

# Designing Your Home to Survive Wildfires

Murray Milne, Research Professor of Architecture, UCLA

As homeowners begin to rebuild after the recent wildfires, there are a few basic architectural design decisions that will greatly improve the chances that their home will survive the next wildfire.

Southern Californians have to realize that sooner or later all chaparral **MUST** burn, and the longer between burns, the more intense the fire will be. If you build near chaparral you must either be prepared to loose your house or else you should design it to automatically protect itself on the assumption that you will be away and that the fireman cannot reach it in time.

The key to survival is to understand the unique way in which a wildfire will attack your home. Originally building codes were designed to protect your house from a fire that started indoors from something like a cigarette or short circuit, grew slowly, and might eventually reach the building's structure. The safety of a building's design is rated in terms of hours, roughly how long the building will stay up so that people can get out and firefighters can get in. A wildfire on the other hand, will attack your home from the exterior, driven by strong winds, it will reach peak temperatures in seconds, and may pass over your site and be gone within minutes, as soon as all the standing fuel is consumed. The problem then is secondary spot fires started on and within your home by wind-driven flames and embers. If you can design your home to withstand this massive but brief exterior attack, it has a good chance of survival. The California Building Code now addresses the materials and construction methods that will protect your home from exterior wildfire exposure. The State Fire Marshall tests hundreds of materials for exterior fire resistant construction.

1. Site Layout: The first strategy is to get a hundred feet of distance and incombustible material between you and the wildlands using patios, driveways, or low-growing fire-retardant plants. You can be attacked from any direction, but an up-slope running fire is by far the most dangerous and so deserves special design attention. When you lay out your site invest in driveways and turn-arounds that are wide enough to make it easy for firefighters to bring their heavy equipment in close to your home. They know how dangerous it is to try to back a fire truck out a narrow driveway if they have to leave in a hurry. Make it easy for them to get close to and around your home.

2. Ignition Resistant Roofs: The most insidious problems are the cracks and openings in Spanish tile roofs that make it easy for the wind to drive brands and embers inside your attic. You can fire-stop individual tiles in an existing roof, but for new roofs choose tiles or other fire rated roofing materials that are designed to interlock tightly and are installed over a fire resistant cap sheet. If you are building a flat composition built-up roof, talk with an expert about how much gravel or ballast to install to protect the asphalt from burning brands.

3. Ember Resistant Exterior: Beautiful, climatologically appropriate homes built of stucco, face brick, tile, adobe, concrete block, or metal siding can be designed in any architectural style you wish. Devote special design attention to the underside of overhangs (roof soffits, cantilevered balconies, decks, and underfloor areas) because here is where flames will be trapped and temperatures will be the highest. Provide double layers of protection and structural integrity here. If you have a particularly severe exposure, your architect can design a firewall, a more technical solution sometimes used in large urban buildings.

4. Window Protection: Windows are the weakest link in defending your building, but there are clever ways to protect them. Radiant heat alone from the fire can shatter glass or ignite combustibles inside your living room, without the flames actually reaching your house. Single glazing is particularly vulnerable; a better choice is double glazing with tempered glass on the exterior. However the safest solution are roll-down metal fire doors built into the roof overhangs or side recesses, and released automatically by fusible links. They will protect windows and sliding glass doors even if they are left standing open. Fold-down panels or shutters on sloped rails can also be designed to close and latch automatically. For non-operable windows, there are many kinds of wire glass or fire safety glass that holds together even though cracked by the heat. These are good alternatives to plastic bubble skylights.

5. Doors: Solid core wood doors are usually rated at 20 minutes of fire protection, but instead for extra safety consider a metal core door that can be faced in any material you like, and for added safety use a metal jamb. Garage doors are especially dangerous, so consider a metal panel door with an automatic fusible link closure. Be sure it is especially tight fitting because if the wind can slide a burning brand under the door all is lost.

6. Louvers and Vents: Houses have lots of other holes in them that need to be protected. Large vents in the attics and under-floors, that are so essential for comfort in Southern California homes, can be protected by fire dampers with fusible links like those built into the heating ducts of all large public buildings. An alternative is the code minimum of 1/4" metal wire screens, but some experts recommend even tighter mesh. Check that all your bathroom, dryer, and kitchen vents have automatic back-draft dampers and fire-rated assemblies where they penetrate the exterior skin of your building. All metal sleeves and hoods should cover plastic plumbing vents where they penetrate your roof. Continuous roof ridge and soffit vents are very effective as attic ventilators, which makes them extremely difficult to protect from wind-driven sparks and embers.

7. Special Equipment: Sprinkler heads on the roof or protecting patios and decks can turn themselves on automatically with a valve that is opened by a fusible link. Design your system so that once the firestorm has passed over your house it can put out all the spot fires on the roof and next to your walls. Assume that at the worst possible moment your house will probably lose both electric power and water pressure, so you might consider a portable generator that will automatically power exterior lights and pump water out of your pool. Design your house so that exterior lights and the aluminum ladders you set up to the roof will be visible from the street to encourage the firefighters to choose your house to defend.

All of these products and materials are available in standard architectural catalogs, nothing here is exotic. A home built using these simple precautions not only has a better chance of surviving a wildfire, but imposes much less financial burden on government and provides much greater safety for the lives of the people who live in it and the firefighters trying to protect it.

The opportunity to design a new house should be a time of joy and excitement for any family. Even if you are rebuilding on existing foundations, your architect can create new kinds of spaces that better meet your changing needs. Please also take advantage of this chance to build a highly energy efficient house that is passively heated and cooled. Photovoltaic panels will not only help protect your roof, but can produce stand-alone power to help your home defend itself. The decisions you and your architect make today will determine the impact your home makes on the environment throughout its entire life.