SERAL Project scoping document

Comments of Bud Hoekstra

To be honest, this is one of the best documents that I have read, a truly outstanding scoping, and I have read literally 100's of such documents, many requiring 100-page responses, over my nearly 80-year lifetime. Yet, despite its genuine perfection, parts of it I could not brook; parts of it even made me laugh with snide disaffection.

For example, on page 14, the scoping document rambles, "Only herbicides that have been approved for use in the state of California ... EPA ... would be used." In other words, you weren't contemplating breaking the law, or you do break the law, and you were reminding us that you were promising not to break the pesticide law this time..

I thought, "Okay, where is your concomitant statement for roads: "We will drive only vehicles registered for the road with drivers who fully licensed to drive them, and we will drive them on the right side of the road and stop for all stop signs as we encounter them." Obviously, the aforementioned statement about herbicides is whitewash in the true meaning of the word.

Why were you motivated to say it, that you are going to obey herbicide law and not violate the law? Why was that even necessary to say?

Law books in CA used to refer to herbicides as "economic poisons" before the advertising term "herbicide" was adopted. Poisons are inherently unsafe and are used for economic prosperity; their history of government approval has been a history of assurances falsified by time. Your lack of honesty here is outrageous. You could have said, "Oh, we're going to use agrichemicals, but we won't use Diquat that the illegal cannabis growers use on public lands." That is the inference.

Maybe you should say, "We will use pest plant poisons, but we will follow the label as the law requires us to do."

I think the point to be observed is that you will use herbicides that can result in untoward impacts on the forest environment. I feel that I must elaborate here to be clear, crisp and concise.

The science of toxicology made the era of agrichemicals possible, and you are using agrichemicals as a forestry practice. The US Forest Service lacks a single toxicologist on its nationwide staff, but you can, if you want, dabble in the science on line by taking the free on-line course TOXTUTOR offered by the National Library of Medicine – or, for a penetrating look at the politics behind agrichemicals, watch the 20-minute Youtube video "The full story: Pesticide Peril" to glean insights. I recommend both.

Okay, you are using agrichemicals but you are using them within the realm of the law. Does that have fallout for forest health? This should be your concern, and the answer is "Yes, it does."

Because you made me laugh, having to state that you will use registered agrichemicals and obey the law with them, as opposed, I suppose, to unregistered chemicals, like Diquat, obtained from the Mexican black market, I am reminded that Washington's Army in 1776 used

muskets, not machine guns, against British forces from the fatherland to gain freedom by British tyranny. The infamous DDT was a musket – whose manufacture was banned in the U.S. in 1972. It was great stuff, it got rid of head lice in soldiers during WWII, and as an agrichemical, it wiped the largest heron rookeries East of the Rockies because its breakdown product DDE softened the shells of Black-crowned Night Herons and made them too fragile for the birds to incubate. One such rookery in Winton Woods, near Cincinnati, reported a decline in the population of more than 1000 nesting pairs to fewer than 10 nesting pairs in ten years. But the U.S. continued to manufacture DDT after 1972 which was sold in markets around the world, including Mexico, where the stuff got into the food chain and threatened peregrine falcons in the tier of southern states from California to Texas – elsewhere it moved in silent waves through the food chain, making peregrins endangered. A decade ago, during the Obama administration, the world entered a treaty to ban organochlorine pesticides like DDT; Article VI of our Constitution makes this treaty U.S. law: "This Constitution, and the Laws of the United States which shall be made in Pursuance thereof; and all the ***Treaties*** made… shall be the supreme Law of the Land, and the Judges in every State shall be bound thereby…" So you felt the impulse to state that you won't be using organochlorine pesticides banned by treaty by stating "registered" herbicides only, omitting that many of the agrichemicals that you have used, now deemed unsafe, have lost their registration.

The problem with economic poisons is that they are all broader than the target species, and you don't state this. Chlorpyralid is used on yellowstar thistle (Centauria) but it kills native Centauria too. You don't refine your target by stating, "We will spot-pray only." SCIENCE in 1995 reported the research in Michigan's Lake Siskiwit, on Isle Royal National Park, an island isolated in Lake Superior, the cleanest of the great lakes. Here researchers cored an isolated, landlocked lake on an island that never saw industry or agriculture, and yet the sediments they cored, laid down after 1940, had trace PCBs and toxaphene – the pesticide used on cotton. When scientists cored the Arctic ice, they found trace toxaphene in the layers put down after 1940. To my knowledge not a single boll of cotton was ever grown in the Arctic, yet toxaphene is there. Several studies found endosulfan, once used on valley nut crops, in high-Sierra streams, affecting frogs with birth defects. The National Park Service released its WACAP report that sampled brook trout in high-elevation streams in western national parks (the cleanest of clean water) and found mercury, dieldrin and DDT in all of the trout, sometimes above the EPA's safe-consumption threshold. El Cabo sued Western Agriculture for contamination of its organic flowers from pesticide drift and was awarded a million dollars. Where is your statement "zero drift." You don't state it, because you expect drift with DPR-registered herbicides. You can't contain what you use to a target species, and you don't circumscribe the impacts beyond the target species.

The scoping document has these risible lapses – you state that you will use allowable herbicides according to law but you fail to list the impacts that may, and will, result from judicious use. To be honest and balanced, you should at least specify that USFS vehicles will stop for stop signs; because it's not controversial.

Despite my sharp criticism, the SERAL scoping document achieves excellence and is topnotch, but I write to find fault with it, not to praise SERAL.

I was bothered by the undefined verbiage "sustainable safe recreation" that appeared early on in the document. Was does it mean? Did you mean "sustainable and safe recreation"

or did you mean "sustainably safe recreation" whatever that may be. Rock-climbing has inherent risks, and the recreation, especially free-climbing, is unsafe. The use of pitons, back when I did mountain rescue, marred the rock walls – relic pitons still exist in Yosemite, momentoes of the 1940's climbing expeditions that left them behind. Did you mean "sustainable, safe recreation" or "sustainably safe recreation" or "sustainable and safe recreation?" I gather you understand the meaning of sustainable, defined by many authorities as "environment, economy and community" and paraphrased as people, profits, planet in some circles. You outline that, and I give you high marks for knowing it. But "sustainable safe recreation" is confusing, what does it mean?

I also dislike the way wildfires were graded in the document. You mention by name Rim, Thomas, Camp, Donnell, Ferguson to make a point that the scales of vulnerability are tipping. Wildfires trend toward greater damages, and the damages posed by these threats can be lessened by forest management. But that is an economic focus, perhaps a community focus, but it's not an environment focus. If you showed environmental damage caused by megafires, you'd show a photo of "fire freeze" where super-heated winds (fire storms make their own weather) freeze-dry leaves or needles and blow them all in one direction. You see trees that escape the wildfire, their leaves all pointing (for example) due South, the direction of the wind, in an eerily ominous manner – but dried, the phenomenon is fragile and lasts only till the next gust, then the tree is bare. Or what about soil (the forest in entropy!). USFS author Chris Maser writes about sterilization, recalling an African post-harvest burn where all replants died – the soil must team with mycorrhizal spores after a fire, and super-heated fires from overdosed fuel burns the spores. In a normal fire setting, mice burrow into the ground and the fire passes over them, leaving them untouched. After the flames pass, the mice return, pooping – and their scat re-inoculates the soil with needed spores. The hotter the fire, the fewer of these interlopers survive. Soil can be burnt – robbed of its nutrients by superheat. Or sealed shut so that infiltration ceases, and the soil unnaturally repels water. The size of the fire, the cost of the fire, isn't a good reckoning. What counts is a measure of resilience – the USDA once defined the health of the soil as the capacity to self-renew without intervention. If we grade fires, we should grade them on their injury to soil and water, on their resilience to disturbance, not to their acres in size and economic losses.

I was disturbed by the approach "reducing fire threat to … critical infrastructure." 100 years ago the USFS was going to stop fires from burning and stop the waste of sawtimber resources. When trees were harvested, contractors burnt the remains of the clearcut. Red spruce were harvested or burnt, commercially more valuable species like Ponderosa Pine were replanted. (I am reminded of Chris Maser's words, "Nobody reforests, all we do is re-tree.") I think the document needs to amplify on reducing fire threat – what does that mean? There are two components to reducing fire threat. One, of course, is ably depicted in the short YouTube video by Paul Hessberg; the other side is reviewed by USFS fire engineer in Missoula, MT, Jack Cohen, and his partner the NFPA (the National Fire Protection Association in Quincy, MA, that gives us the National Electric Code). The pair have three videos on Youtube which are worth seeing. He echoes what so many have said in the past. The CDF's textbook THE CALIFORNIA i-ZONE has a chapter on code reform – we have hurricane codes, we have flood codes, we have no – WUI codes. CalFire ridiculously spouts and blathers about fire-safe vegetation. In fact, in its community fire safe kit of the 1980 it listed safe plants ("toyon Christmasberry" was named) and flammable plants that every California homeowner should

extirpate ("toyon Christmasberry" was named!) The truth is that trees burn, standing and green or flat, milled and nailed. Defensible space has to do with selling "more fire-fighters and more fire stations" to the public. CalFire's policy is designed to put "an engine in every yard" to reduce infrastructure losses. It didn't work in the CAMP fire the other year; it didn't work in the Stumpfield Fire 40 years ago. It's not going to work tomorrow.

The SERAL Project alone won't spare the fate of matchbox houses. In fact, Jack Cohen has pointed to the ignitability of homes is the main problem, and in the state of Washington homes ignited wildfires. Trees burn, standing and green, or flat, milled and nailed. Defensible space stops flame contact; USFS Jack Cohen and the NFPA have build mock homes and simulation wildfires to see how infrastructure ignites. Ember showers are the number one cause – yet CalFire says nothing about ember entry points – CalFire spins a yarn about fire-resistive landscaping instead.

The SERAL scoping document is no better, because reducing the threat to infrastructure is two-fold. We must build ignition-resistance to be resilient. Leo DuLac, a prolific California author, wrote FIREPROOF HOMEBUILDING and the message never got across to CalFire, or to the Forest Service for that matter. 4/15/2019 the SACRAMENTO BEE published its ground-breaker, "The weakest link': Why your house may burn while your neighbor's survives the next wildfire." March 29, 2019, The WALL STREET JOURNAL wrote about California's fire season, "(page M1) Prepared for the Worst" about a home designed to survive. In May 2004, page 78, FINE HOMEBUILDING magazine, page 78, sent the same message "Fire-Wise Construction." Indeed, California architect Frank Lloyd Wright wrote free plans for 1500-sq-ft home in the WUI which he published in the LADIES HOME JOURNAL. When will we ever learn, when will we ever learn.

Get real – "reducing fire threat to … critical infrastructure [SERAL scoping]" is a two-pronged project. Thinning fuel can help, reducing ignitability of forests, but reducing the ignitability of homes and power lines with code changes is half the battle. California (and CalFire!) is not serious about wildfires. We need code changes. The Calaveras County Fuel Reduction Plan preplanned a 30,000 gal fire-fighting cistern for the middle of Deardorff Road, a one-lane county road, when CPUD says it has a water line on Deardorff Road that needs a hydrant. To upgrade its fire code, Calaveras County did one thing in twenty years – it required shared driveways to be two lanes of travel – no secondary escape route, but two lanes of traffic. Developers can still build subdivisions in box canyons, but to reconcile with the woefully outdated Public Resources Code, a shared driveway should be two lanes! Lawyer Philip K Howard in his book THE DEATH OF COMMON SENSE, page 5, writes, "Even serene suburban landscapes are stamped out of the law's mold. Have you ever noticed how new housing subdivisions have an open, almost empty look? It isn't just the absence of trees. The streets are fifty feet wide, about 50 percent wider than streets were than a few decades ago. Why? Because traffic engineers who wrote the standard code after World War II believed that streets should be wide enough to allow two fire engines going in opposite directions to pass each other at 50 miles per hour." Therein is the gist of fire prevention in California's PUBLIC RESOURCES CODE. Want me to tell you a fire prevention joke? "CalFire" and that's the hilarious punch line!

The SERAL scoping document comes across as a joke too. Pages 7, 8 and even 14 talk about "strategic fire management features' which it demarcates as "fuel breaks, prepared

roadsides and defensible space" to "reduce the fire risk to communities and infrastructure." If ember showers ignite homes, and as Jack Cohen has shown scientifically, gutters catch leaf litter and ignite from embers – we should be talking about gutterless homes – outlawing gutters in a WUI code, or encouraging overhang edges with rocked drip zones below them for infiltration. California has a problem with infiltration: we design everything to channelize flows ocean-ward. Roads are artificial watercourses according to UCCE, huge, magnified gutters with inboard designs, ditches and culverts in forestland, made for drainage, not recharge

Why is it that a timber state like Wyoming recommends building patios instead of decks, inasmuch as CalFire is mum – is it because CDF's mission is marketing timber and California is a leading producer of decking materials? The bulk of literature on fire prevention focuses on the myth of fire-resistive landscaping. Nobody talks of banning gutters or decks. Nobody talks of the benefits of double-panes – instead we have a law that fixes the size of defensible space. Now SERAL talks about the fire-prevention BMPs called "fuelbreaks, prepared roadsides and defensible space." Defensible space is a euphemism for "an engine in every yard" and "prepared roadside" is a buzzword for fire-resistive landscaping applied to roadways. What happened to Jack Cohen and the NFPA when this SERAL document was written?

Clean water is our most important forest product, and a prepared roadside is one that applies the principle of surface-spreading rather than channelization (which the forest service used to allow allotment owners to do to snaky meadow streams). We want recharge, not runoff! Roads need not be artificial streams. Yet, there's not a word about road ecology, the ecology of totem road, in the SERAL document. All that's mentioned, iterated and reiterated, is roads as fire-fighting BMPs. Not a word is said about code reform, about removing ignitability from infrastructure design, about water infiltration and soil holding capacities – water is a noneconomic good, sawtimber and its nemesis wildfire are economically important – a wildfire being negative board feet. And a boost to the lumber market

I thought the SERAL document was skewed economically and very omitting of a focus on the forest environment. For example, UC-Riverside just released a report on native bees and wildfire, concluding or suggesting that wildfires stimulate native bee populations which forage better during droughts than European honey bees which often decline in numbers during droughts. Given that two of every three bites of food rely on bees, native or European, wildfire is a big investment in California's agriculture. The economics of water, the economics of bees, play second fiddle to prepared roadsides and fuelbreaks in the SERAL document.

I should mention that there are other BMPs to consider, not just the GREEN BOOK – there's the BAERcat (catalog of post-fire BMPs that neither USFS or CalFire seems to know of). The USDA-NRCS admits that it access to its conservation practice standards (BMPs also) is unwieldy, but in 20 years, it has yet to correct the deficiency. You can't even run off an entire code book of their practice standards, but the Calaveras County Grading ordinance incorporates these BMPs.

Economic goods like sawtimber and biomass are repeated and repeated, but the SERAL scoping document lacks a discussion of elderberries. For years the Vliet family of Glencoe made an annual family outing to collect elderberries for consumption, and have seen that USFS policies forced an elderberry decline over the years. Elderberries like water or like bees is not

an economic good, and wildfire reduction has to do with protecting wealth – protecting economic goods. Ecology is a second thought, though considered in the document.

I discovered in reading the document that SERAL defines surfactants: "Surfactants are materials that facilitate the activity of herbicides through emulsifying, wetting, spreading or otherwise modifying the properties of liquid chemicals." Surfactants are also called adjuvants and sometimes vehicles, and what should have been said was that FIFRA (our nation's pesticide law) requires companies to safety-test active ingredients, but surfactants (even though they are toxic) are not tested. Before 1985, the USDA randomly tested foodstuffs for residual surfactants – for example, high phthalates in avacados – but we stopped testing when the residues became too high. Why talk about surfactants, why define them? Actually, surfactants change the physical properties of the herbicide, like a spray nozzle that curbs drift – and most surfactants are known to enhance the toxic effects through addition or synergistically. Piperonyl butoxide is a pyrethroid synergist, making pyrethroid 20 times more potent; yet, some labels do not list it as an active ingredient of dog shampoos, because the company deems it inert under FIFRA. The company that manufactures a formulation decides what the active ingredients are and what the surfactants and vehicles are. The applicator decides the nozzle that determines and sets the drift pattern. SERAL doesn't talk of nozzles and drift patterns, it whitewashes surfactants by omission of their multiple effects.

The SERAL document comes across almost as bogus whitewash – a clearcut con job – in its treatment of agrichemicals. I believe there's an overemphasis on the economics in the document too.

I was dismayed to see another form of doubletalk. The SERAL stated goal is to reduce fuel loads – objectively by thinning, masticating and prescribed fires. Mastication alone does not reduce fuel loads – it merely converts understory fuels to ground fuel. The biomass hasn't changed at all.

Meadows were poorly discussed because we have four distinct types of meadows – those perpetuated by fire, those perpetuated by grazing, those perpetuated by periodic flooding that includes wet meadows. Wet meadows have a geology unlike vernal pools which are rock bowls that collect water like Cranberry Glades in West Virginia. Wet meadows have underlying rock that forces subsurface flows to the surface, and when the hydrologic pressure is great, the water table reaches ground level, killing off trees. In prairies, frequent fires kill the invading trees and perpetuate the prairie meadows. Grazing perpetuates meadows too, but cows alter the species composition – preferring the ice cream plants and avoiding the cod-liver-oil plants that they find distasteful. A famous Australian range scientist suggests that once grazed, a meadow can never be restored to its original climax. The advent of cheatgrass into the forests and meadows probably means fire in meadows where fire normally wasn't. Cheatgrass, a fire-climax invasive species, may change the fire regime of the forest or meadow.

Page 13 examines invasive species – curation rather than prevention. Invasive species are generally ranked by economics, not by their ecology, mostly. Klamathweed is one story that I choose to remember. John M Kingsbury, in his veterinary reference POINSOUS PLANTS OF THE UNITED STATES AND CANADA quotes an extension report that dubs klamathweed, a hypericum, "the greatest cause of financial loss to livestock owners of California." The invasive weed was driven back to less than 1% of its original range by the bug Chrysolina quadrigemina –

I hope I spelled it correctly. Biocontrols work but the nation switched its direction to chemicals, and I detect that favoritism in the Forest Service.

Halogeton tells yet another story. Apparently this fire-climax species invaded with kurakuli sheep in the 1890's but it wasn't noticed or collected for an herbarium till 1936. During the war, soldiers needed wool, and wool-growers were asked to bump up production which they did by overgrazing. Overgrazing allowed the noncompetitor Halogeton (which is poisonous to sheep) to edge out other species and gain a greater hold on the range. After the war, Cooperative Extension told ranchers who lost sheep to the toxic weed to burn the fire-climax adventive from the Steppes of Russia, burn it off the range. Spraying diesel from planes, they lit the infested rangeland, acres with less than 10% halogeton came back 90% halogeton. Halogeton came back ten-fold because it is a terrific seeder. As more and more sheep died, LIFE photographers who photographed dead bodies on the fields of France put dead sheep on the front cover of LIFE. Reader's Digest published "Poison Rides the Range," the story that resulted in the Halogeton Act of 1954 allocating more money to exterminate this plant than what BLM had to manage all its millions of acres. Perhaps the key turning point in the passage of the Act was a story in Idaho's magazine THE WOOL GROWER (Idaho is the McCarthy state, in reference to the the Senator who investigated the Red Scare). The article in THE WOOL GROWER was titled, 'Another Russian Invades the U.S." The USFS is still home to a lot of these Russian invaders, but the odor of greenbacks caught the attention of chemicals companies that had toxic wastes to bury – and these companies reformulated their toxic wastes into pesticides which the USFS buries on its forestland.

CalIPC's biggest donors are makers of these chemicals, and like the U.S. Forest Service, CalIPC tends to think in terms of chemicals – if you know only hammers, the solution to every problem is a nail.

Sadly, I find yet another fault with SERAL, an exceptional document. The SERAL scoping talks about decommissioning roads – the roadbase is compaction, and how does one decommission compaction? Trees do it over time, and in the 1920's, the Forest Service banned the use of forest roads seasonally – during wet seasons to guard against compaction and rutting – ruts channelize flows into runoff and erode soils. Farmers can now buy "floatation" tires to prevent the mischief of compaction, and horse-logging is often touted for its reduction in compaction. The USFS has yet to determine the decline in infiltration of rain water due to compaction over the decades. It is often cited that pavements in the U.S. if they were consolidated into one location would cover the square miles of the state of Mississippi – representing a sizable drop in continental infiltration and recharge. California's Water Resources Control Board refused to address the issue in the latest version of the Water Plan update. Compaction has economic implications, but so far the Forest Service has successfully ignored it.

Despite my incisive, even searing, comments on the SERAL scoping document, it is well-founded and on good ground – we need prescribed fire to substitute for high-intensity mega-fires, and the Forest Service is headed in the right direction with it. The SERAL scoping document wins kudos for foundational excellence and science.

I am reminded that Indiana is the state with the most orchid species, but many orchids grow after fires, Indiana's yellowwood state forest no longer has a living yellowwood tree in it.

And a great many orchids are missing. Biodiversity cannot come with mastication or thinning alone, fire is a primary necessity for a healthy forest ecosystem. The Forest Service has a number of reorts that underscore this, including GTR 220. The SERAL scoping document seems to put thinning and mastication on the same plane as prescribed fire, and they are not. Dr York, a prescribed fire specialist, repeatedly quotes the importance of fire "Fire in the Sierra-Nevadas is essential as rain." The USFS can manage fire with prescribed burns and can manage rain with better infiltration and thinning. The SERAL document, I agree, is on the right track, and I hope that the EIS is perfected so that I need not comment on the EIS's final draft.

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Citations

YouTube's video titled "The full story: pesticide peril" The representative story repeats itself with other pesticides. Humans are thought to be among the non-target species affected. For example, OPs (diazinon, chlorpyrifos,malathion) lie behind what the journal NATURE calls "the silent epidemic of neurodevelopmental disorders." Maneb, diquat, paraquat, cyperquat, rotenone bring about Parkinson's Disease 40-50 years after exposure.

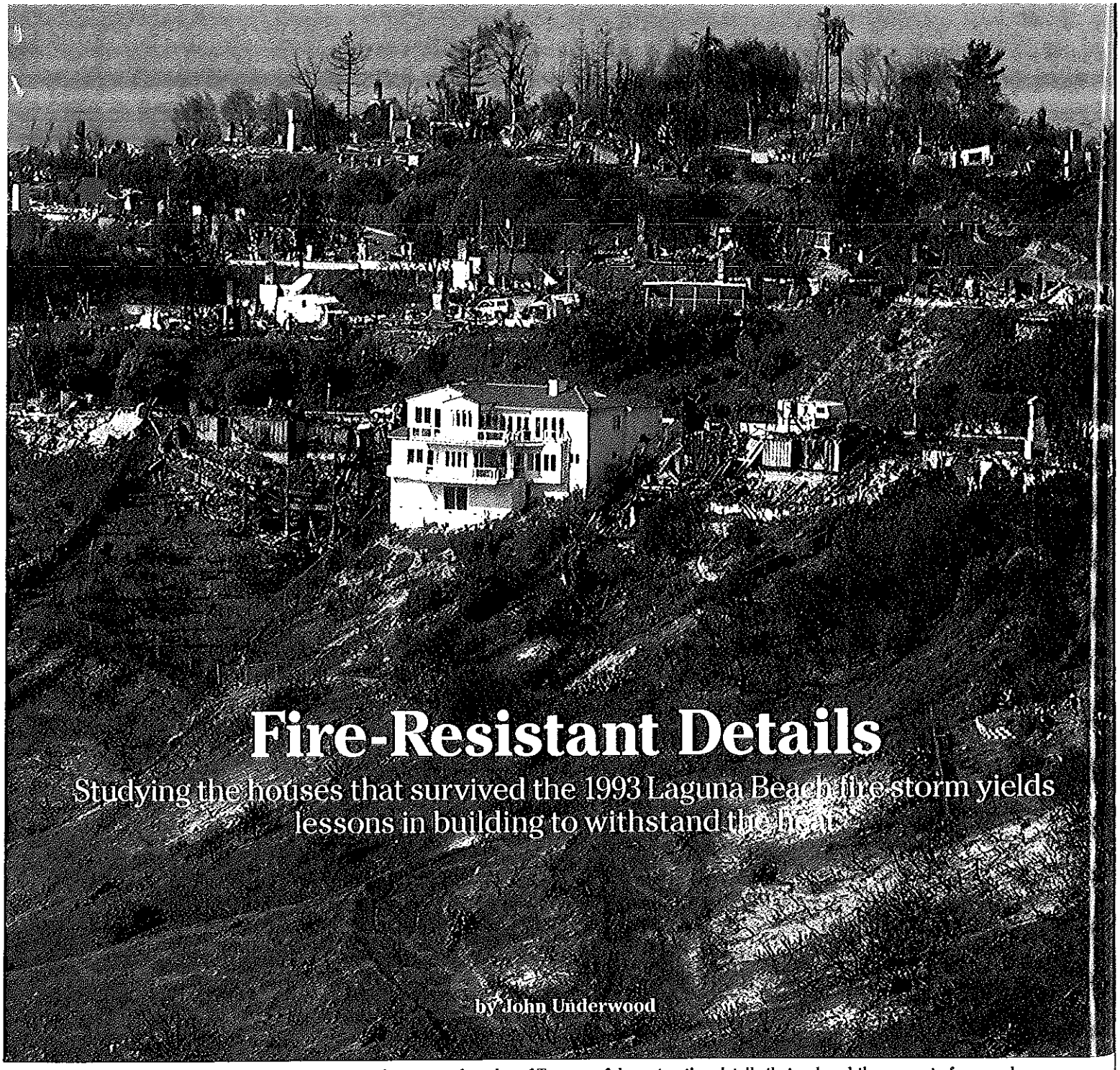
EPA brochure "Reduce health risks in areas with wildfire smoke:" Smoke is unhealthy. Burning CCA-treated wood, for example, spews arsene gas, a chemical weapon. Fire is best for the forest, thinning and mastication are best for logging companies and machinery dealers. Smoke is headed to become a controversy in forest management.

CA-state Fire Safe Council brochure "Is your Home Hardened to Survive a Wildfire Ember Storm?" Embers, not flames, ignite homes. The brochure is outstanding, except for gutter advice – wildfires blow leaves into gutters which ignite. Wildfire policy in California has to be two-pronged: one, reduce the fuel overload of the forest; two, reduce the ignitability of structures. Harden the home and harden the forest!

FINE HOMEBUILDING's 1995 article on the Laguna Beach fire and its one surviver built to withstand a wildfire. There are no insurance incentives to build a fire-fit home; no code to make it happen, But a firesafe home can be cheaper to build than a traditional home. Insurance payouts after the Butte Fire required homeowners to rebuild with the same inherent construction flaws that promote ignitability.

Reference book THE CALIFORNIA I-ZONE. In 1989 the timber lobby demanded that CalFire rate wood shakes, treated with retardant, the same as metal panel roofs, because both passed and failed the same outdated engineering tests.

Jack Cohen and NFPA have a series of videos on YouTube, ill-directed but potent with information on ignitability. The fable of the three little pigs is apropos: one builds a house of straw, one builds a house of sticks, one builds a house of bricks. The big bad wolf blows the houses down – except for the brick home. It's a message that no one in California gets. Reducing the fire risk in CA by forest treatments alone is like playing the Star-Spangled Banner on the piano with black keys only; it can't be done.



Fire-Resistant Details

Studying the houses that survived the 1993 Laguna Beach fire storm yields lessons in building to withstand the heat

by John Underwood

Survival of the fittest. Why did some houses—such as that of To Bui and Doris Bender—survive the Laguna Beach fire storm of 1993, while those around them burned? The answer is found in careful construction details that reduced the amount of exposed combustible material and insulated the insides of the houses long enough for the fire to pass by.

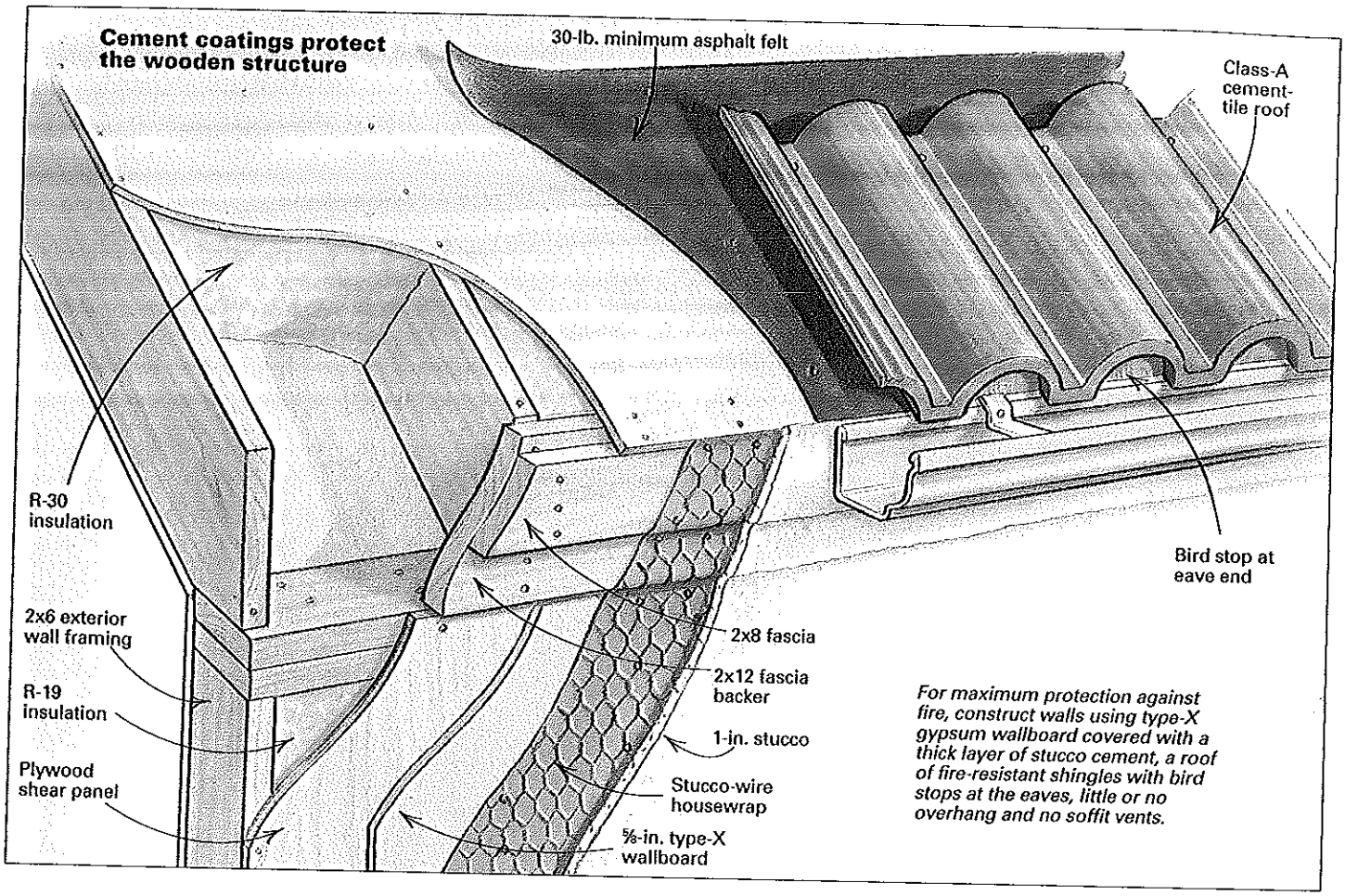
Imagine this: A brushfire, blistering and intense, breaks out on a dry, windy day and races up hills and down valleys, devouring trees, cars and houses. By the next morning the flames are gone, and the heavy clouds of black smoke have washed away to sea, leaving a clear view of charred trees and hundreds of seared foundations. Yet somehow, a few houses still stand, vivid against the backdrop of ruin.

That was the scene in October 1993 after a fire storm destroyed nearly 400 homes in Laguna Beach, California. The fires started several miles inland and swept to the sea at a brisk 2 mph to 4 mph, consuming increasingly thick vegetation along the way. Often, the course of the blaze forced the firefighters to make stands at what they considered to be the least defensible positions: the doorsteps of homes. Frequently, the flames boiled 50 ft. or 60 ft. into the air, and they reached temperatures of 2,000°F or greater. When the fire became that intense, the firefighters then were forced to abandon the structures, which in some instances burned to the ground in five minutes.

Now, more than a year and a half later, rebuilding efforts have begun to reclaim the blackened California hills and bare mountaintops where many houses once stood and where only a few houses remain.

The most obvious question homeowners, builders, architects and code officials asked as they combed the rubble for clues was how did a precious few structures survive such an inferno while houses on all sides vanished in the fire? What they learned was a number of lessons that likely will work their way into local building

Photo this page: Don Leach



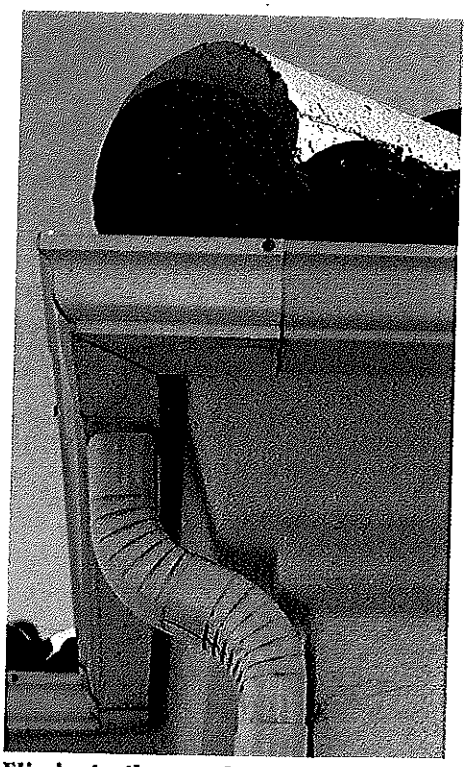
codes and should help to reduce the damage of future fires.

Houses burn from inside out—At 400°F, curtains, wallpaper and bedding ignite. Wood studs spontaneously combust, or pyrolize, at about 450°F (steel studs melt and deform at only slightly higher temperatures). At that point, single-pane windows blow out from heat and ambient-pressure differences. Flame and heat rush in to meet interior combustion, thoroughly consuming structures. Whole houses can reach temperatures hot enough to weaken and spall concrete foundations. According to Laguna Beach Fire Chief Rich DuBerry, many if not most of the Laguna homes lost to fire burned from inside out.

Extreme heat—with or without direct flame—compromised the envelopes of houses and ignited material inside by entering houses through vents; poorly sealed doors or windows; and cracks in walls, subfloors or attics.

When such heat is present, destruction is a matter of time. The critical question is how much time is there? Any structures exposed to extreme temperatures and flame long enough will burn. For DuBerry Laguna's lessons are clear: "Keeping the envelope sealed can buy precious time."

Why did some survive in the midst of charred destruction?—The home of To Bui and Doris Bender was called a "miracle house" by the *Los Angeles Times* because of its dramatic survival in a neighborhood almost totally devastated by the fire (photo facing page). Why did this trilevel structure and a few others like it survive while neighbors' homes on all sides, sometimes no more than 10 ft. or 15 ft. away, burned to the ground?



Eliminate the overhang, and plug all holes. To prevent heat buildup, this house was constructed without eave overhangs, which also eliminates soffit vents. Cornices are built up with 2x12s and 2x8s and covered with 1-in. stucco. The class-A fire-retardant roof tiles are plugged with metal bird stop.

"It's in the details," Bui insists. He knows about such details. Originally from Vietnam, he lived and worked as a structural engineer in Germany for more than 10 years. There, the predominant building materials are concrete, stone, brick and steel. "In Germany, structures are designed to last hundreds of years," he said. "I built my house to last." He insists his Laguna home is not overbuilt. "It's just that whatever the minimum codes called for, I went a little further."

For example, exterior walls are 2x6 wood-frame construction, which allowed Bui to install R-19 foil-faced insulation (the code requires R-11, kraft-faced insulation). Exterior-wall stucco was as much as an inch thick (nominal thickness is ⅞ in.) (drawing above). Ordinarily, nominal thickness of stucco is ¾ in.

Where ½-in. wallboard is the minimal requirement on interior walls and ceilings, Bui opted for ⅝-in. wallboard and one-hour-rated exterior doors and jambs.

Where single-pane windows are acceptable in this mild climate, Bui installed dual-pane windows by International Window Corporation (5625 E. Firestorm Blvd., South Gate, Calif. 90280; 310-928-6411) that contain an insulating air gap.

Roofs on the prevailing ranch-style or cottage-style homes in the area typically had 2-ft. or 3-ft.

Drawing: Bob La Pointe

details that gave Bui's house its edge against fire: double-pane windows on the exposed downslope side, a class-A fire-retardant roof, stuccoed undereaves and exposed deck areas, and vents sealed off under eaves. Parks built removable wooden stops that fit behind crawlspace vents.

"The place is sealed tight," said Susan Parks. "At the doors, windows, wherever stucco meets wood—you see, it's not just one thing, it's every little extra thing put together that saved our home."

Something else the Parkses now appreciate is the swath of ice plant that borders their house on three sides. Ice plant comprises a large group of fleshy ground covers that can be fire retardant if kept free of dead vegetation. On the downhill slope, the patch of ice plant extends 40 ft. or more. When the fire storm raged up the hill toward the house, flames encountered the ice plant and singed the first 10 ft. or so. The intense heat burst the watery pods into clouds of steam, which momentarily stalled the advance of the fire. Then the flames jumped the ice plant and the top of the house altogether. Rising five or six stories in the air, the fire showered the rooftop with cinders. The cement-tile roof survived, but the trees, foliage and houses around it did not.

Reduce vent space to the bare minimum. Minimal gable-end vents (photo above) and dormer-type roof vents (photo below) are adequate to ventilate the roof of this Pacific Coast house. Soffit vents are eliminated altogether. The reduced venting meets code for the area because of the greater concerns for fire safety. Behind the vents, ¼-in. wire mesh was installed to cut the risk that cinders would be drawn into the attic space.

Code officials take lessons from the surviving structures—Rich DuBerry is not the only official impressed by the houses that survived. In Laguna Beach, architects and building officials convened an emergency task force to discuss lessons that could be learned from the devastating fires. Headed by the Laguna Beach Building Department's John Gustafson, the task force called attention to the hazards of building beside Southern California's dry wildland areas and to what builders and homeowners can do to defend structures against future fires.

The report, which draws from examples of miracle houses and from field observations and analysis of fire experiences across the state, generally recommends that houses be built or retrofitted to withstand as much as one hour of fire conditions on the magnitude of the Laguna Beach blaze.

Task-force recommendations include:

• *Venting should not be located in roof eaves or cornices or in the underside or on exposed edges of decks.* Required individual venting at gable ends and on roofs should not exceed 144 sq. in. and should be covered with ¼-in. mesh screen. The Uniform Building Code normally calls for total square footage of venting to be one-one hundred fiftieth of the total attic area, but the code allows for modifications by local building officials when they determine it to be necessary, as in cases of milder or drier climates, or where fire-safety requirements warrant it.

• *Exterior-wall surfaces should be concrete block or brick, cement plaster, or stucco (⅞-in. minimum thickness).* If wood, vinyl or fiber exterior siding is used, it should be applied directly over standard ⅝-in. type-X gypsum wallboard, a gypsum-core panel laced with chemical additives and glass fibers that are commonly used in one-hour fire-rated walls that are between attached garages and living areas.

• *All projections, such as roof overhangs, balconies, decks, exterior stairs, carports or patio covers, should be protected on their undersides and on exposed edges with cement plaster.* Or they should be protected with a continuous wall, most likely cinder block, around the perimeter of the projection from the underside down to the existing grade; or with UBC approved fire-retardant wood specially treated with fire-retardant chemicals such as Dricon by the Hickson Corporation (1955 Lake Park Drive, Suite 250, Smyrna, Ga. 30080; 404-801-6600).

• *Wood deck and trellis members should be a minimum 2x4 dimension; wood beams, floor joists and stair stringers a minimum 4x6 dimension; and posts a minimum 6x6 dimension.* All such wood should be UBC-approved fire-retardant material or cement plastered.

• *Glass in exterior openings should be dual-glazed and resistant to transmission of radiant heat from direct flame.* Though there is no industry-approved uniform fire rating for dual-glazed windows, windows with an insulating-air-gap feature have proved their worth under actual fire conditions. The task force also recommends certain newly developed heat-reflective single-pane windows, which actually reflect heat back to the source at the same time that they keep the inside cool, such as the windows that are sold by O'Keefe Inc. (75 Williams Ave., San Francisco, Calif. 94124-0443; 800-227-3305). The windows are of a calcium silica-based float glass with a lab-tested 60-minute fire-resistance rating. The glass is also stronger than normal glass.

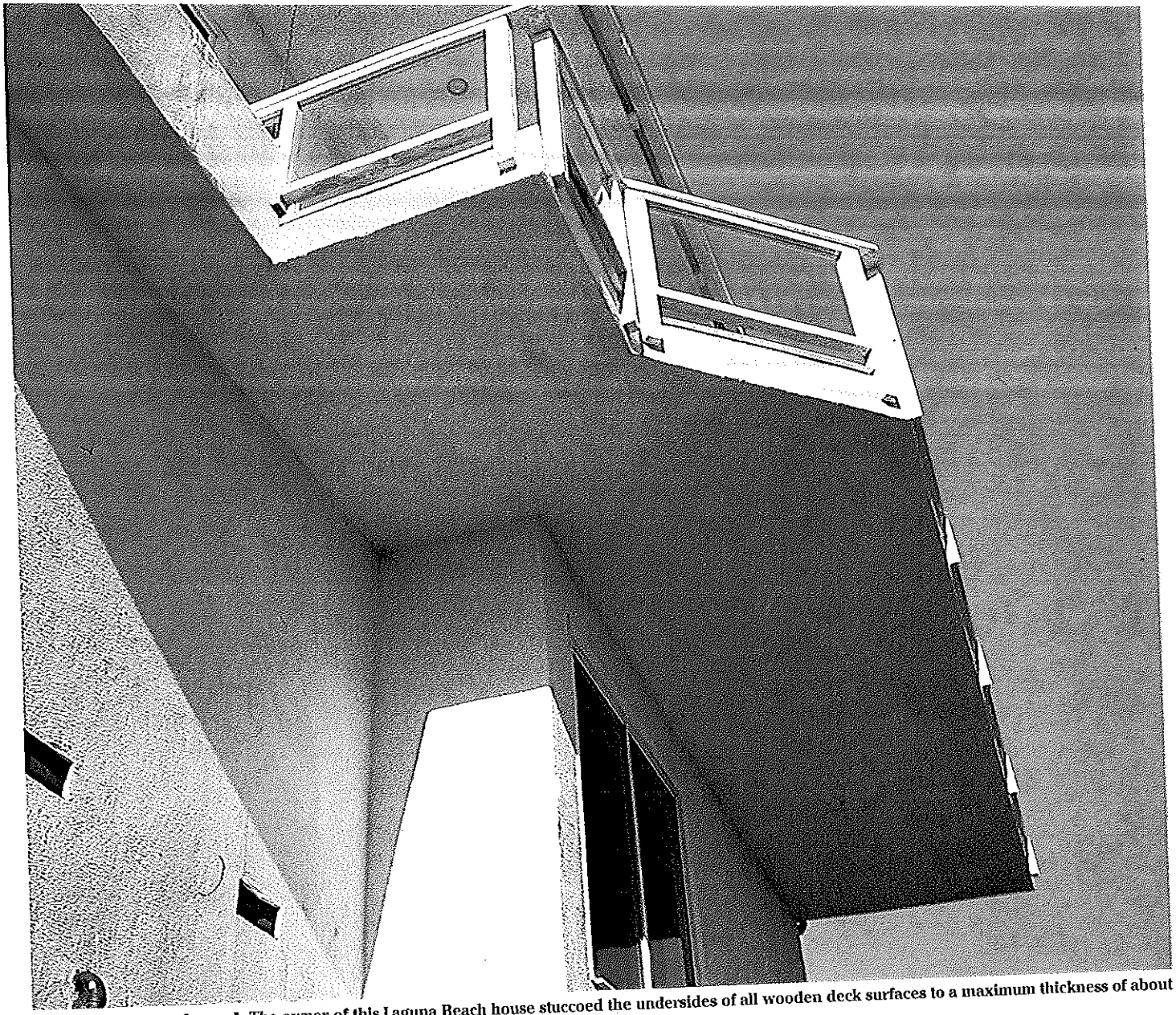
• *Class-A fiberglass or cement-tile roof coverings should be used in designated high-hazard areas on all new construction, additions or repairs.* Eave-end gaps in tile roofs should be fire-stopped with cement mortar or metal bird stops (photo p. 91), which are available at most roofing-supply stores.

These task-force recommendations would apply to all homes that are designated to be in the high-hazard area of what is known as the "urban/wildland interface," the place where brush, trees and grasslands grow to reach the edges of the neighborhoods.

The question for homeowners, builders and architects now is not whether to rebuild on the ashes of the old but how to rebuild. As rebuilding begins to take shape, it appears the lessons of Laguna are finding their way into the materials list of these reconstructions.

None of the task force's recommendations has become part of the local code, although they're moving in that direction, Gustafson said. However, virtually all homes being built in the high-hazard area are incorporating many or all of the fire-resistant features recommended by the task force. □

John Underwood is a remodeling contractor in Los Alamitos, California. Photos by Steve Culpepper except where noted.

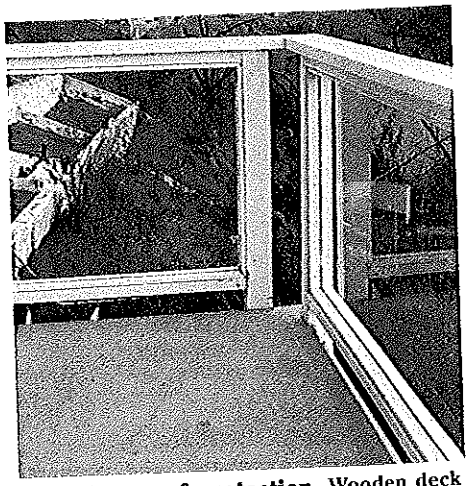


Eliminate exposed wood. The owner of this Laguna Beach house stuccoed the undersides of all wooden deck surfaces to a maximum thickness of about 1 in., virtually eliminating any exposed wood.

overhangs and undereave vents that trapped heat and flame and induced ignition. Bui eliminated eave overhangs altogether in his design and replaced them with double 2x fascia, which he then stuccoed over (photo p. 91).

Ventilation, ordinarily found in soffits, on the ridges of roofs and in crawlspaces, was placed at the midpeak points of gable-end walls (top photo, facing page). Bui positioned horizontal, eyebrow-type roof vents on the class-A cement-tile roof at every peak, which allows the quick and efficient release of attic heat (bottom photo, facing page). That is a critical factor because attic insulation ignites at about 450°F. There are no crawlspace vents in Bui's house.

Bui covered wood-deck surfaces with successive layers of a fire-resistant polyurethane and a sand-coating product manufactured by Pacific Polymers Inc. (12271 Monarch St., Garden Grove, Calif. 92641; 714-898-0025) (photo right). This is a three-part, trowel-applied material that cures to about a 50-mil thickness and carries a Los Angeles Fire Department class-A fire rating. Bui installed scuppered drains before he applied the coating to allow drainage at several points through the subfloor.



Extra layers of protection. Wooden deck surfaces are troweled over with several layers of fire-resistant coating. Undersides of all decking are stuccoed over with a 1-in. layer of cement. The glassed-in deck rails are further protection against fire.

Bui stuccoed the undersides of all exposed decking to the same thickness as exterior walls (photo above). The result is a house with virtually no exposed exterior wood.

Every house around Bui and Bender's house burned. But when firefighters broke into the house to search for occupants, the place was a "cool" 100°F, Bender said.

Another survivor shows similar detailing— On the opposite slope of this hillside Laguna Beach neighborhood is the home of John and Susan Parks, which also stood alone on a street of charred foundations after the fire. John Parks designed the house to withstand the heat of a brushfire. At first glance, the Parkses' home looks like a typical California stucco-and-wood-frame house. A closer look reveals many of the same