GREEN HAVEN HOMES

Our Goals Are

* A fire resistant home
* A durable home against earthquake and age
* A low maintenance home with little annual cost of ownership
* An energy efficient home with low utility bills
* A healthful home
* A good investment

Our Team

Green Haven Homes
PMB 301, PO Box 1989
Big Bear Lake, CA 92315

Design/Build: Fred & Denise Westcott
General Contractor: Hayes Construction
Mike Hayes lic.# 348263

CAD Draftsman: Craig McAllester, Inc.
Structural Engineering: SIP Engineering Consultants, Inc
Energy Compliance: Berkeley Energy Compliance Associates

Visit our website
www.californiahavenhomes.com
(909) 866-1703

California Haven Homes

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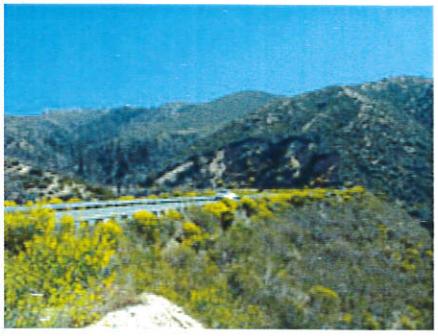
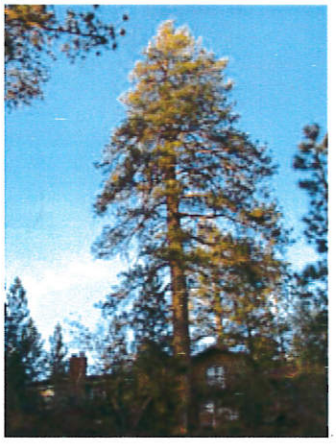
INTERESTED IN FIRE RESISTANT DESIGN? click here!

GREEN HAVEN HOMES

A design/build company

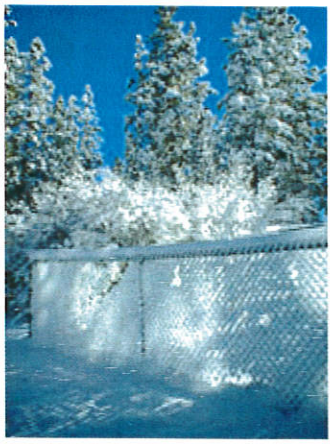
Building "green", fire resistant homes in the San Bernardino Mtns. of Southern California. Can we design your new home?

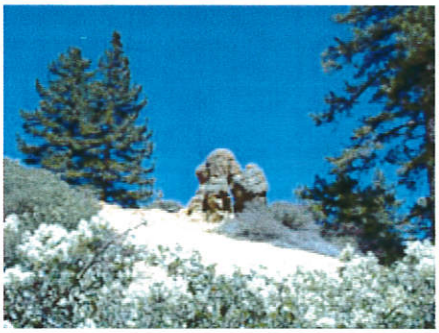


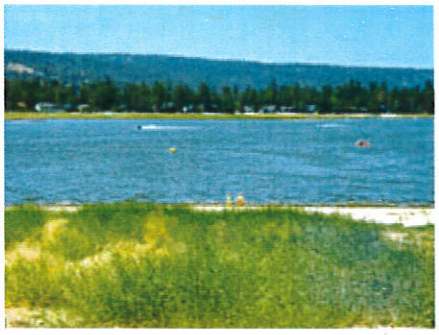


When you are fortunate enough to live so close to nature, surrounded by beautiful lakes and majestic trees and can enjoy air so pure that the sky is an intense blue most of the year

HOW CAN YOU JUSTIFY NOT BUILDING "GREEN"







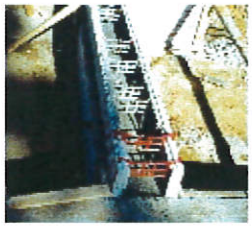
:Green Haven Homes is a design build team of CAD design, structural engineering, energy compliance engineering, and construction managers experienced with "green" building and wildfire resistant design techniques and materials.

WHAT CAN YOU EXPECT WHEN YOU BUILD A "GREEN" HOME?

- An affordable home
- A green-built home that is friendly to the environment
- A durable home against earthquake and age
- A home that will survive wildfires
- A low maintenance home with little annual cost of ownership

WHY BUY A GREEN HAVEN HOME?

Steel Floor Joists and Interior Walls



Insulated Concrete Forms

Far exceeds Federal & State energy codes

SIP Walls and Roof

Four to six times stronger and more durable

Resistant to growth of mold and bacteria

Radiant Heating

Water Conservation

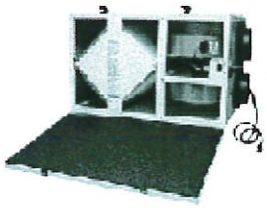
Lower Utility bills

Warm Driveway

Little or no maintenance Fiber Cement and Cultured Stone Exteriors

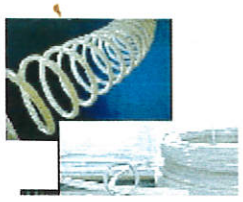
Low exterior maintenance

Solar-assisted warm floor heating and hot water



Energy Recovery Ventilation

Solar Thermal



Manifold Water Distribution

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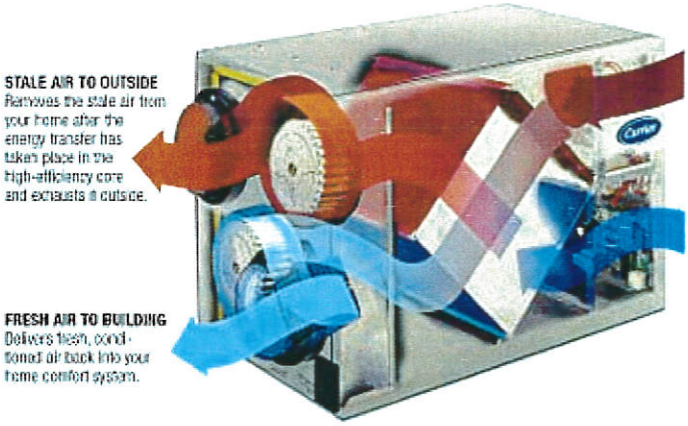
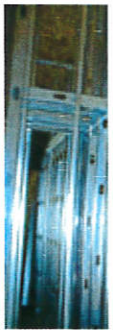
GREEN HAVEN HOMES
BIG BEAR'S GREEN BUILDING TEAM

Green and fire resistant home design is a matter of choices between different building technologies a materials. As you follow the design choices you will see how your home becomes a home that will l through anything nature can throw at our mountains. Your choices allow your home to conserve ene and water as well as reduce exterior maintenance. Your choices can make your house almost fire pr Our goal is to give you the best information about the ever-changing selection of building methods a materials.





OUR Design-Build TEAM

Designers: Denise Westcott and Craig McAllester
CAD drafting: CAD Construction Design
Green and Fire Resistant Design -- Sales and Finance: Fred Westcott
General Contractor: Mike Hayes Lic# 348263
Structural Engineer: SIP Engineering Consultants, LLC
Energy Compliance Engineer: BEC Associates

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Now coated with Contego 1-Hour Firewall!

Select Fire Resistance on the buttons on the left for more information on Contego Intumescent Coating

You can build any custom design with SIPs. Although the panels are pre-cut into the size and shape of the wall segments in your design, there is no limitation in the style and design of your home. SIPs are simply a better wall and roof framing technology than 2x4 or 2x6 wood.

SIPs are the fastest growing of the three major alternatives to lumber framing. A Structural Insulated Panel (SIP) is a sandwich of two sheets of Oriented Strand Board (OSB) containing a solid insulation, usually expanded polystyrene. Panels are made in standard sizes and then cut to order to fit the wall and roof segments of your home design. The panels are both nailed and adhesively bonded to each other and to the beams and posts of the house structure. The resulting walls and roof are several times stronger than a lumber framed wall and roof for two reasons: first, the entire structure is a shear wall, and, second, the entire structure responds to loads as a unit. SIPs are flat and dimensionally stable so they remain strong in the long term while lumber-framed walls lose strength due moisture caused dimensional changes that reduce the strength of the nail connections and change the distribution of loads. Insulation values for a wall consisting of panels with a solid insulation core are two to three times higher than a lumber framed wall with insulation between the lumber. Fire safety is also enhanced with a SIP wall since there is little fuel to burn and the solid core offers no channels for oxygen or a chimney effect. For more details and links to testing and manufacturers, click here.

The other two major alternatives to lumber framing are Concrete using Insulated Concrete Forms (ICFs) and light gauge residential steel (no acronym surprisingly). We use ICFs for forming the foundation and basements or crawl spaces. And we use steel for floor joisting and interior walls. A new framing product has come on the market, composite wood framing, pioneered by TimberStrand. You can learn about these products, what choices you can make

and what our recommendations are by selecting from the buttons on the left or clicking on the highlighted words.

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Steel

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ADVANTAGES OF STEEL FRAMING

- **STRENGTH -- now and forever**
- **FIRE SAFETY -- no fuel to burn**
- **ENVIRONMENT -- 64% recycle**
- **No Mold or Termites**

Steel is inorganic -- it does not warp, split or twist. It does not absorb moisture so it does not swell or shrink.Steel is dimensionally stable and will not settle with time as wood does. Cracks or shifting of walls over time does not exist for steel framed walls and floors. Shifting, warping, swelling and shrinking cause wood framed walls to weaken as nailed joints fail and stresses are shifted to other structural members. A steel framed wall or floor is always as strong as the original construction.

The strength of steel make it a natural choice for earthquake resistance. The manufacturing process creates a consistent strength in steel members that engineers can rely upon -- a strength that remains the same over time as connections within a steel framed structure are less susceptible to pull-out or failure caused by changes in the character of the framing material with age.

Fire safety is a major selling point of steel. A steel framed wall covered with dry wall material is non-combustible. It contains no fuel to feed fire growth. Temperatures that would have consumed a wood-framed wall completely only deform a steel-framed wall. Not only does a steel framed wall contain no fuel for fire growth, it also does not emit smoke or toxic fumes when subjected to elevated temperatures. Intumescent paints can be used to protect steel walls. (see Fire Resistance)

Steel is our most recycled material. Residential steel framing is a true "green building" product even when the production of steel is considered.

Termites and mold are two of the most costly problems associated with construction

materials. Steel, as an inorganic product that does not contain moisture, is impervious to both insect attack and mold growth.

More information about steel

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ICF

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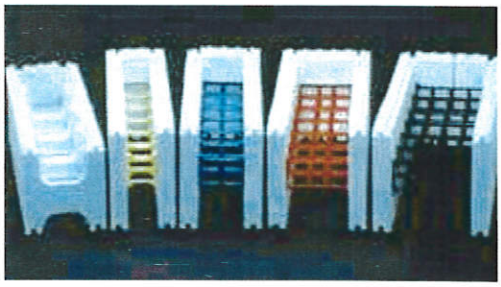
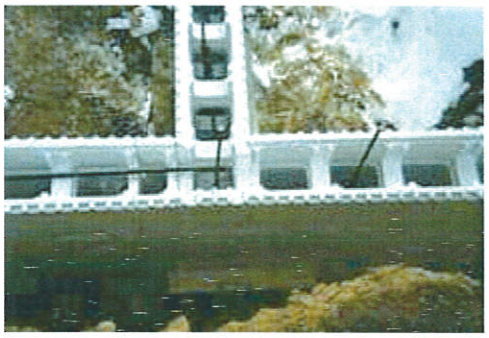
Insulating Concrete Forms

ICFs consist of two sections of 2" thick EPS foam connected by spacers. They replace traditional wood forming material.



Compared to wood forms, ICFs generate less waste and are easier to work into complex shapes. The insulation provides an ideal curing environment for the concrete in any weather.



Energy Efficient

By placing the floor insulation in the perimeter of the crawl space, the homeowner benefits from superior energy efficiency. In addition, a sealed crawl space prevents condensation, mold growth and infestation by vermin and insects. For more information on sealed crawl spaces, click here.

For more information about ICFs, try these links:
www.forms.org
www.ICFweb.com
www.owenscorning.com

Click for Next Page

WHY ERV?

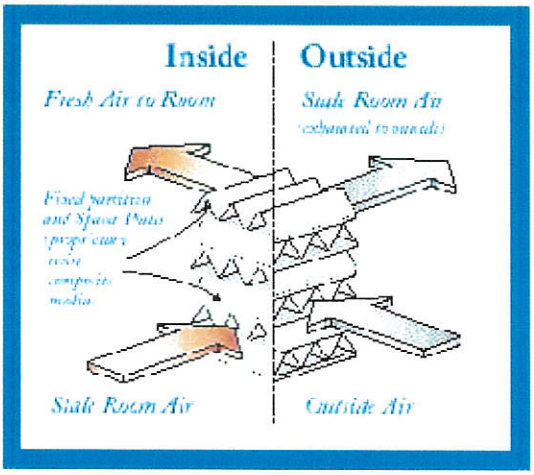
Energy Recovery Ventilation

Healthier Homes: Ventilation

Eliminating wasteful air leaks is very desirable in helping to control energy costs but it doesn't allow a house to "breathe". Indoor air pollutants and moisture trapped in your well insulated home may be harmful to your health. That is why Green Haven Homes uses RenewAire ERV systems in their homes. www.renewaire.com

Exchange of Air

Stale room air loaded with air pollutants is exhausted to the outside and fresh outdoor air is brought in. Heat and moisture are exchanged through the core but do not mix.



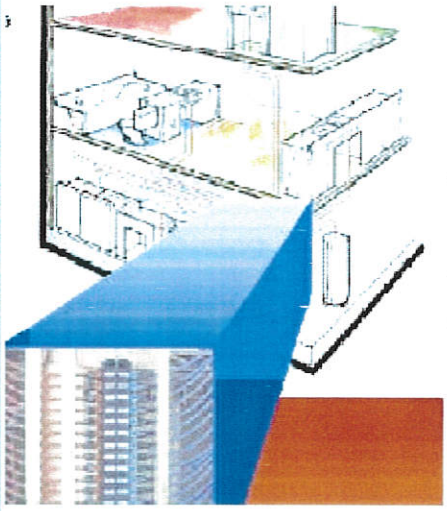
Exchange of Energy

RenewAire efficiently transfers both heat (sensible energy) and water vapor (latent energy), from inside the house to the incoming fresh air. This enthalpic energy transfer preserves about 80% of the heat humidity. The air doesn't mix but the temperatures do.

Quiet

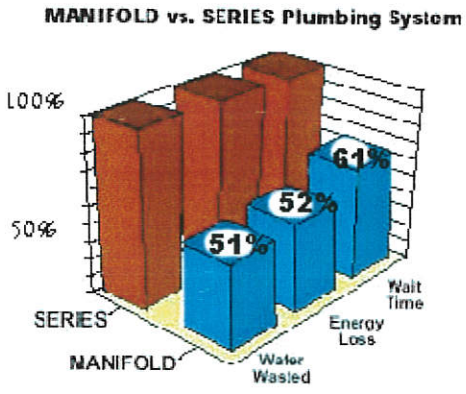
Powerful enough to generate ample airflow,
yet virtually silent when operating

WHY A MANIFOLD Plumbing System ?



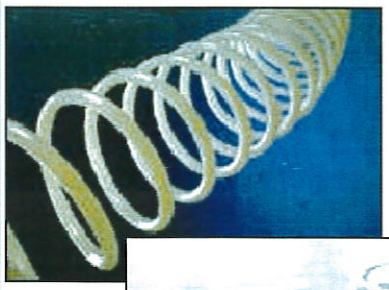
Faster Hot Water Delivery

Because every fixture has it's own distribution line, less water is needed to "flush" the line of cool water before th hot water is delivered. By having direct lines to each fixture you can run multiple fixtures at the same time without experiencing temperature or pressure changes.



Water & Energy Efficient

Less time waiting for hot water means less water and less energy loss. A manifold plumbing system reduces water and energy loss by half .See Davis Energy Group report www.vanguardpipe.com



Freeze & Corrosion Resistan

Unlike copper tubing PEX tubing does not corrode even in areas with aggressive water. The smooth interior eliminates scale build-up. PEX tubing is freeze resistant because it expands to accommodate the expansion of freezing water.

Quiet, Clean & Healthy

No more pinging pipes or water hammer. PEX tubing is quiet. And, PEX tubing is completely non-toxic. Lead (used to solder copper pipe) and other harmful substances do not leach into the drinking water from the plumbing system.

Heating

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Radiant Heating and Hot Water Systems

At least 35% of your energy usage – and your utility bill – is used to heat water and another third is used to heat your house. Space heating and hot water heating account for two-thirds or more of your energy costs. Green Haven Homes are designed first to reduce the amount of energy used to heat your house and second to provide high-efficiency space and hot water heating alternatives.

The insulation provided by the walls of your home is two to three times the whole house insulation provided by traditional stick construction. Tests have shown that this insulation alone will reduce your heating bills by as much as 51%. The Energy Recovery Ventilator in your Green Haven Home adds additional heating efficiency by providing clean, fresh air without loss of heat or humidity. We offer three tested hot water and space heating systems: a high-efficiency (92%) boiler system by Peerless Heating Products that produces both hot water and radiant floor heating, a ductless furnace by Rennai with a choice of hot water systems, and a low temperature radiant floor hot water system that can be solar assisted in areas with high solar exposure.

Radiant Heating With Peerless

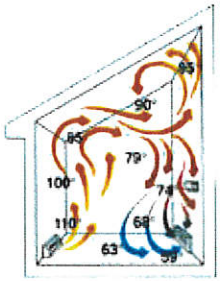
This is our preferred system. It consists of a Peerless gas boiler that delivers both 180 degree radiant heating fluid and a large volume of hot water. As a hot water heater, the Peerless boiler holds 50 gallons on demand and has a recovery rate of over 150 gallons per hour. As a radiant heating boiler, it produces high temperature fluid for radiant efficiency at low cost. Our tests here in Big Bear Valley show that this system can supply the needs of a large house with gas bills of less than $100 in the coldest months.

Radiant fluid is pumped through loops attached under the floor in the living areas. In the bedrooms, the heat radiates from baseboards.

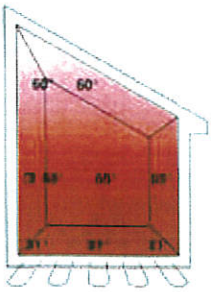
We are often asked, "Why doesn't everyone use radiant floor heating? The advantages are so overwhelming!" The answer is cost! Radiant heating has been known for thousands of years. The Romans used it in their villas as did the Chinese emperors 4000 years ago. But, until about 15 years ago, it was too expensive for all but the most luxurious homes. It is still four times as expensive as a typical quality forced air furnace system. Why do we use an expensive system in an Affordable home? Because, the advantages are so overwhelming!

Would you prefer a heating system that creates a constant blowing noise, creates warm and cold drafts, blows dust and allergens around in the air to dirty your house and your sinuses, and dries the air you breathe to a dangerously unhealthy level? Or, would you prefer a heating system with the comfort of a warm floor, that heats you instead of the air, that does not reduce the humidity of the air in your home, is completely silent, and does not stir up and redeposit dangerous allergens? The answer is obvious and that is why we use radiant heating warm floor and baseboard systems. It costs a little more, but our customers deserve it.

If you or a member of your family has a serious respiratory problem, the combination of radiant heating and the Energy Recovery Ventilator can have a significantly positive impact on their health, especially in a new home that is free of mold or bacteriological contamination and resistant to its growth. Consult your respiratory specialist about the advantages.



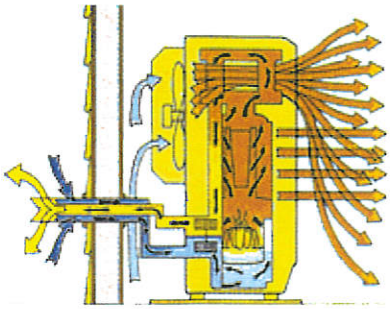
Forced Air



Radiant Floor

Rinnai Ductless Hi-Efficiency Furnace

While radiant heat is superior, it will add about $6,000 to the cost of your home purchase. An innovative ductless heating system by Rinnai will provide whole house heating at a very affordable price and has a built-in humidifier. The Rennai furnace and the fireplace work together as a two-stage heating system. The Rinnai unit provides the heating on all but the coldest days. Its seven stage heating system is state-of-the-art in furnace design. On the coldest days, or when outside activities bring a lot of cold air into the house, the fireplace supplements the furnace.



Solar-Assisted System

Solar thermal panels absorb the sun's heat and transfer it to a fluid similar to the coolant in your car. This fluid is then pumped to wherever you need heat – a hot water tank, a spa heater, a floor radiant heating system or a driveway de-icer, for example. Where potable water is being heated, a double-walled heat exchanger is used to insure that the coolant cannot contaminate the water.

You read a lot about solar electric panels but very little about solar thermal panels. In fact, solar thermal panels benefit from a far higher yield in energy per dollar and from a very simple technology that simply does not fail. The most complicated

piece of machinery in a solar thermal system is a pump!

The hot water system consists of two solar thermal panels mounted on the roof. They look like a luxury skylight but instead they trap the sun's heat in a closed loop much like the coolant system of your car. A solar electric powered pump circulates this 130 degree fluid in heat exchanger coils contained in the hot water tank of a Bradford-White Ultracoil hot water heater and heat exchanger. The heat from the solar panel fluid transfers to the water in the tank. If your hot water use is primarily during the daytime, you may get 100% of your hot water without energy cost. On cloudy days and nights, the electronic ignition in the hot water heater fires up to insure your continuous supply of hot water.

Compared to the efficiency and cost of operation of the Peerless system, solar-assistance does not currently break-even with the extra cost (about $3500) in a reasonable time. But, who knows where energy costs will go in the next decade? There is also the advantage of knowing that your hot water and even house heating can be independent of the local utility. In the event of a winter-time fire or an earthquake when the gas service may be shut down for days or weeks, solar energy can save the day.

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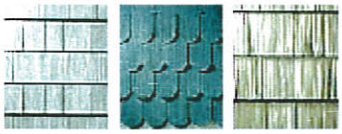
OUR GOAL
A NO MAINTENANCE EXTERIOR

Green Haven Homes are built for your comfort and enjoyment. No one enjoys spending time or money on yearly exterior maintenance, so we select exterior materials to minimize maintenance.

Weatherboard Siding

Fiber cement siding, shingles, rails, trim etc, when stained in a cedar, redwood, maple or mahogany finish looks so real you can't believe it's not wood. The difference? Beauty with no maintenance.
www.certainteed.com



Cultured Stone

The beauty of real stone in a durable lighter weight veneer.

Elk Premium Roof

Fiber laminate roofing with 40 year warranty.
Metal roof optional.

Fire Resistance

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Summary of Design for Wildfire Resistance

Click on More-> for more detail and here for references and links

- Exterior walls and siding should be Noncombustible and One-hour fire-wall assembly. More->
- Roofing should be Class A materials. More->
- Decks should be fire-resistant in design and materials. More->
- Windows should be low-E and protectable by steel shutters. More->
- Doors should be steel or fiberglass with minimum 20 minute rating. More->
- Eddy current areas should be eliminated or protected. More->
- Vents should be eliminated or protected. More->
- Soffits should protect eaves. More->
- Landscaping should be designed to resist fire movement. More->
- Site improvement, walls and fencing should resist and deflect fire movement. More->
- Consider active protective systems. More->

Exterior Wall Design and Materials Selection

Most homes in wildfire areas are built of 2x4 or 2x6 wood walls with fiberglass bat insulation. The inside is covered with 1/2" or 5/8" drywall and the outside is covered with wood siding. This wall assembly will readily ignite from radiated heat from a wildfire, or by embers, and burn through in ten minutes or less. A one-hour rating can be achieved if a 5/8" drywall sheathing is applied under the wood siding but this benefit is defeated by the combustibility of the siding. The burning siding will ignite the eaves and the window frames.

The recommended wall assembly is a solid panel wall of Structural Insulated Panels (SIPs) or concrete (See ICF) sheathed on both sides with 5/8" drywall and sided with fiber cement panels, boards or shingles. This assembly forms a noncombustible, 1 hour rated wall. The materials cost little more than wood products. The siding materials are virtually permanent and come with a fifty-year guarantee. They can be stained so that they are indistinguishable from wood siding at a distance of a few feet.

Other materials with good fire ratings are stucco, synthetic stucco over a drywall and fiber cement underlayment, concrete synthetic stone, concrete and stone or brick veneers.

Roofing Materials

Roofing is a rough surface material that easily holds fire blown embers and firebrands. Houses thousands of feet from a major fire have been observed with burning roofs. The most common roofing materials seen in wildfire areas are wood shake and asphalt shingle. Wood shake and shingle are banned by NFPA codes unless treated. Both chemically-treated wood shake and conventional mineral reinforced asphalt shingle have class C fire ratings.. This is unacceptably low for wildfire areas.

Homes built in wildfire areas should have no less than Class A rated roofing. Roofing in this class includes fiberglass reinforced asphalt shingles (see Elk Premium), metal sheet and shingle with a drywall underlayment, and concrete and tile (these may not be warranteed in mountain weather). It is important to note that a metal roof by itself is NOT a class A rated roof. This is because the metal is an excellent conductor of heat to the wood sheathing of the roof. Concrete tile may spall in winter weather and clay tile may deteriorate in the freeze-thaw cycle of our winters.

Deck Design and Decking Materials

Conventional wood decks have been described as being constructed the way you would stack wood in a campfire. Decks are very popular for their cabiny look, because they elevate you above a sloping terrain and surrounding vegetation and provide a flat area for outside living. The problem is that most deck designs are extremely combustible structures and trap hot gasses from an approaching fire and conduct the fire to your home. Wood decks are so easily ignited that they are often observed on fire well before the fire approached the home.

There are too many possibilities for fire-resistant deck construction and too many site and home design variables to recommend a single deck design. A fully enclosed deck of fire-resistant decking materials and railing materials with a concrete patio and barrier wall below is the fire code recommendation but there are many designs that retain the attractiveness of a deck. The ideal deck for fire-resistance would be a metal or concrete decking over a sheet EPDM (rubber) membrane supported by a soffited joist box covered in a 1-hr rated drywall and fiber cement siding assembly with a steel post and railing or tempered glass and wire rope railing system. Composite wood with a good flammability rating can be used instead of concrete or metal decking and railing. A solid wall rather than an open railing is additionally beneficial since it serves as a deflector of upslope radiant heat and convective air currents to protect the house.

Windows

Windows are one of the weakest building components. Radiant heat from high fuel fires (big trees) will crack a single pane window in less than 5 minutes with full window failure in less than 10 minutes. Unprotected, single pane windows will usually be wide open to the fire well before it could reach the structure. This open area in the wall allows flammable interior materials to be ignited by radiant heat from the fire even when the fire does not otherwise touch the house. Standard double pane windows last only slightly longer since they first become single pane windows when the first pane falls out.

Radiant energy from a fire is similar to the radiant energy from the sun. A standard window transmits about 70% of this energy to the interior of the building, reflects about 10% and absorbs about 20%. Since the glass is held by the window sash and the sash covers the perimeter of the pane, the differential heating causes the glass to crack and fall out. Small windows may retain their glass but large windows (more than 2020) will not.

Low-E glass is recommended for both energy savings and fire resistance. Low E glass has an ultra thin coating that reflects 70% of radiant energy and deflects 70% of convective energy while a standard glass allows 70% of this energy into the building. Tempered glass is both an impact and heat resistant treatment to glass that is required in patio doors and other areas subject to possible human

impact. The combination may be 25% higher in cost at installation but there is an energy saving pay back and well as the fire resistance.

Only an additional 10 or 20 minutes of protection is usually needed for a window to survive a fire. Steel shutters can be stored at the house and put in place prior to an evacuation. Wood shutter should not be used as their combustibility will reduce the window's chance of survival. The protective foam used by some fire departments to protect structures does not stick to glass so a shutter is useful as a structure to hold foam. Exterior metal screening that covers the entire window also serves to protect a window for that vital few minutes and will hold protective foam.

The window frame material is critical. Wood frames readily ignite and vinyl frames made from sheets of vinyl melt away from radiant and convective heat. The best choices are metal (not good for energy conservation), composite systems of wood, metal and fiberglass, fiberglass, and solid vinyl.

Doors

A solid wood door has a 10 minute rating. Glass in the door and windows along side the door can cut this burn through time in half. Decorative glass with etchings or cut designs is not low-E or tempered. Higher quality doors can be purchased with a 20 minute rating but the same caution applies to glass.

The recommendation is to use a steel or fiberglass door with at least a 45 minute rating. Decorative glass should be protected with a shutter.

Eddy Current Design Issues

Embers and firebrands are carried by hot winds well before the fire. As an ember-bearing convective current passes over your house, some shapes of roof and walls will cause the current to develop swirls or eddies just like water in a river. Whenever a current changes direction, and especially when it spirals around, it loses the ability to carry particles. When a river goes around a bend, it always drops the sand of mud it is carrying and whenever your house shape makes the hot winds change direction, it drops embers and firebrands at that spot. It is important in the design of roofs, walls and even landscape, to know where an upslope fire wind might drop its load. The solutions are to either streamline the area or protect it by reducing its combustibility.

Vents and Mountain Climates

Vents are often a forgotten weak spot in an otherwise well defended house. Crawl space venting is one of those items of building code history that we can't seem to get rid of even after decades of proof that they are of little use even in very humid climates. They are very useful to fires, however.

If you have crawl space vents in our high desert climate of low humidity, you probably also have a blocking panel that should be closed in the winter. These should be closed for fire resistance. It is permissible to close these vents when air humidity levels are moderate (ours are always low). Since our humidity level always allows these vents to be closed, there is no reason for them other than building codes designed for other conditions. The California codes allow a controlled ventilation method for crawl space ventilation that replaces crawl space venting with mechanical ventilation .

Venting is also required for attic spaces and roof cavities. The form of ventilation for these areas is critical to avoid creating a path for fire to enter the roof. Vents should not be placed in Soffits. The preferred location is in the fascia or on the lower edge of the roof combined with a ridge vent. A number of small vents is preferable to fewer large vents.

Soffits and Eaves

The extension of the roof beyond the exterior wall is call the eave. An open eave showing the roof rafter ends and the roof sheathing is a very common construction form that is seemingly design to ignite the house and defeat the best selection of fire-resistant roofing. Hot air will pass up the wall where it will be trapped by the open eave angle and rafter ends resulting in the exposed roof sheathing plywood igniting underneath the protective roofing. If you have this structure, or see it in a proposed design for any wildfire area, you need a soffit.

A soffit is sheet material, preferably fire resistant, applied to the underside of the eave. It can be applied directly to the rafter or to a structure attached to the end of the rafter and extending in a flat plane to the wall. The recommend method for wildfire areas is to form a flat soffit so that the fire is more readily directed away from the roof and the wall and to build it as a 1 hour fire wall assembly of 5/8" drywall covered by fiber cement sheet.

Landscape and Site Issues

Fire moves in predictable, although perhaps not consistent, ways relative to the contour of the land and the fuel upon it. Landscape and site issues involve making what changes one can to deflect the flow of a fire away from structures and to reduce the quality and quantity of fuel available to the fire on your property. Like our discussion of deck issues, we can cover some preferred principals but each design must relate to the site and structure.

The first principal is that we want to create a defensible space around the structures. Defensible space is in zones around your structures and attached decks. In many cases with the size and dimensions of the building lots in our area, we cannot control as much of the defensible space zones as is the ideal. Zone 1 is the critical area. It extends 15 feet around your structures measured from the outside edge of the eaves and decking. Ideally there should be no trees within this area. If you do keep a tree, consider it as part of the house when measuring the 15 perimeter. Within that area there should be a minimum of flammable vegetation and clear passage for fire fighters. Grow only fire-wise plants in this area, keep all plants well groomed, and store no flammable materials in this zone.

The second principal is to create a barrier of fire-resistant plants at your property line, especially along probably fire paths. Slope is the primary way of guessing where a fire might travel to your home. Plant as deep a barrier of xeriscapic and fire resistant plants where you see a likely fire path. Consider reducing fuel from trees and resinous bushes along those paths by removing them or keeping them heavily pruned. Trees should have no side branches in the first 10 or 15 feet from the ground. Be aware of the laddering effect of brush and smaller trees under the canopy of larger trees.

Active Fire Protection

There are a number of spray-on products for structure protection and tree protection. Some of them were used effectively in the fight to hold Hwy. 18.

They are combinations of gelling agents combined with flocculants, water holding agents similar to personal hygiene products for incontinentancy. While they can be applied with a garden hose in the same manner as spray fertilizers, piping systems and sensors can be created to spray walls and roofs when sensor systems detect radiant heat at preset levels.

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