FSTF will report their findings to the Board for possible action.

Yet report after report over the past 30 years has identified all of the fire-risk conditions and the remedial actions required. Over those many years, every report and study regarding managing vegetation has been sensitive to Forestry Guidelines, fire expert advice (including arborist recommendations), and regard for habitat aesthetics, environmental stewardship, and protection from re-forestation of natural view corridors.

The Sea Ranch community is faced with an increasing danger that continues to threaten life

(human and animal) and property, while the Association continues to overlook CC&R directives and state law mandates for maintaining ALL of the commons.

No amount of fire-risk mitigation can fireproof The Sea Ranch. Any home in an environment such as The Sea Ranch is at risk, but fire science is increasingly knowledgeable about mitigating those risks through appropriate vegetation management and building codes that require fire-resistant building materials and applications.

There are three factors in wildfire: climate, terrain, and fuel. The weather cannot be changed, nor the terrain. But the fuel can be reduced and the vegetation managed for fire safety. And doing so should be a first principle for people who choose to build homes in a Wildland-Urban Interface zone, not only for their own safety, but for the protection of the wildlands as well.

With this background one might ponder why anyone would want to put his or her life and property at risk with the ever-present danger of a wildfire. Some people will always place high value on the beauty of the natural environment and want to be invigorated by this beauty on a daily basis. That is why we chose The Sea Ranch site for building the first Optimum Performance Home. The natural environment is gorgeous and features stunning coastal views, trees, ocean bluffs, coves, meadows, and trails.

Unlike other Sea Ranch homes, the planned Optimum Performance Home will feature "green" sustainable build quality, universal

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aging-in-place living design, and comprehensive electronic lifestyle features. The home is deliberately designed to fully survive a wildfire through a careful selection of building materials and techniques designed to mitigate fire risk.

## The Home

The Sea Ranch Design Committee imposes upon designers architectural building blocks derived from the original rural structures found on the northern California coast. Designers are expected to apply their creativity to render various arrangements and deviations to arrive at a custom solution that specifically responds to the site. Successful proposals submitted to the Design Committee address the issues of passive solar positioning, wind, glazing (window) layout, privacy between neighbors, vegetation protection, view preservation, topography and grade changes, roof slopes, appropriate exterior materials and finishes, and other exterior design considerations—all within the building and site design.

A focus of the Optimum Performance Home's design is to stand as a showcase for the "green" movement and demonstrate means of reducing a home's impact on the planet through the use of Low-Impact Development (LID) and environmentally responsible building materials. It is hoped that the home will become a case study for a "Green Points Program" suited to the scale of The Sea Ranch.

The home's 3,272-square-foot living space (4,441-square-foot total building "footprint," including garages, covered walkways, courtyard, and decks) will be arranged in a three-building compound using a well-sealed, well-insulated, super-tight building envelope that reduces temperature fluctuations and enhances overall energy efficiency. This arrangement provides for an alcove courtyard protected from the prevailing wind from the northwest. The home is designed with differing spatial experiences throughout to encourage exploration. The home will display innovative interior design and be furnished in a contemporary Frank Lloyd Wright style appropriate to its dimensions. The home design connects the indoors and the outdoors with covered walkways, a courtyard, decks, and a garden to expand livable space, without requiring heating or air conditioning. The home is designed in accordance with biophilic-design principles with abundant and excellent use of natural light and natural indigenous landscaping planned. (For an in-depth analysis of the biophilic attributes of the home, please read "Biophilic Design," "Biophilic Design Attributes," and "The Interior Design Process, Part I: Synthesizing Sustainability, Universal Design, And Technology" authored by Julie Stewart-Pollack in Issue 3 (May/June 2006), Issue 4 (July/August 2006), and Issue 10 (July/August 2007), respectively.

The main-floor living area is designed to accommodate the capabilities of all occupants without any challenging physical barriers, even for the elderly and disabled. The home design features a ground-level open plan for the living room, dining room, master bedroom suite, and spacious kitchen with solarium, exhibition cooktops, and home management system.

The second building in the compound is designed to accommodate a large state-of-the-art Optimum Performance Home Theatre™ with integrated rear-screen projection room and a home office.

The third building will include a two-car and boat garage, workshop, main-level guest bathroom, and laundry room. The second level of this building will have two guest bedrooms, a bathroom, and a dedicated library/home theatre/surround music room distinguished by a high-tower feature. To insure universal access to this floor, the design provides for an Otis® Gen2 residential elevator.

The entrance and walkways that connect the three buildings and the solarium will be enclosed with insulated- and solar gain-reduced-tempered glass. There will be a seating area at the vestibule entrance to the home. The main entrance vestibule will serve as an oversized mudroom. The driveway, area around the garage, guest parking, and entrance to the home—as well as all paths—are designed in accordance with The Sea Ranch guidelines governing exterior hard-surfaced paths. All such surfaces are pervious to virtually eliminate water runoff. The surface will be packed with decorative gravel to enhance the natural appearance of the home's setting. There also will be a dedicated equipment room off the courtyard, which accommodates the Uponor® and WaterFurnace® radiant-heating apparatus, TrendSetter® solar hot water storage tanks, Microtherm's Seisco® on-demand electric tankless water heater, and other equipment. The backup Kohler® generator is housed within a separate weather-resistant enclosure located off the wind tower on the north wall of the two-car garage and guest bedroom, within the fenced dog run. This tower is designed to optimize the northwest wind performance of the PacWind® Seahawk® vertical-axis Savarrius™ wind turbines disguised within. The dual turbines will produce from one to five kilowatts of power.

The home site is nestled on an almost-acre parcel at the edge of a forested area of the southern section overlooking the Pacific Ocean, offering distant water views. Some of the home's features will include a Benissimo® slate-floor outdoor courtyard, two hardwood Ipé deck areas, in-ground Dimension One Spa® hot tub, Finnello® Finnish sauna, and underground wine cellar. The orientation of the home on the site is designed to take advantage of natural lighting and passive solar heating and cooling. Good site and land planning will result in minimal land disturbance and

preservation of natural features and environments.

Landscaping will consist of The Sea Ranch-approved indigenous vegetation with low-water requirements and unique water conservation features, including two ponds and a stream supported by rainwater catchment and captured runoff. Site grading has been specifically planned to enhance the project's placement in the watershed, and the design incorporates the principles of Low Impact Development to minimize runoff from impervious surfaces and mimic the natural hydrology in overall effect. The resultant water harvesting will then minimize the use of irrigation, and the increased infiltration and retention will passively support the native landscape. Additionally, a gray water system will be used for undersurface plant irrigation.

## Fire Risk Mitigation Features

What follows is a Fire Protection Plan, which documents the ways in which the Optimum Performance Home has been designed and will be built to minimize and mitigate the potential for loss from wildfire exposure. In areas that are designated Wildland-Urban Interface Fire Areas and/or Very High Fire Hazard Severity Zones by the office of the State Fire Marshal pursuant to California Public Resources Codes, such as The Sea Ranch, certain building standards apply to mitigate wildfire exposure. Wildfire exposure is one—or a combination of—radiant heat, convective heat, direct flame contact, and burning embers projected by vegetation fire, which can travel as much as a mile away from a wildfire to a structure and its immediate environment.

Traditional fire-safety education focuses on smoke alarm installation and escape techniques, including evacuation routes. The design of the Optimum Performance Home embraces this strategy, including multiple Uponor fire sprinklers, smoke detector alarms, PEARL® Protected permanent escape and rescue ladders (accessible from second-story living quarters), and evacuation plans to get out of the house, but applies new technologies that make it possible to save the home as well as its occupants by preventing a fire before it starts.

While most of the existing building-code requirements that relate to fire danger have been derived from decades of experience in urban fires, changes are being evaluated and will be forthcoming in the near future, based on the experiences of recent years from losses in wildfires in the west.

Red-hot burning embers or particles falling from the sky will start fires only where there's fuel for them to burn. The home design's objective is to keep flames away from the home and to eliminate combustible building material that would otherwise be open to attack from flying embers.

Whether or not a fire engine and crew visits a home in wildfire conditions depends mostly on the homeowner's preparation. This will depend on their assessment of whether the home is prepared and can be saved. If they see a wide driveway, a clearing around the home, and a place to turn around, they are more likely to protect the home.

Protection depends largely on these factors:

- How the home is built
- What plants surround it
- The access to reach it
- If water is available that can be tapped by fire engines

A principal design goal for the Optimum Performance Home is to incorporate building safety elements. In the case of the design of the structure, there are four major areas, which have been addressed to build a wildfire-safe home:

- Exterior walls will be heat- and fire-resistant so as to resist both combustion and radiant heat transfer to the interior.
- A Class A fireproof roof structure will prevent ignition.
- Exterior projections (eaves, decks, porches, cantilevers, etc.) will be fire-resistant.
- Careful selection and maintenance of vegetation around the home to prevent pass-along fire ignition.

The goal in the design of the Optimum Performance Home is to build a Survivable Home—one that will survive without firefighters' help.

## Site Treatment And Exteriors

All vegetation near the structure has been carefully selected and will be maintained to reduce the flames and heat that could attack the home in the event of a wildfire. This is the area referred to as part of "defensible space," in which vegetation is cleared back from the home enough that the home is "defensible"—able to be defended—in a wildfire.

Effective fuel reduction means arranging the trees, shrubs, aerial above-surface brush, and other fuel sources in a way that makes it



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### PEARL® Protected Permanent Escape & Rescue Ladder

- A PEARL® Protected Permanent Escape And Rescue Ladder will be installed in each second-story guest bedroom and the library/home theatre/surround music room. Pearl provides the ultimate escape solution in the event of a fire or other home emergency.



difficult for fire to transfer from one fuel source to another. Plants will be separated from each other vertically and horizontally to prevent a fire from jumping from grass to brush to trees (“ladder” fuels), or from bush to bush or tree to tree. No grass will be permitted to grow below and near brush or shrubs. Tree branches will be pruned at least six feet, up to 15 feet from the ground, so that anything burning below them won’t catch the trees on fire, and also for fire engine access.

The site has a gradual slope to the east, as the terrain rises gradually from the bluffs along the Pacific Ocean. Fires will run uphill hotter and faster than on level ground. The clearing distance downhill around and in front of the home to the frontage street will be maintained in a fire-preventive natural vegetative state. Dead and diseased trees, branches, and bushes will be removed as well as dry grass, twigs, needles, wood chips, and dead leaves on the ground, so burning embers won’t have the fuel they crave in the event of a wildfire.

The master bedroom suite Ipé deck will be clear underneath to bare soil and enclosed with non-flammable material so that flying embers or a grass fire cannot burn beneath and start the structure on fire. Ipé is an extremely dense hardwood that is ignition-resistant and virtually non-combustible at three inches thick, especially when coated with No-Burn® fire-retardant protection before staining.

All plants surrounding the home will be those that are native to the region, as they were when the first residents settled the region. They have co-evolved with the wildlife, fungi, and microbes to form a complex network of relationships. Native plants promote water conservation and can survive with only seasonable rainfall. Thus, less water consumption means more water available for firefighting—a particular benefit during a drought. All natural grasses will be mowed and maintained to a height of four inches maximum.

The design of the driveway provides safe emergency vehicle access and egress. The 50-foot straight-path driveway will be 12 feet wide with a large guest parking area at the front of the home that will provide for a three-point turn for fire engines. The grade is eight

percent—not too steep for navigating fire equipment. A numbered address sign will be visible from the road from at least 100 feet in both directions in a fire engine’s headlights. The copper sign will have reflective numbers four inches tall.

A pathway will surround the compound structures, which will serve as an access for firefighters to work. The wide driveway and pathway will serve as a firebreak between the home, neighboring vegetation, and the nearby wildlands.

An 11,000-gallon surplus supply of water will be available from the pond, which will be located approximately 100 feet uphill from the home, with a three-inch filtered underground water line down to the home. A standard 2-1/2-inch value red-painted standpipe hydrant with a male National Hose fire-thread fitting will be located at the driveway entrance at the front of the boat garage, to which a fire hose can be connected. The pond and gravity hose will be able to provide 250 gallons-per-minute without a pump. The firewater fittings will be painted red, and the location of the water source marked with a blue reflector and a “fire water” sign at the entrance to the driveway pointing to the water connection and source. Fire engine access to within 12 feet of the pond will be provided.

In-ground accessible water hoses will be positioned at each building corner, and on decks, to be used to dampen falling burning embers and keep temperatures below ignition of combustibles, in the event of a fire. These in-ground hose receptacles will be covered with a non-combustible easily removable lid.

The propane tank will be buried in a concrete enclosure located 40 feet away from the home in a non-flammable aboveground storage structure next to the non-flammable garbage structure.

While The Sea Ranch still stipulates that fences be made of wood, the design provides for separating the fenced areas from the home using metal gates or open space to prevent a fence from touching the structure. Otherwise, a wood fence can carry a fire right to a deck and the home.

The underground wine cellar has been designed to provide an emergency fire “safety zone” cocoon to hunker down in while a fire passes.

### The Structure

In wildfires, homes, in many cases, initially combust by radiant transfer of heat through the exterior shell of the home so that the interior furnishings

### Amvic® Insulated Concrete Forms



- The Amvic® ICF 5-in-1 system incorporates structure, insulation, vapor barrier, sound barrier, and studding attachments for drywall and exterior siding in one easy step.

combust in a burst of flame that rapidly engulfs the structure. Amvic® Insulating Concrete Form (ICF) and IHSN ThermaSAVE® Structural Insulated Panel (SIP) walls and roofs, as well as Industrial Acoustics Corporation (IAC) STC-61 Noise-Lock steel door assemblies, heavy solid-wood Holzkraft® interior doors, and Artistic® 90-minute fire-rated 1-3/4-inch thick doors, will, along with the solid insulated walls, protect the interior of the home from radiant transfer. Artistic doors are crafted with their patented one-half-inch panel rated at 90 minutes, and are available with a glass panel insert, which will be the style used in the home. The Artistic doors will be used for the first- and second-floor openings to the Otis Gen2 residential elevator and the garage opening to the vestibule walkway. The IAC doors will be used at the entrance to the Optimum Performance Home Theatre and the rear-projection room.

As noted, the Optimum Performance Home will be built with non-combustible and impact-resistant exterior walls. The Amvic ICF walls will provide a solid flat wall of concrete sandwiched between two layers of expanded polystyrene (EPS) foam. The minimum thickness of the Amvic ICF exterior walls is nine inches, which will provide a building shell with a wall-fire rating of greater than three hours. A five-hour firewall will be created with the application of 7/16-inch thick MaxiTile® fiber-cement fire-proof cladding panels and trim on the exterior and fire-rated sheetrock on the interior. The main residence, home office, and boat garage will use MaxiPanel® as the exterior and interior cladding for the ThermaSAVE Structural Insulated Panels (SIPs) that form the 8-3/8-inch-thick walls using non-combustible EPS foam as structural insulation sandwiched between the MaxiPanels. The roofs also will be constructed with the ThermaSAVE/MaxiTile SIPs and covered with non-combustible Class A Evergreen Welch Black stone slate tiles. Class A roofing assemblies are effective against severe fire exposures. Even the Ashland® ISOSET® adhesive, which will be used to glue the MaxiTile panels to the EPS panels, is non-combustible. As with the other materials, the adhesive is free of VOCs (Volatile Organic Compounds). MaxiPanel and MaxiTrim® will be used to create the board and batt exterior of the home.

Fiber-cement components are very stable and include Portland cement and silica sand, as well as mineral aggregates and cellulose fibers. The characteristics of fiber-cement materials have



### ThermaSAVE®

- The IHSN ThermaSAVE® Structural Insulated Panel Building System consists of a MaxiTile® inner and outer fiber-cement skin and a core of super-insulating expanded polystyrene (EPS) glued together with a special high-strength glue and dried under extreme pressure, resulting in a stressed-skin panel that has amazing capabilities.

### MaxiTile®



- MaxiTile® provides a 50-year limited transferable product warranty on its MaxiPlank®, MaxiPanel® and MaxiTrim® fiber-cement products. The products are dimensionally stable and resist cracking, rotting, and delamination. As well, they resist damage caused by extended exposure to moisture, humidity, UV rays, and salt air. And they are non-combustible.

### Industrial Acoustics Corporation (IAC)



- IAC STC-61 Noise-Lock steel door acoustical assemblies feature cam-lift hinges, allowing a barrier-free sill—important for universal design considerations (the door rises as it opens, and falls as it closes), magnetic-type triple seals, and magnet sleeve bellows that reach out to provide a continuous seal around the perimeter of the assembly.

### 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.

### Artistic® Doors

- Artistic® 90-minute fire-rated 1-3/4-inch thick doors are meticulously handcrafted and are made from the finest materials, with hardware available to ensure long-lasting beauty, reliable performance, and low maintenance.



### Evergreen Slate Company

- Evergreen's 11 natural slate colors and texture afford many architectural effects, contributing to a building's appearance. Slate quarried for roofing stock is of dense, sound rock, exceedingly tough and durable. It is also fire- and waterproof and resistant to climactic changes, with absolutely no disintegration. Evergreen slate has the highest designation for durability in excess of 75 years.



### TrendSetter® Industries' Evacuated Solar Tube Collectors

- TrendSetter® solar-tube systems reduce the water-heating portion of a utility bill by as much as 90 percent. Each of the solar collector arrays are made of 30 non-combustible borosilicate impact-resistant evacuated glass tubes with a copper super-heat pipe and aluminum heat fin within each tube.



### 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.



always been exceptional, such as their structural resistance to impact, weather conditions, and fire. MaxiTile's fiber cement contains three tri-hydrated alumina, which strongly increase its structural properties and its fire resistance.

MaxiPlank®, MaxiPanel, and MaxiTrim fiber-cement exteriors have been tested in accordance with the American Society of Testing Materials standards and other testing development organizations to be non-combustible (ASTM E136), approved for fire-rated construction (ASTM E119), and have zero flame spread (ASTM E84). Under UBC

2-1, MaxiTile fiber-cement products have zero smoke generation and fuel contribution. The National Wildland/Urban Interface Fire Program's Firewise Communities lists fiber-cement siding among steps to reduce a home's vulnerability. MaxiTile fiber-cement products are designed to protect the entire exterior of the home with flame-resistant siding and trim boards for corners and around windows and doors. MaxiPanel Cedar and MaxiTrim will be used for the exterior of the Optimum Performance Home and MaxiTrim for framing doors and windows that are vulnerable to contact with fire. In the SIP application, MaxiPanel Smooth will be used as the interior facing and the surfacing for the roofs.

The TrendSetter® solar hot water system will employ TrendSetter's proprietary solar collectors on the southern roof above the guest bedroom. Each of the solar collector arrays are made of 30 non-combustible borosilicate impact-resistant evacuated glass tubes with a copper super-heat pipe and aluminum heat fin within each tube. The evacuated tubes are tied together with a single 30-tube header. The header consists of a fiberglass insulated copper manifold contained within a powder-coated aluminum casing which is mounted to the roof as a complete evacuated tube array with a stainless-steel frame.

Carriage House Garage and Barn Doors will craft the home's custom garage and barn doors. The doors will be overlaid with the same non-combustible MaxiTile fiber-cement cladding that will be used on the home's exterior.

Attic vents located in the roof above the Optimum Performance Home Theatre will be covered with a metal mesh screen with a small grid size to prevent wind-borne embers from penetrating into attic space. Chimney and stovepipe openings will also be covered with wire mesh 1/4-inch or smaller, with an approved spark-arrestor cap.

Gutters and places where roof angles meet can trap burning embers. According to the American Red Cross and the Federal Emergency Management Agency (FEMA), keeping gutters clean of debris (dry tinder) is an important practice for fire mitigation. When burning embers carry onto roofs and into gutters, homes are at a much higher fire risk.

The Gutter Helmet® gutter protection system will shield the home's gutters from burning embers and keep the home's roofs free of leaves, needles, and other debris using a flow-limiting, ribbed design that slows and spreads water, causing it to flow easily into the gutters, while debris falls to the

ground, thus preventing dry tinder from collecting.

Radiant heat from a wildfire can cause windows to shatter and melt window frames, allowing burning embers to enter the structure and cause more damage. The glass in exterior openings will be tempered and either dual- or triple-glazed and resistant to transmission of radiant heat from direct flame. Though there is no industry-approved uniform fire rating from dual- or triple-glazed windows and doors, windows and doors with glass components with an insulating-air-gap feature have proved their worth under actual fire conditions. The Optimum Performance Home will use Pella® insulating-air-gap tempered glass windows and VELUX® electronic-venting glass skylights (VSE) with four-sided aluminum inserts and exterior aluminum cladding to prevent fire from penetrating the building shell. VELUX skylights meet ASTM standards. The VELUX SunTunnel® skylight fitted to the ceiling of the underground wine cellar features a hemispherical-shaped acrylic dome that rolls any material hitting or landing on the dome to the sides. The unit features a steel ring to further inhibit damage. As with the VELUX fixed and fixed curb-mount units, the SunTunnel has passed ASTM Class B burn brand testing. Note that Class B roofing assemblies are effective against moderate fire test exposures. The ridge skylight will use VELUX tempered glass and a non-combustible aluminum assembly. The pyramid skylight over the library/home theatre/surround music room will use tempered glass and a non-combustible aluminum assembly. Additionally, Pella's integrated Venetian blinds within the air gap can be effective in holding out radiant heat.

Likewise, the Lindal®-built vestibule, walkway, and solarium will fabricated with tempered glass and aluminum exterior structural elements.

### The Interior

The interior walls will be constructed with Nordic Structures' light-gauge (cold-formed) steel framing. In addition to being recycled and recyclable, steel has a significantly higher strength-to-weight ratio than wood and thus has greater earthquake resistance. Steel is non-combustible and does not contribute fuel to the spread of a fire, and steel is an inorganic material, which does not provide an environment on which mold can grow. The interior steel-framed

### Gutter Helmet®



- The Gutter Helmet® gutter protection system is a multi-patented, flow-limiting, ribbed design that slows and spreads water, causing it to flow easily into the gutters, while debris falls to the ground.

### 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 weather ability 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.

### VELUX® Sun Tunnel™



- Accentuated by the natural stone walls and vaulted ceiling, an integrated VELUX® Sun Tunnel™ will project natural daylight into the wine cellar.

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### Nordic Structures, LLC

- The advantages of light-gauge (cold-formed) steel framing is that in addition to being recycled and recyclable, steel has a significantly higher strength-to-weight ratio than wood and thus has greater earthquake resistance. Steel framing also is impervious to rot and termites. Steel is non-combustible and does not contribute fuel to the spread of a fire, and steel is an inorganic material, which does not provide an environment on which mold can grow.



### Bonded Logic®

- Bonded Logic's UltraTouch® insulation product is 100 percent post-industrial recyclable and environmentally friendly insulation that provides maximum health and superior R-value thermal performance. It is Class-A fire rated, offers excellent thermal and acoustical properties, and is treated with a non-toxic mold, mildew, and pest inhibitor.



### Acoustiblok®

- The steel-framed stud walls enclosing the Otis Gen2 elevator shaft and the laundry room will be surfaced with an Acoustiblok® UL (Underwriters Laboratories) assembly designed to soundproof these areas. Acoustiblok is the only particular formula that has passed UL's stringent requirements. Therefore, Acoustiblok has earned a Class A one-hour fire rating.



### USG Sheetrock™ Firecode® C Core Gypsum Panels

- USG Sheetrock is composed of enhanced fire-resistant gypsum core (Type C) encased in 100 percent recycled natural-finish face paper and 100 percent recycled liner paper on the backside, possess superior fire-resistance and heat transmission properties for added safety, and are exceptionally resistant to cracks caused by structural, thermal, or hygrometric changes.



### VELUX® Skylights And Roof Windows

- VELUX® is the only manufacturer with all standard skylights meeting ENERGY STAR® approval guidelines for all climactic 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™.



stud walls will be packed with Bonded Logic's UltraTouch® cotton fiber insulation. In addition to providing maximum health and superior R-value thermal performance, it is Class A fire rated, offers excellent thermal and acoustical properties, and is treated with a non-toxic mold, mildew, and pest inhibitor. The steel-framed stud walls enclosing the Otis Gen2 elevator shaft and the laundry room will further be surfaced with an Acoustiblok® UL (Underwriters Laboratories) assembly designed to soundproof these areas. While Acoustiblok meets over 207 UL wall, ceiling, and floor-assembly codes, it in itself is not, nor claims to be, a fire-proofing method for construction. However, relative to virtually 99 percent of all similar products on the market that might be used in a home and add to the risk of fire, Acoustiblok is the only particular formula that has passed UL's stringent requirements. Therefore, Acoustiblok has earned a Class A one-hour fire rating. Overlaid on top of the Acoustiblok material will be USG Sheetrock™ Firecode® Type C Core gypsum panels. USB Sheetrock possesses superior fire-resistance and heat-transmission properties and is exceptionally resistant to cracks caused by structural, thermal, or hygrometric changes.

The elaborate 2-foot-13/16-inch-thick acoustical wall assemblies to be constructed in the Optimum Performance Home Theatre will be faced with double layers of USG Sheetrock Firecode Type C Core gypsum panels. The rear-projection room will be faced with Quite Solution® QuietRock 530, which is UL Classified fire-rated for one hour. The insulation to be packed into the Owens Corning QuietZone® Acoustical Wall Framing cavities will be fire-resistant Latitude™ natural wool insulation. Wool has a high, natural fire resistance and is virtually non-flammable. The main reason for this is that wool contains moisture in each fiber and resists flame without chemical treatment. Wool has a high Limiting Oxygen Index (LOI=25.2), and this means that oxygen content of 25.2 percent is necessary to completely burn wool, whereas air only contains 21 percent. Thus, wool will tend to char or smolder instead of bursting into flame in the event of a fire. When the flame source is removed, wool will self-extinguish; it will not support combustion. This benefit has led to the use of wool fabrics as fire-resistance clothing for personnel involved in high-risk fire environments.

The floors of the master bedroom suite, guest bedrooms, living room, and Optimum Performance

Home Theatre and rear-projection room will be covered with Earth Weave Carpet Mills' Broadloom Bio-Floor® sustainable wool carpet—the purest carpet available. Wool's high-moisture content and protein constituents make it naturally flame retardant.

Natures Acoustics' Whisper Wool® material will be the underlay for the Kahrs® hardwood flooring, Natural Cork® flooring, and Bedrosians slate flooring in the home. In tests, Whisper Wool has a Flame Spread Index of 35 and a Smoke Developed Index of 50, both indicating excellent fire mitigation.

An Uponor fire sprinkler system will be employed throughout the home. Designed for fast response, the AQUAPEX® plumbing system will provide water to the sprinkler fixtures, which will activate independently when temperatures reach 150-degrees Fahrenheit. The system exceeds the National Fire Protection Association (NFPA) requirements.

### Other Fire Mitigation Treatments

Henkel's OSI GreenSeries™ Flameseal® Flame, Smoke and Draft Stop Sealant will be applied throughout the construction. The product is designed for use in both residential and commercial fire-stopping applications. The sealant was developed to seal service penetrations and joints in Fire Separations and Firewalls, and prevent the passage of flame, smoke, and fumes under actual fire conditions. Also, when applied at penetrations between walls and floors, Flameseal will prevent drafts from room to room and floor to floor during the normal life of the structure which, over the life cycle of the structure Flameseal will help lower heating and cooling costs. Flameseal meets all requirements of a single component fire-stop for gypsum wallboard (drywall/sheetrock) and concrete and concrete block one-, two- and three-hour rated fire separations, and has been fire-resistance-tested as a through penetration fire-stop by Underwriters Laboratories and Warnock Hersey.

No-Burn fire retardants and reactants will be applied throughout the home, including the structure and combustible items within the home. No-Burn, Inc. has developed a highly advanced line of non-toxic, non-carcinogenic liquids that render a vast array of materials incapable of burning as well as inhibiting the growth of toxic-black mold (stachybotrus chartarum). No-Burn formulas are designed to remove the fuel a fire needs to burn and deny mold a food source. Fabric, carpet, and furniture

### Latitude™ Insulation

- The natural wool used in Latitude's insulation is from wool processing in New Zealand. Wool, unlike synthetic materials, actually reacts to changes in temperature and atmospheric moisture. Insulation made with natural wool fibers not only achieves impressive R-value thermal performance, but because of wool's thermo-regulation properties, wool insulation has the ability to absorb and release water vapor and has been proven through independent laboratory tests to help keep buildings cool in summer and warm in winter.



### Earth Weave Carpet Mills, Inc.



- Earth Weave's 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).

### Nature's Acoustics



- 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.

### Uponor® Fire Protection System



- Uponor's reliable and trouble-free fire sprinkler system is designed for fast response. The AQUAPEX® plumbing system provides water to the sprinkler fixtures, which activate independently when temperatures reach 150-degrees Fahrenheit. The system exceeds the National Fire Protection Association (NFPA) requirements.

### OSI Sealants, Inc.



- OSI Sealants, Inc. is a leading manufacturer of caulks, sealants, adhesives, and wood-patching products with more than four decades of experience in developing and supplying the highest quality products. The company's Green Series™ features low-VOC construction adhesives, caulks, and sealants.

### 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.



### No-Burn®

• No-Burn® fire retardants and reactants, are a highly advanced line of non-toxic, non-carcinogenic liquids that render a vast array of materials incapable of burning, as well as inhibiting the growth of toxic black mold. No-Burn removes the fuel a fire needs to burn when applied to wood, drywall, fabric, carpet, and furniture.



can also become highly flame resistant with the use of No-Burn products. All No-Burn products carry a Class A rating and are designed to reduce the choking, toxic smoke produced by a fire by as much as 80 percent. They have passed a multitude of test standards, including those performed by the National Fire Protection Agency.

In the event that a fire were to occur anywhere in or around the structure, No-Burn provides additional time to exit safely. The application of No-Burn coatings on the Optimum Performance Home will allow the structure to be encapsulated with a non-toxic, non-carcinogenic flame retardant; preventing the home from being fuel in the case of a fire.

Where wood is used on the exterior and interior structure of the Optimum Performance Home, No-Burn Wood Gard Mih will be applied. This is a dual-action product that has proven to be effective against the potential of fires with regard to the preservation of the structural integrity of wooden structures. The product is UL and UL Classified, carries a Class A rating per ASTM E-84, and meets the requirements of UL 723. It has also achieved zero mold growth per ASTM D5590-94.

Paintable surfaces within the home will be treated with No-Burn Plus Mih. This product is a dual-action coating that protects surfaces as a fire reactant while inhibiting the growth of toxic-black mold. No-Burn Plus Mih provides the same fire and mold-resistant protection as Wood Gard Mih, but is suitable for application to the interior surfaces of a structure, such as drywall/sheetrock or anywhere where latex paint can be used. The same UL and ASTM standards apply. No-Burn Plus Mih carries a Class A rating and meets the requirements of UL 723.

No-Burn Fabric Fire Gard effectively slows down the spread of fire and prevents interior furnishings from catching fire. Fabric Fire Gard is a clear and odorless liquid that is non-toxic, non-carcinogenic, and an environmentally safe fire retardant. It will be applied to furniture fabrics (leather excluded) and other interior furnishings, such as bedding and mattresses, drapes, curtains, tablecloths. No-Burn Fabric Fire Gard has received a Class A fire rating per ASTM E-84 and meets the requirements of NFPA 701.

Finally, No-Burn Original will be applied to furniture, wood furniture, wood cabinets, and other wooden ornamental surfaces (prior to finishing).

No-Burn Original is odorless, non-toxic, non-carcinogenic and will not leave a residue. It carries a Class A fire rating and meets the requirements of UL 723

Property insurance coverage in certain states can be reduced by up to 15 percent when No-Burn products are specified during the construction of a new home. Furthermore, a new home built with No-Burn products may receive a .5-percent mortgage rate reduction. No-Burn provides a seven-year Builder Mold Warranty, which covers the home builder for all areas treated with No-Burn Mih up to \$50,000 in mold remediation-related costs.

Finally, as part of the training conducted by the Community Emergency Response Team (CERT) at The Sea Ranch, an evacuation response will be rehearsed and documented throughout the home. A well-equipped emergency kit will be located in each building of the compound with instructions for use and what items to take and put into the evacuation vehicle, should evacuation be necessary. Other emergency lists will be provided at key locations within the home providing instructions for preparing the indoors and outdoors if a wildfire should occur and endanger the home and its occupants.

### Next

Now that Sonoma County Building Department has completed its review of the building plans and all permits have been issued, this continuing series of articles will focus on the design elements as they pertain to each stage of construction, and include coverage of the technologies and building systems, and the materials used and applied to construct 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@ultimatehome-design.com.

### Product Information

- Acoustiblok, 4216 East Busch Boulevard, Tampa, Florida 33617, 813 980 1400, www.acoustiblok.com
- Amvic, Inc. 501 McNicoll Avenue, Toronto, Ontario, Canada M2H 2E2, 877 470 9991, www.amvicssystem.com
- Amvic Pacific, Inc. 12531 Lowhills Road, Nevada City, Nevada, 95959, 530 265 9085, www.amvicssystem.com

- Artistic Doors And Windows, 10 South Inman Avenue, Avenel, New Jersey, 07011, 800 278 3667, www.artisticdoorsandwindows.com
- Ashland, Inc., 5200 Blazer Parkway, Dublin, Ohio 43017, 614 790 3818, www.ashland.com
- Bedrosians, 4285 North Golden State Boulevard, Fresno, California 93722, 559 275 5000, www.bedrosians.com
- Carriage House Door, 1421 Richards Boulevard, Sacramento, California 95814, 916 375 0575, www.carriagedoor.com
- Copper Craft, 4995 Keller Haslet Road, Keller, Texas 76248, 817 490 9622, www.coppercraft.com
- Dimension One Spas, 2611 Business Park Drive, Vista, California 92081, 800 345 7272, www.d1spas.com
- DrewFoam, Inc., 144 Industrial Drive, Monticello, Arkansas 71655, 870 367 6245, www.drewfoam.com
- EarthSource Forestry Products, 1618 28th Street, Oakland, California 9460, 510 208 7257, www.earthsourcewood.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
- Finnleo Sauna & Steam, 575 East Cokato Street, Cokato, Minnesota 55321, 800 346 6536, www.finnleo.com
- Gutter Helmet/Southeastern Metals (SEMCO), 11801 Industry Drive, Jacksonville, Florida 32218, 904 757 4200, www.gutterhelmet.com
- Holzkraft Industries, LLC, 28206 Commercial Avenue, Barinton, Illinois 60010, 847 381 7670, www.holzkraft.com
- Industrial Acoustics Corporation (IAC), 1160 Commerce Avenue, Bronx, New York 10462, 718 931 8000, www.industrialacoustics.com
- Kahrs, 940 Centre Circle, Suite 1000, Altamonte Springs, Florida 32714, 407 260 9910, www.kahrs.com
- Latitude/Live Edge, LLC @ Joinery Structures, 2500 Kirkman Street, Oakland, California 94607, 510 451 6345, www.latitudeinsulation.com
- Lindal SunRooms/Cedar Homes, P.O. Box 24426, Seattle, Washington 98124, 206 725 0900, www.lindal.com
- MaxiTile, Inc., 849 East Sandhill Avenue, Carson, California 90746, 800 338 8453, www.maxitile.com

- Natural Cork, 150 Connector 3, Dalton, Georgia 30720, 800 250 6690, www.naturalcork.com
- Nature's Acoustics, 80 Old East Road, Chatsworth, Georgia 30705, 706 422 8660, www.naturesacoustics.com
- No-Burn, 1392 High Street, Suite 211, Wadsworth, Ohio 44281, 330 336 1500, www.noburn.com
- Nordic Structures, LLC, 536 Alcoa Circle, Corona, California 92880, 951 493 7770, www.nordicstructures.com
- OSI Sealants, Inc./Henkel Corporation, 32150 Just Imagine Drive, Avon, Ohio 44011-1355, 800 321 3578, www.osisealants.com
- Owens Corning, One Owens Corning Parkway, Toledo, Ohio 43659, 419 248 8000 / 2790 Columbus Road, Route 16, Granville, Ohio 43023-1200, 800 GET PINK (800 438 7465), www.owenscorning.com
- Otis Elevator Company, 10 Farm Springs Road, Farmington, Connecticut 06032, 860 676.6000, www.otiselevator.com
- PacWind, Inc., 23930 Madison Street, Torrance, California 90505, 310 375 9952, www.pacwind.net
- Pella Corporation, 102 Main Street, Pella, Iowa 50219, 641 621 1000, www.pella.com
- PEARL Protected, 730 Peachtree Street, NE, Suite 850, Atlanta, Georgia 30308, 800 374 5737, www.pearlprotected.com
- Quite Solution, 1250 Elko Drive, Sunnyvale, California 94089, 408 541 8000, www.quitesolution.com
- Revere Copper Products, Inc., One Revere Park, Rome, New York 13440-5561, 800 448 1776, www.reverecopper.com
- ThermaSAVE/IHSN, Inc. 2470 County Road, Florence, Alabama 35633, 256 766 3378, www.thermapanel.net
- TrendSetter Industries, Inc., 818 Broadway, Eureka, California 95501, 800 492 9276, www.trendsetterindustries.com
- United States Gypsum Company/USG Products, 125 South Franklin Street, Chicago, Illinois 60606, 800 874 4968, www.usg.com
- Uponor North America, 5925 148th Street West, Apple Valley, Minnesota 55124, 952 997 5329, 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

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# More Than Just A Hurricane Proof House



**ASHEVILLE, NC**—With energy costs rising to astronomical levels, homeowners are looking for any way possible to save money. North Carolina-based Deltec Homes, with their unique home design, has the answer.

Deltec specializes in building round homes, which tests have proven to be about twice as energy efficient as the conventional square or rectangular house. Circular structures require less exterior walls to enclose the living area. This allows for less energy to escape from the house. The aerodynamic nature of the circular design also helps reduce drafts throughout the home, which is one of the biggest reasons for increased energy use. "Some of the same qualities that make our homes so wind resistant also contribute to their high degree of energy efficiency," said Joseph Schlenk, Director of Sales and Marketing for Deltec Homes.

"Our design takes the round, energy-efficient design a step further," Schlenk said. "One example of this is the roof venting system, which is unique to Deltec's design."

The roof design contributes to lower energy use by allowing constant airflow throughout the year. The continuous airflow keeps hot air out of the attic in the

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."



## RESHAPING HOW WE LIVE

**Deltec Homes offer:**

- Breathtaking panoramic views
- Outstanding energy efficiency
- High degree of design flexibility
- Resistance to hurricane-force winds
- Eco-friendly design
- Superior quality and strength

**Delivered Worldwide**

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**800-642-2508**

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