

Bushfire safety principles



Building in bushfire areas doesn't need to be complex, says Jerry Tyrrell. Clear strategies based on logic will provide a durable home that is easy to maintain, comfortable to live in and safe.

After February's tragic Victorian bushfires, politicians were rightly critical of the loss of life and supportive of the hundreds of people who were left without homes. But human kindness and money is only part of the solution. The main objective should be prevention. Yet historically, contractors, designers and building surveyors face a muddle of rules and regulations. So how can we see through the 'smoke filled' room and find

answers that are already available?

I've come up with some clear strategies based upon logic, science and foresight. If you've read the 107 pages of *AS3959 – 2009 Construction of buildings in bushfire prone areas* you may initially think construction for bushfire risk is complex. It isn't and change is overdue. And like any change for the better, it will be quite controversial.

For example: the Pine Lobby dismissed my desire that their framing products should be termite and rot proof. I also remember the Chemical Lobby ridiculing my determination that contractors and owners should not be poisoned any more by toxic termite chemicals.

Recently, I've seen how encouragement of more durable products is causing less call backs for contractors and making buildings

cheaper to own and maintain. And, of course, within a decade I believe the Building Code of Australia (BCA) will no longer total two volumes and will probably be less than 100 pages of mainly illustrated text. So over time, the good sense of making bushfire safety simple, durable and needing little maintenance will work best.

The story so far...

Australian regulators and scientists have discovered how to keep our buildings and their occupants safe from fire. The body of knowledge is good – very good. Extensive testing has been done and validated over time to allow designers and builders to use appropriate materials as fire barriers and to install systems which warn occupants or actively suppress fires. Australian buildings in cities and towns are safe to live and work in.

Problems versus solutions

| Problem | What the Standard or BCA says | Solutions |
|--|--|--|
| Risk level | Six different levels. | Set a single fire proof risk level so no-one dies and buildings do not get destroyed. |
| Nature | Tries to interpret/predict landforms and vegetation changes. | History teaches us there will be a lot of trees and poor maintenance. |
| FRL required | Nil to 30/30/30. | 30/30/30 including 5mm toughened glass, solid core doors with smoke seals. |
| Embers and cinders | Various methods. | Require ember guards (3mm) and mesh screens (2mm) everywhere, and fire shutters to any fire front. |
| Location of services | Above-ground, exposed water and gas supply pipes shall be metal. | Locate hot water tanks and pumps within main buildings. Protect electrical meter box. All supply to buildings/between buildings should be underground. |
| Occupant safety during a fire storm | None provided. | Provide survival cell with 60/60/60 FRL plus emergency source of gravity fed water. |
| Method to monitor fire safety measures | Nothing required. | Require annual Fire Safety Certification like all other buildings. |
| Illegal building work | Nothing mentioned. | Educate owners how to conform and penalise breaches through voided insurance and failure to get annual certification. |
| Community warnings | Nothing mentioned. | Resolve reliable, failsafe way to communicate to all residents/occupants about impending fires. |
| Safe egress procedures | Nothing mentioned. | Develop protocols to ensure roads are clear before evacuation orders are given. |



So why does a bushfire change anything we already know?

The only difference with a bushfire is the fire source, not something inside the building itself or an adjoining building. But nothing really changes because a fire is still fire.

Sure, there are complications with the speed at which the fire moves, how to warn entire communities and how to plan for changes in nature due to droughts, regrowth, neglect and poor hazard reduction.

Fires do move quickly and it seems the worst of bushfires create intense radiant heat and flame plus the risk of air borne debris and embers. But this heat dissipates quickly and unlike building fires, where structures need protection for anywhere up to four hours, the maximum protection a home

Benefits of a fire safe home

Bushfire safe homes should last longer, be easier to maintain and more pleasant to live in because of improved thermal performance and resistance to:

- Termites
- Decay
- Cyclone and hail damage.

In any event, the additional cost of bushfire safe construction would be minimal and may even end up as a saving because of the reduced costs of maintenance over the life of building.

needs during a bushfire is 30min.

Nature is also part of the problem by just being itself. What starts as a cleared allotment with a few gardens evolves into a well maintained garden with lots of flammable older trees. Then

the property changes hand or the owner has a stroke and the garden becomes overgrown and the fuel load builds up. Sensible zones of cleared land get overlooked. Or what is clear to one owner is never communicated to others.

Smoke must be in everyone's eyes when you look at the history of bushfires. It is not a success story. Over the past 200 years there have been endless 'black' and 'ash' days because bushfires are a natural phenomenon. In 1939 bushfires killed 71 people and destroyed over 1,000 buildings. Between 2000 and 2005 there were four major fires in which over 2,900 homes were damaged and 830 destroyed. This year's Victorian fire killed more than 180 people. For the record, only about 100 people die every year in non-bushfire affected ➤

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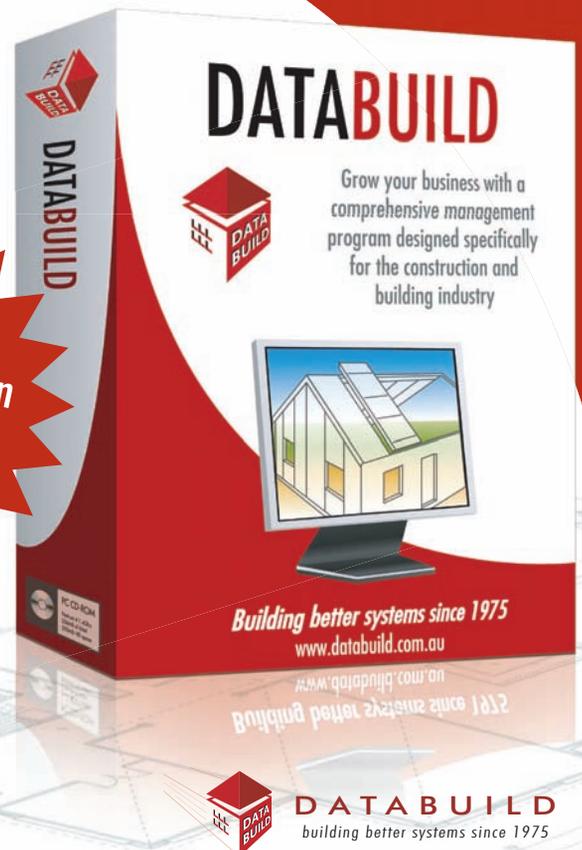
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WALLS

- All externally exposed materials must be non combustible (FRL-/30/30)
- External structural items to have FRL 30/30/30
- Every joint/opening must be sealed with fire resistant sealant with no gap exceeding 3mm including weepholes, open perpend

GENERALLY

- Annual Fire Safety Statement to be displayed and updated every year after inspection and service of all fire safety measures including hazard reduction zones
- Survival Cell to be provided in all dwellings with FRL 60/60/60. This higher FRL is based upon the worstcase risk that the house may ignite around around the Cell.
- Horizontal surfaces/unsealed tracks to be avoided

- Attached garage to be 60/60/60 (-/60/60 non structural) fire separated from main building due to risk of fire entry through garage doors - no bulk flammable products to be stored within garage
- Provide and maintain extinguishers to garage and Survival Cell
- Gravity fed source of emergency water -provide supply to Survival Cell
- Protection to base of walls/surfaces within 400mm of ground or horizontal surface

DOORS

- Solid core, outward opening,-/30/30 doors and frame with maintained smoke seals

FLOORS

- Reinforced concrete slab including suspended floors
- No combustible materials stored under floors

buildings in Australia. So it looks like we are failing to harness the knowledge we have to prevent deaths and damage to buildings in rural and heavily treed areas.

The answer is...

The new Standard tells us about six Bushfire Attack Levels (BALs) based upon the Fire Danger Index (FDI), vegetation and slope. Oddly, the Standard uses different terms to those used in many of the other fire safety Standards. I don't think the six different options in the Standard are necessary. As argued earlier, the risk to any building will change over time.

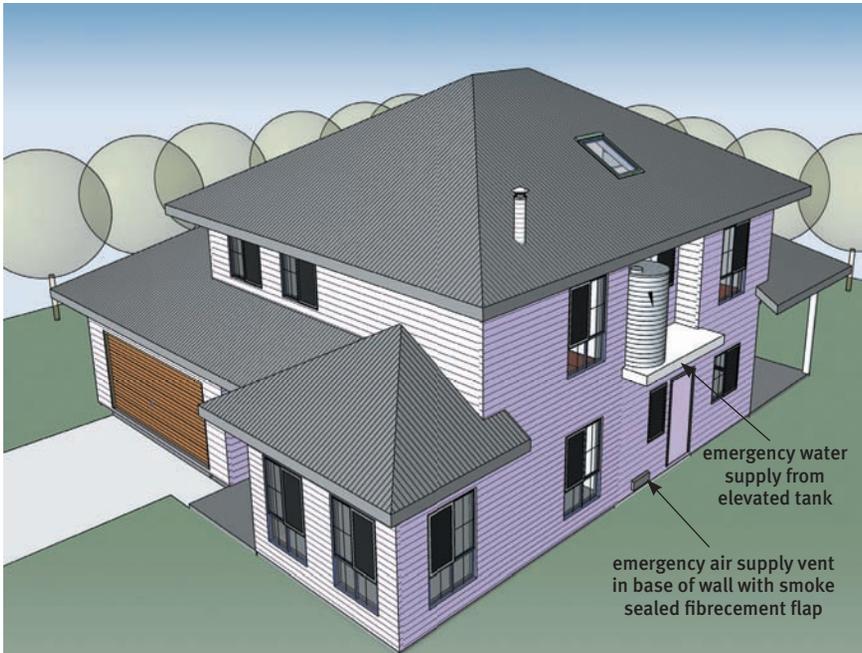
What starts as grass ends up as heavily treed gardens, so why not create a building which will never need modification even if there are large trees close by. And let's start using the accepted products and terminology such as smoke seals to doors, fire rated sealants, fire collars, intumescent dampers etc. I summarised what we can do in the table titled 'Problems versus solutions' (page 28).

You will notice that I have included a survival cell in any bushfire safe home. I think this is a really positive way to live safely surrounded by the splendour of nature. The survival cell is not a special, dedicated space. It is simply a small, ground floor laundry/WC that is surrounded by 60/60/60 fire resistant construction including fire doors and smoke seals. What a great way to sleep easy, knowing that you can always survive the worst of an inferno because of good foresight and building design.

Australia is big place with plenty of homes in rural and bush areas. All these buildings need to survive any likely fire risk, and not just when the lawn is freshly laid and the gum trees are saplings. It's time we worked out that most of our buildings and people aren't surviving the inevitable bushfires. The cost of building a durable, fire safe home is quickly offset by benefits in reduced energy

Diagram 1: Survival Cell - Plan (Top), Survival Cell - Section (bottom).





ROOF

- Non combustible
- -/30/30 FRL
- Sarked (flammability index < 5)
- All gaps between valleys/flashings/cappings sealed with ember guards ie non wicking, fire rated foam/sealant/mineral fibre
- No plastic/rubber/aluminium pipes/flues/flashings/sealants
- Metal (non aluminium) sheeting preferred due to absence of gaps/crevices, resistance to limb damage, wind resistance
- Non combustible battens
- Avoid flat roofs and use minimum 15' gradient to promote self cleaning (debris slipping off roof)
- Use wide valleys (free draining)
- Avoid areas which are not self cleaning eg behind chimneys and skylights

SERVICES

- No non-metal pipes /conduits /registers/ boxes /lights / sensors above ground
- Use copper for gas and water pipework
- Invest in underground supply for all services including electrical and telephone
- External insulation to pipework to be weatherproof and non combustible
- Services shall be protected/located to avoid fire damage
- Gas tanks not installed next to dwelling

FASCIAS AND BARGES

- Zinalume, stainless or copper

DECKS

- No joints between boards in suspended decking
- Fire resistant timber?

GARAGE DOORS

- Non combustible material including tracks/ jamb with draft excluders/weatherseals with particular attention between lintel and head of door

GUTTERS & DOWNPIPES

- Zinalume, stainless or copper
- Fit leaf guards
- Do not use box gutters

ROOFLIGHTS/ROOF GLAZING

- -/30/30 FRL
- Ventilation openings protected by 2mm bronze or steel mesh

WINDOWS

- Glazing to be 5mm toughened
- Openable sashes protected with steel or bronze mesh with maximum 2mm aperture
- Install bushfire shutters to potential fire front
- Use heat resistant neoprene/rubberseals/ sealants
- No external plastic/PVC/rubber products

COATINGS

- Avoid oils and varnishes
- Consider using intumescent paint to timber posts or decorative timber eg screens

WATER TANKS

- Zinalume, stainless steel or concrete
- Elevate at least one tank for gravity feed in emergencies (no pump required)
- Provide tap in Survival Cell
- Pump located in garage or fire resistant enclosure

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costs, less maintenance and much less anxiety.

And let's not forget the ultimate win of no more deaths of innocent occupants.

Where to find help

- Australian Standard 3959 – 2009 Construction of buildings in bushfire prone areas
- Building Code of Australia 2009 Volume 2 Part 3.7.4 bushfire areas
- Your local council
- jwtyrrell@tyrrells.com for a PDF of the plans for the bushfire safe house

Please email me any thoughts or experiences at jwtyrrell@tyrrells.com ■

Jerry Tyrrell is co-founder of Tyrrells Property Inspections. He has more than 30 years' experience as a labourer, tradesman, contractor, architect, mediator, building consultant and author.

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BCA, ABCB and Standards Australia

The Australian Building Code Board could contribute clarity quickly and effectively by:

- Including bushfire safety under the existing fire safety umbrella;
- Deciding to require service and certification of fire safety measures (including bushfire safety measures) in residential buildings;
- Taking occupant safety that little bit further with the concept of a survival cell which could also provide safety in cyclone and earthquake prone regions (remember your mum telling you to get to the bathroom during major winds);
- Avoid duplication with the bushfire Standard but extract the main issues so designers and contractors can get the key basics right;
- Initiate a coordinated Federal system of community warnings integrated with all buildings in bushfire areas;
- Encourage the use of gravity fed tank water;
- pssssstttt....no contractor I know is reading the BCA or the Standard.

Diagram 2: Bushfire Safe home.

