

## How houses are destroyed by bushfire

Chair: Malcolm Hackett OAM

Presenter: Dr Justin Leonard



### The Q&A process

Members of the audience submit questions during the Q&A sessions. The Moderator passes a selected question to the Chair who asks for a response from the presenter.

### Transcript of Q&A sessions

#### 1. BAL Ratings

**Is there an easy and affordable way to find out your home's Bushfire Attack Level (BAL) rating? And if so, would having this information be useful to assist homeowners to direct their attention to the more vulnerable aspects of preparing their home?**

**Justin Leonard**

Yes, I certainly would encourage people to determine their BAL attack level as a measure of working out whether they've got simply an ember attack problem, or an ember attack and significant radiant heat and/or flame problem. I'd always start with ember attack as the first thing to address, but it's very worthwhile knowing how much of a list you actually have to solve. In terms of determining your Bushfire Attack Level, it's a method that's described within the Australian Standard AS 3959, which should be available in your local public library. And if it isn't, I would badger them until they got it in. Otherwise you actually, historically, need to pay for it. But actually, since the recent fires, it's actually free to access and download.

Now, actually getting a BAL assessment done for you is a great thing in itself, but even better is actually learning how to do your own BAL assessment and self assessing your own property. And through developing that understanding and knowledge, you'll have a far deeper appreciation for the specific risks on your property.

And because the system is actually a bunch of lookup tables and a process to step through, with pictures and guides and vegetation structure guides, you really can get to the end of the process without actually doing any deep math. So, I strongly encourage everyone to have a go.

#### 2. European Trees

**Is it true that European tree species, such as oaks, are more protective of houses than native trees such as Eucalypts?**

**Justin Leonard**

As a general rule, things like oaks and figs, by their nature and their structure, have no specific bark that presents an ember hazard and they don't tend to burn in a fire. But I guess the statement that European trees are less of a fire risk than eucalypts is not true in all accounts. So, you can have a European tree, like I showed in an earlier slide, which was a Cyprus or a Pencil Pine, that can burn far worse than a Eucalypt and present far more acute risk on its own next to a house than a Eucalypt ever could. And I guess there's also good and bad Eucalypts. So, smooth bark, very clean bark Eucalypts that are virtually shiny finish, have little to no bark hazard at all. Whereas

other types of Eucalypts can present a very high acute bark load, which is the fundamental source of embers.

### **3. What is a shrub in 10/50 rule**

**What defines a shrub in the 10/50 rule? Is there a maximum diameter size of the trunk? What actually is the definition?**

**Justin Leonard**

Oh, that's a good question. I don't have a scientific answer for you, and that would be straight to the regulations in the Terms and Conditions to see what's allowed.

### **4. Measurement of 50m in a BMO**

**What's the starting point for measuring the 50m in a Bushfire Management Overlay (BMO)?**

**Justin Leonard**

I'd suggest they use the closer distance to the bush between your eave and your wall. But I would certainly also check the Terms and Conditions of the regulations before you head off and start cutting away.

### **5. Slope and the 10/50m rule**

**If someone's surrounded by unmanaged bush and they've got slopes down to the North and the Northwest, how effective is that 50m scrub removal when you've got that much bush and it's downhill to the North and the Northwest?**

**Justin Leonard**

The particular issue there is what is the slope under the vegetation beyond the 50m or the 30m, so beyond the clearance point. The slope under the vegetation beyond that point is going to be the slope that supports or enhances the fire spread up to your property. And, as a general rule, the fire will move with twice the speed, and therefore twice the severity, up a slope for every 10 degrees increase in slope up towards your property, and conversely 10 degrees slower and less severe 10 degrees down slope. It's not so much the slope between the edge of the bush and you but what's beyond. And that's a nuance where the 10/50 and the 10/30 rule isn't sensitive to slope, and I would be very careful and cautious about other measures and being particularly focused on house design and other measures when you're facing a significant upslope fire approach.

### **6. Radiant heat or ember threat**

**Is the greatest threat there the radiant heat or is it from embers being directed by that slope and the ferocity towards the house?**

**Justin Leonard**

Invariably, the greatest risk by fire is the ember attack and the surface fire that ignites the houses. That's the predominant way houses are ignited. And I guess that doesn't rule out, or under emphasize, the importance of dealing with radiant heat and flame attack on particularly high risk properties. What it does highlight is that even though you might be facing a significant upslope run through some heavy fuels, many things have to also align, like the wind direction and a formal fire front that's lined up along that slope for it to come out and express at its worst case potential. So, what you find is some houses in those worse scenarios are impacted by the flame contact and the radiant heat. But, it's relatively rare in the broader scheme of things. And if you haven't addressed

all the ember attack and surface fire issues first, then you're not really doing it justice before you move on to the radiant heat and flame issues.

## **7. Big trees just outside 10m limit**

**Being in a BMO with 40m Manna Gums outside the 10m limit. So, within striking distance of the house. Where does that leave a land holder?**

**Justin Leonard**

At high risk of tree strike. I was actually speaking to a person in another jurisdiction; I think it Shoalhaven, up in New South Wales. And they have an alternative measure, which is a 45 degree rule. So, if you imagine looking from the base of your structure out on a 45 degree trajectory, your tree clearance opportunities are governed by whether that tree falls within that 45 degree incline. So, that obviously deals with a 40m Manna Gum at 10m. I think it's worth thinking and possibly pitching alternate enhancements to a 10/30 or a 10/50 rule to account for those scenarios. So yeah, I certainly feel for that circumstance.

The next thing you can do is harvest reports and whatnot to carefully assess those trees to see if they're in a particular state that would make them vulnerable in the event of a fire. So are they already scarred? Do they have weak aspects to their branches and tree trunks that would put them at risk of being the ones that can fall? So, an informed arborist can actually help to identify where the highest risk trees are.

## **8. Victorian Bushfire Risk Register**

**The Victorian Bushfire Risk Register identifies targeted properties. Are these properties subject to a higher level of preventative action in addition to the BMO?**

**Justin Leonard**

Yes. They've got particular additional measures and risks and you'll find that those identified areas are actually additional areas that will also fall within a BMO that even had a higher elevated risk.

## **9. Finding out about The Victorian Bushfire Risk Register**

**Where would people find out about which particular areas or properties are on that list?**

**Justin Leonard**

It's an initiative that was developed and implemented by the Country Fire Authority, so they would be the point of call to determine what specific aspects of that location and why that area was designated and put on the register. So, there's an actual storyline behind each of those locations and it's worth following up to see what the specifics are around each of those.

## **10. Bark mulch**

**What about bark mulch around the house, and the fine fuel load that comes from that. What should people do there? What's the alternatives?**

**Justin Leonard**

Well, I think you've inferred the answer there: what are the alternatives? Because there's nothing good about bark mulch near your house. It's just as bad on the ground as it is on the trees and will produce extensive and prolific ember load to the structures. And if the bark mulch is actually adjacent to the structure itself, it can also provide so much heat that it can crack windows and ignite decks and facades and building elements, just simply at that adjacent proximity. So, I would

suggest all the non-combustible alternatives, be it gravel or stone or physical separations. So, garden beds significantly far from the house. And, if you're going to use things like bark mulch or you're inevitably near a forest that has a high ember load, then you really have to focus on making your house ember proof, because eliminating embers from those landscapes all together, from a landscaping approach, is not technically possible or feasible.

## **11. Lower flammable planting around house**

**Does planting less flammable bushes and trees really make a difference to the safety of the property? Is it a strategy that people can implement or are they just loading up the environment with further vegetation?**

**Justin Leonard**

No. Using low flammable plants and less flammable plants, strategically, is quite important. It's fair to say that if your garden or immediate landscape is under extreme water stress and drought and, for instance, we're inside a Level Five water restriction and aren't even allowed to water our gardens, and everything dies and desiccates, even the best plants will burn. But if they're in a reasonable state and they are carefully considered and selected, those plants present no additional risk in the landscape, and in many cases can help to manage and mitigate certain things, for instance radiant heat blockers, wind attenuators, moisture retaining shade, all of those aspects that the trees offer, careful planting can also provide. And of course, aesthetics, and shade management on the soils to help mitigate surface fuel growth.

## **12. Terracotta tiled roof**

**With terracotta tile roofs, what preventative measures are recommended, firstly in the lead up to the Summer Bushfire Season, and secondly in the scenario of an approaching bushfire?**

**Justin Leonard**

A terracotta roof presents a particular problem in that they just inherently aren't ember tight. The ridgelines certainly are, if they're well pointed and covered, but the tiles simply don't sit tightly enough over each other to prevent long term leaf, debris and build up under the tiles, and also allow embers through those same gaps. So, you pretty much don't have an easy fix. Watering the roof down doesn't fix it. There isn't much you can do short of removal of the tiles and significant remediation of what's under those tiles, like putting up a special fire resisting sarking over your existing frame and then putting your tiles back on, or moving to a different roofing system, is really the only reliable and viable way to eliminate that as a risk.

Simply, the timber framing elements immediately under it, even if there's conventional sarking over them, which is typically only even under the timber tile battens that are holding the battens in place, don't offer any significant protection from a roof fire that could develop to a massive house fire where the first you realize is that your roof plaster is collapsing in multiple rooms at once.

## **13. Where to park a car**

**Is it best to keep the car in an enclosed garage adjoined to the house, or park it away from the house when preparing for a bushfire?**

**Justin Leonard**

If the garage is essentially ember proof, then it's fine to keep it in that location. And, in fact, that gives you some particularly useful options for leaving a house that may become compromised during the throes of a fire event. So, you can imagine that the contingencies that you may have to

leave the house, if the house happened to start to burn, you'd rather leave the house in a vehicle than on foot. So, having an ember-tight garage with a car in it gives you that opportunity. If your garage simply isn't ember-proof at all, well, having it completely devoid of any fuels stored materials and vehicles is by far the best approach.

#### **14. Wooden door steps and ember attack**

**What's the best way to protect a wooden door step from embers?**

**Justin Leonard**

Well, that's a tricky one. So, the wooden doorstep would be the lower threshold? I would probably consider trying to wrap it with some type of metal flashing or finishing. It'd probably give you one of the more durable solutions.

#### **15. Protecting plastic water tanks**

**if someone has already installed plastic tanks for the house supply, is there any way that they can protect them from radiant heat?**

**Justin Leonard**

What we've found is plastic tanks, and by plastic I assume it's polyethylene tanks, which are the dominant plastic tank type are fine if they are on their own, completely isolated out in an open paddock. So, they can handle a low level grass fire and even a bit of debris blown up against them. They will suffer and burn a little bit but they won't lose their integrity or lose the contents of the water within them.

If you put two tanks next to each other, that's when you start to have problems, even in that open paddock scenario. The debris that builds up between the two tanks will burn. The tanks start to burn, and then one burning tank will feed onto and off the other tank, and you'll get this chimney effect between the two tanks that will develop to a crescendo until both tanks have actually fully ruptured. And that rupturing process can be quite severe. We've seen tanks rupture, say, against a steel shed or a house and it's equivalent to driving a car into the side of the shed at about 50km/hr. So, it's like a really huge amount of brute force.

So, yeah, tanks with any heavy fuel element around it that will start to burn even if that's treated pine boxing that you've used to form the platform to get a level surface to put the tank on is enough to take out the tank. So, to actually protect it, it's quite tricky. But whatever you do, you'd have to look at how to prevent debris building up against the base, or having any heavy fuel elements near it to burn in sympathy with the tank. Protecting it and flashing it off is usually counterproductive because the debris and leaf debris end up going between the covering and the tank itself.

#### **16. Roof mounted evaporative coolers**

**What about roof mounted evaporative coolers? Do they cause problems?**

**Justin Leonard**

Yes, they're quite problematic in fires. There are a few brands that specifically are targeted towards being bushfire resistant, so they have specifically designed fine meshes and non-combustible filters, and the whole box is essentially non-combustible. Other than that, they burn prolifically during these fire events. One of the things, if you have quite a switched on electrician and plumber, you can fit an override switch to them that allows you to recirculate the water over the filters without pumping air through them, and have them operating in that mode during a fire event. That will help to reduce the risk of them being lost, but you've obviously got an issue that you need water and you need power to be maintained through that event for that to actually work. But, if you've already

got one and you're trying to make the most of the situation, it's approaches like that that will help, as well as dropping over a fine mesh screen over the entire unit to try and protect it from embers. I have seen a couple of models that have a self cleaning cycle that does something similar (recirculate water over filters).

## **17. Spraying the roof**

**Will spraying the roof with water with an automatic system during an ember attack do much good? And what about the effects when the flame front reaches the house?**

**Justin Leonard**

So, water on the actual roof does virtually nothing for a roof that has ember gaps in it. Let's say we're talking about the terracotta tile roof scenario that we were discussing previously. The water simply doesn't seal the gaps. It flows over the tiles, but the embers can blow up to and through those gaps even if the roof tiles are wet, or water is dribbling over those gaps. The roof tiles themselves aren't combustible, so making them wet doesn't help. The same with steel roof. The thing that water on the roof does do is flow into the gutters, and the debris that has built up in those gutters will obviously then be wet. So, it does address some aspects of the debris around your gutters.

But, be very wary. Because in a lot of these fire events when the winds are strong, the spray systems that are mounted along the ridge lines of the roofs are spraying, but there's water only going into the downwind side gutters, and virtually none get into the upwind side gutters. So, if that's the case, then you've pretty much got a completely ineffective system, except for possibly your neighbour's house, if he happens to be in the downwind spray field of your rooftop sprinklers.

## **18. Effectiveness of house sprinklers**

**How effective is the house sprinkler system for a rectangular house with overlapping spray patterns, when they're operating in the vertical plane? As opposed to just attached on the top of the gutter.**

**Justin Leonard**

The best way to assess the viability of a spray system is to get the windiest possible day and operate them. And to see what surfaces they still effectively wet. And if they're wetting things that would otherwise be a major risk like, your deck or combustible cladding, or extensively wet out a window, like keep the glass constantly wet then they're offering protection to those specific elements. But they don't offer protection to subfloors, roof cavities, wall cavities, which have remained dry under those cladding. So, they're not a panacea for gaps and ember entries and other things, they simply have some targeted elements that they may be useful for if they can continue to wet them throughout an event.

## **19. Sarking (Reflective foil)**

**After the 1969 fires, this person's family visited friends, whose house in the foothills of the Dandenongs was left standing in the street. So, we're still there and that chap had covered everything with reflective building foil. Is that thinking out of date?**

**Justin Leonard**

The reflective building foil obviously does what it says: it reflects. And if it reflects light and heat, it can reflect radiant heat. And, obviously if it's wrapped well enough, you've actually got a secondary ember barrier that may compensate for ember issues in whatever it's being wrapped over. I'd say it'd be particularly challenging to get that right, and also to wrap a house in a high wind scenario. And, I would also caution in terms of what would be the most appropriate thing to use. So, if you

duck down to Bunnings and bought the roll of the cheapest sarking you can get your hands on, that in itself does not offer much protection, and actually will have a lot of holes burnt through it even if that's what they call Level Five sarking, which is the sarking required to be used in AS 3959 in bushfire resistant houses.

So, even though it's shiny on one side, the back of it can be paper, and in many cases, it doesn't offer a specific barrier to flame or ember attack.

## **20. Storing gas bottles**

**What are the key elements in storing gas bottles safely?**

**Justin Leonard**

So, most importantly, wherever they're stored they need to be on a stable surface and chained, with a metal chain, to a metal upright system that is concreted into the ground essentially. So, if whatever structure they're placed near or against fell on that gas bottle, it would not be pushed over. So, that's the primary thing. Then the other consideration is, well, what have you put immediately around that gas bottle that could represent a significant heat load, because as that gas bottle heats up it will flare, and those flares are many metres long, and are typically horizontal, particularly from the 9-60kg range bottles that will flare outwards, and that might be onto a road, it might be onto a neighbour's house, if it was pointed the wrong way it might be directly at your house. You really need to consider the appropriate location.

The other thing to consider is: the larger the gas bottle and the more full it is, the longer it needs to be heated before it could possibly flare. So, if you move to a much larger single-point gas bottle, and pipe that to all the locations that you might have barbecues and house usage, and you can turn that gas bottle off in its location before an imminent fire, that means you've got one potential flare point rather than many. And because it's a large gas bottle, it'll be far less likely to be able to be pushed over.

## **21. Canvas blinds**

**Will pulling down canvas blinds over windows during a fire event help?**

**Justin Leonard**

Yes, you're better off having them down than up, and one of the amazing accounts from Malcolm Gill, who I've showed an account of in that process, he actually had the forethought to ask that question before the Canberra Fires actually occurred. And his accounts on the day, whether the embers flew in, hit the canvas blinds, and, because of their incline, simply rolled off. And when his fence burned up past his windows, those drawn canvas blinds offered significant radiant heat protection from that adjacent fence fire. And, although they charred very, very slightly so they discoloured a little bit, they didn't burn in situ and provide an additional heat load to his windows.

And just a word of warning, they're the old school heavy-set canvas blinds, and the caution there would be that all blinds probably aren't created equal.

## **22. Solar Panels**

**What about solar panels? Do they melt or catch fire easily in a bushfire?**

**Justin Leonard**

No, they're pretty much made of glass and aluminium and metal componentry, with a very small amount of fire retardant coated wiring at the back of them, and some very small plastic boxes. So, they don't represent any particular additional heat load to the building. Depending on how they're installed, they can be a reason for some additional leaf debris and litter to build up on the roof, on

the support points, so, one thing to look out for housekeeping. And they can present a risk to fire fighters that are trying to suppress or put out a house, even if that's on the ground, because they may continue to produce electricity, even though the power's gone out and the switchboard's been isolated. There's an electrocution risk that can persist after the fire event. But no real risk or additional issues really in the scheme of things during the bushfire event itself.

### **23. Evaporative coolers being ripped off roof**

**Staying up on the roof again, seeing examples of evaporative coolers being ripped from the roof in strong winds and then allowing embers to get into the roof cavity because of that?**

**Justin Leonard**

Oh yes, definitely. There's so many examples of where the roof has been compromised, before or during the fire event, due to simply the wind loads that are part of the worst of the days that we see these fires come at. So, as soon as you start approaching wind gusts of 75km/hr or more, you can expect to see tiles dislodge, roof sheeting peeled back or peeled off the actual screws, the loss of vents, whirlybirds, evaporative coolers, and every one of those actions opens a roof or a house up to a prolific ember attack. So, you can see the synergies there. I've even seen entire roofs taken off houses during these fire events and trying to make sense of the order the things unfolded for various locations.

I think Black Saturday, in our surveys, we found 13% of the structures we surveyed had evidence of some type of extraordinary wind damage. And so, that's 13% that had obvious examples; many more would have had wind damage, but were simply piles of rubble on the ground that you couldn't deduce a scenario for.

### **24. Fire retardant paints**

**What's your view on fire retardant paints?**

**Justin Leonard**

Yes, they can be particularly useful and interesting. The main challenge with fire retardant paints is their efficacy as a fire retardant will diminish over time, so, they might be exposed to the actions of rain and ultraviolet light from the sun. And, those two processes will constantly degrade the paint and make it less effective over time from being a useful fire retardant coating. So, be very reticent of the recoding and reapplication requirements of that approved and tested system, and follow the directions on applying it in exactly the right way so it meets even the expectations of that duration.

Using it in areas specifically that aren't exposed to the weather is a really possible free kick. So, getting under your house and painting the subfloor with a fire retardant paint, that will never see the sun or constant rain action throughout its life means that it could actually have a very long life as an effective retardant. And even painting the roof beams in your roof is another possible one be it quite challenging unless you pull off your roof sheets or have a particularly accessible roof cavity.