

Beating the **bushfires**

Bushfire season 2006/07 is already upon us. *Housing* looks at the latest information about fireproofing and how you can get it.

It's the time of year when nerves begin to fray and speculation builds about the likelihood of bushfires in the coming summer. And as if to help snap us into action, 'official' bushfire season start dates have again been brought forward this year.

There is ample justification for this. In the past decade there have been disastrous fires in Sydney, the ACT, the Port Lincoln area of South Australia, and others on a smaller scale throughout the nation.

Bushfires are not simply a country phenomenon, but are a concern for built environments just about everywhere. That makes them a real issue for the building industry, especially for housing.

And building for the event of bushfires is not simply about fireproofing the home as such; the main aim is to keep occupants safe. That's the

word from HIA's manager, building products and innovation, Garry Kwok.

"The challenge for the builder is not necessarily to produce impregnable bunkers for homes which will cost the earth to construct," he says. "It's more about designing and building a cost-affordable and liveable home that will first, provide safe shelter to its occupants during the course of the bushfire and second, help to minimise fire damage to the building."

Issues for the industry

So, what can be done at the design and construct stage to ensure that new housing has inbuilt safeguards?

From the housing industry's perspective this is the main issue, says Garry, because home buyers in vulnerable areas want that protection and government regulations mandate it.

Bushfires are an inescapable fact of life on this continent. Moreover, as our cities and larger towns continue to expand rapidly into what were formerly rural areas, the attendant risks to major built areas will increase. Think Canberra in 2003, to take just one example.

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Home buyers, especially in vulnerable areas, are becoming more informed and showing increasing interest in housing designed for maximum protection. And those people building, rebuilding or renovating – especially in areas with a reputation for vulnerability – will expect their builders to be knowledgeable about bushfire protection. So it will help to be able to explain just why particular features are not negotiable, especially if those features impact on their budget.

Long-term protection of buildings from bushfires begins with good initial



Photo courtesy John Nairn, Bureau of Meteorology



design – in both new home construction and in renovations. A house designed to withstand bushfires will make normal seasonal protective maintenance easier and more effective.

How buildings ignite

Analysis of what makes buildings vulnerable to bushfire is the logical place to begin in establishing first the broad principles of good protection design, and then practical approaches to achieving design objectives.

For starters, houses are not always inevitably ‘swallowed whole’ by bushfires. In most cases their destruction results from fires started inside the house as the result of penetration by embers and other burning debris through gaps or openings. Protection against such intrusions, and measures to stop fires starting on the outside of the house, greatly increase the chances of the house and occupants surviving passage of the firefront.

There is general agreement, based on widespread experience and considerable research, that the most significant threats, those which sometimes seem to single out some houses and leave others untouched, are:

- flying embers
- heat radiation
- flame contact.

Embers, especially when borne by the strong winds which typically accompany

Above: Timber, concrete, steel and glass can all be managed to minimise bushfire damage.

bushfires, have the capacity to extend the threat over long distances from the firefront.

Radiant heat and direct contact with flame are typically a threat for very short periods, but are also intensified by strong winds.

All three factors increase the threat posed by combustible debris carelessly accumulated around the house.

High levels of radiant heat can crack and distort windows, doors and cladding materials, allowing breaches of the building envelope and ember attack on flammable contents. Flame contact can cause building ignition when exposed materials, dried and prepared by sustained wind, are contacted directly by flames for even short periods.

Roof structure, eaves, verandas and sub-floor spaces are especially vulnerable, and frequently difficult to get to for effective firefighting.

Design principles and pointers

The general objective of all the various bushfire provisions is to construct a building that will provide safe haven for the occupants, with minimal damage to the house, while the bushfire front passes

Practical design tips

- As the vulnerability towards bushfire attack increases in any given area, increase the use of non-combustible materials (such as metal, concrete or masonry) for the construction of the main exposed elements of the building.
- Consider concrete ‘slab on ground’ floor construction with no exposed sub-floor. If a sub-floor space is part of the building design due to a suspended floor, it is a good idea to totally enclose the sub-floor space.
- Have a simple roof design, minimising roof valleys, skylights and any nooks and re-entrant corner spaces which could trap combustible debris during a bushfire.
- Seal around eaves and any other roof gaps. Install fire protection shutters made from lightweight steel frames with perforated corrugated steel infill over windows. Ensure that the appropriate type of glass is installed for the expected bushfire exposure level (as detailed in AS 3959). This will help reduce the possibility of flying debris breaking the windows, or heat cracking the windows.
- External timber doors should be of solid construction to reduce the possibility of ignition from an accumulation of burning debris at low level.
- Screen all weepholes and wall vents with corrosion-resistant wire mesh (maximum aperture 1.8mm) to prevent embers entering the sub-floor space.
- Install water storage and pumps dedicated to fire-fighting.

– allowing them then to come out to extinguish any surrounding small fires.

The fundamental design principles for more bushfire-resistant housing centre on resistance to ignition, restricting propagation and avoiding adding fuel to a fire.



Prevention of ignition

- Keep embers out by blocking, screening or shielding openings, voids and build-up points.
- Use non-combustible or less combustible materials for parts of the dwelling likely to be exposed to sustained attack by embers or high radiant heat levels.
- Use high-quality, durable exterior materials to ensure long-term strength and fire resistance with minimum maintenance.

Propagation

If there is any possibility of a spreading fire, the design features of the house should make fighting the fire as easy as possible. For example, sub-floor spaces, if not fully screened, should be completely accessible to allow rapid extinguishing of spot fires.

The less fuel available to a fire the smaller it will be and the more likely it will burn itself out. Fuel reduction around a house reduces radiant heat on the house and spot fires, and assists firefighting.

Regulatory environment

Two instruments provide the basis for most bushfire-related regulation nationwide – the Building Code of Australia (BCA) and Australian Standard AS 3959 – *Construction of Buildings in Bushfire Prone Areas*. The BCA, familiar to all builders, applies reasonably uniformly in most states and territories. In some states (e.g. NSW and



Above: Combustible debris can accumulate in roof valleys and gutters.

SA) variations apply to the BCA to take account of planning, siting and construction requirements reflecting regional factors.

Australian Standard AS 3959 is a detailed site assessment and construction document, setting out specific construction requirements for all major residential building elements at various levels of expected bushfire attack:

- Level 1 – medium attack
- Level 2 – high attack
- Level 3 – extreme attack.

(The Standard notes that ‘for the category of low bushfire attack, the degree of bushfire attack is considered insufficient to warrant specific construction requirements’.)

Construction requirements for each level are spelled out for: flooring systems, supporting posts and piers, external walls, windows, external doors, vents and weepholes, roofs, eaves, gutters and downpipes, verandas and decks, and water and gas services pipes.

The Standard carries a warning to the effect that, due to the unpredictable nature and behaviour of bushfires and the difficulties associated with extreme weather conditions, there can be no guarantees that a compliant building will survive a bushfire without damage.

The Standard is intended to give occupants a degree of safety and property protection until the bushfire front passes.

How does it work?

The Standard is not mandatory in its own right. So how does it work?

HIA’s Garry Kwok succinctly sums it up by saying that the BCA is effectively ‘the bible’ because it is enshrined in all state and territory legislation. “This then ‘calls up’ the requirements of the Standard, effectively giving it legislative force,” he says. “But there is another potential tier of regulatory complexity because local councils add requirements to meet conditions seen to be peculiar to their localities.”

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The Standard has been more than 22 years in the making, he adds. It was developed following the coronial investigation into the 1983 Ash Wednesday fires in South Australia and Victoria and, like the BCA, is probably best considered a work in progress.

Research is continuing into the behaviour of complete buildings in



bushfire, the behaviour of particular materials (glass, timber, plastics etc) and elements of construction such as walls, roofs, windows and doors.

AS 3959 is currently being reviewed in the light of such research. A new product testing protocol standard is also being developed. This will lead to greater product selection flexibility, by allowing new innovative products to be created, tested and proven to meet AS 3959 requirements.

Choosing the right materials and products

There is a mine of information available about the performance of particular structural materials in buildings under attack by fire.

The best place to find it is through HIA Building Services. HIA's Building Services staff can help guide you through the maze of information to get just what you need for your specific project, or refer you to a relevant industry body. The various industry associations, such as the state timber associations, the National Association of Steel-Framed Housing, Think Brick Australia, and Cement Concrete &

Aggregates Australia have all contributed to the development of both the BCA and the Standard.

An industry perspective

Andrew Dunn, chief executive officer of the Timber Development Association of NSW, doesn't dispute the desirability of bushfire protection design requirements for housing.

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However, in support of HIA's and the general industry's call for consistency, and making it easier for industry to satisfy compliance with bushfire regulations, he is strongly critical of this omission in current regulations.

"There is no consistency in their interpretation and application," he says. "That's the biggest problem. Supplying products nationally to meet the requirements is a nightmare that contributes to housing affordability problems."

Fire-retardant timbers

While brick, steel, and concrete seem the only likely candidates for fireproofing a home, contrary to many people's initial thoughts, timber products can be used in many cases under AS 3959. However, as the construction levels increase, so do the limits to what and where timber can be used. It is best to use fire-retarding (hardwood) timbers in accordance with AS 3959, i.e.:

- blackbutt
- merbau (kwila)
- red ironbark
- river red gum
- silvertop ash
- spotted gum
- turpentine.

Andrew stresses that minimising bushfire damage requires an integrated approach – involving educating the community on how to respond in a bushfire, planning to reduce the impact of fire on a house, and construction techniques that reduce ignition.

He also comments that changes in regulatory regimes are often the result of "knee-jerk reactions to the latest disaster".


"Back in the seventies it was cyclones, in the eighties after Newcastle it was earthquakes, and in the nineties bushfires. Now it's a drought, we're about due for a major flood."

Andrew's three-point prescription is:

- consistency in the regulations
- development of uniform test methods to verify the performance of materials and systems
- making the requirements more easily understood.

How to get advice

HIA has been, and will continue to be, actively involved throughout the development of the BCA and of the Standard.

For up-to-date, relevant information call the HIA Memberline on 1300 650 620 to speak to an HIA Building Services staff member. 

Left: The Quantum XP Xtreme heat-resistant window by Trend.



Photo courtesy Trend Windows & Doors