

How to harden an existing house

Chair: Malcolm Hackett OAM
Presenter: Dr Justin Leonard



The Q&A Process

Members of the audience submit a question during the Q&A part of the webinar. A Moderator passes the question to the Chair who asks for a response from the panel member, Justin Leonard

Transcript of Q&A sessions

1. Tiled roof

Are there any options to modify an existing tiled roof, or do you need to replace it to give greater protection? In particular: what about a fire-resistant lining under the tiles, like Firefly or something similar to that?

Justin Leonard

Yes, certainly. That's an excellent suggestion for a way forward and, I guess, it does really go straight to the point that a tiled roof needs quite a dramatic intervention to resolve the problem. And the problem is fundamentally because the tiles don't seal against each other, and the entire roof itself has almost a universal ember-access problem. The second part of that problem is that the battens that the tiles are sitting on, and secured to, are timber. And, in most cases, the trusses that those tile battens are screwed to, or nailed to, are timber also. And the sarking, if it's ever fitted, is usually fitted over the framing, the A-framing, but under the tile battens, only because that is actually the only practical way a tile roofing contractor can navigate and walk over the roof without damaging the sarking.

So, given that that is sort of the combination of problems, using a Firefly sarking would be an excellent way forward, but it must be used in combination with metal tile battens. So, you put the Firefly sarking over the A-Frame, screw that down and secure it down with metal tile battens, and then put your tiles back on, and you can have a fairly bushfire-tolerant tile roof.

2. Firefly sarking

Can you describe the make-up of that Firefly sarking?

Justin Leonard

It's a combination of foil coatings, and ceramic and glass fibre, but it's essentially a non-combustible fire-resistant sarking-type material, but the important aspect of it is that it's fire-resisting. So, if you ever want to determine whether your sarking is adequate or not, string it out, clamp it to a couple of saw horses, put a big pile of leaves in the middle of it, and burn that pile of leaves on the sarking. And if it doesn't burn through the sarking, then you've got the right stuff.

3. Dektite

What's the probability of embers or radiant heat affecting dektites, the rubber moulding that surrounds a roof opening with a pipe coming through it. And is there any way to minimize the impact?

Justin Leonard

All Dektites aren't created equal, and you'll find that there's two types when you go into a hardware store. One is a high temperature one, which is actually designed to go around things like flues for wood heaters and gas heaters that perforate up through the roof, and they're typically a red silicon material. They're quite high-temperature performing, and can resist quite a bit of debris build up against them, and the burning out of that debris. The other types, which are a butyl-rubber-style material, which can also be red or black, so be careful. It will burn out readily when a small amount of debris builds up against it and burns in a bushfire.

Chair

And those different styles, are they marked or do you have to ask about their flammability?

Justin Leonard

The high temperature ones will be deliberately rated and marked, and will cost significantly more. So, there'll be a fair bit of enthusiastic advertising around them to try and convince you to pay the extra.

4. Roof capping ember protection

Re-blocking of a roof ridge capping caused by corrugated roofing. Can you confirm that you suggested a fiberglass-type batt to block the openings? This person had read and I must admit, I believed that rockwool was recommended for those sorts of things. Because again, not all insulation is created equal.

Justin Leonard

Yes, it's certainly true that rockwool and glass wool are two quite different batt materials, and that the rockwool, by name, means that it's actually made from a rock silica material which has a much higher melting point than glass wool. But in that application, under a roof ridgeline for ember attack, both will perform adequately because there simply isn't the heat locally to actually melt out the glass batt. So, it's easy to go with the more compliant, cheaper glass batt. If you were trying to prepare a roof for flame attack and direct-like flame-zone impingement, then the rockwool option would be a preferred upgrade.

5. Polycarbonate Vs fiberglass

Here's a person who'd like to confirm the desirability of replacing full-length fiberglass-reinforced skylight strips in a shed with their polycarbonate strips.

Justin Leonard

Most definitely a dramatic improvement because the fibreglass skylights can perform or burn quite aggressively from a very small gutter fire. Neither of them will offer you a complete barrier protection to those glazing units breaching when there's significant fuel load in the gutter. But, you're far better off with a polycarbonate alternative than the fiberglass.

6. Garage doors and ember attack

How would I deal with a roller garage door? What would I do? How am I going to protect that opening? What's the best you've seen? Are there proprietary things you can buy? How can you go about improving that situation?

Justin Leonard

So, a roller door has a couple of challenging points. The first one's the contact point where the roller door touches the ground. And the ideal thing there is to have a reasonably-good high-temperature silicon seal that runs along the bottom so it comes down and contacts the ground firmly, and with a flexible material that is going to stay in place even when debris burns up against it.

The second place the roller door is susceptible to is up both sides where the roller door runs in a track. And, unfortunately, the tolerances in those tracks are so broad that a bit of air pressure against it will allow embers to blow around that track and allow embers to get into your garage. And the third one is the one shown in that photo, which is the massive gaps that can be at the top of your roller door, when the roller door unspools and it's lowered. And the way to address that is either to have a flashing that comes down, and a nylon fire-retardant brush seal that rubs against your roller door as it goes up and down, but you end up losing a certain amount of overhead height to allow that brush seal to come in contact with the roller door that is already remaining in the track. So, it doesn't go in and out. There is a better way than that to do it, and that is to work from inside your garage, and you actually box out the entire spool of roller door and put the nylon seal on the back face of your roller door, at the bottom of the box. So that the box actually forms a whole ember-tight helmet for your roller door.

7. Treated pine retaining walls

What can you do if you've got treated-pine retaining walls, say, within 3m of the house? Is there any way you can mitigate that or you're in trouble?

Justin Leonard

You're certainly in trouble at that distance. So, I guess, it's a question of how integral the wall already is, and whether it's really coming up for time for the treated-pine elements to actually be replaced. So, it's a little bit of a cost benefit implication to either replace them with the fibre-reinforced concrete-mock sleeper look, which is expensive but very appropriate in a bushfire, and made to the same sizes as the treated-pine standard sleepers; or you need to think about some intermediate step, where you might actually clad out the treated pine with AC sheet that runs over its surface, across the top and for some distance down the back, until you get well into the soil line. And it's only once you've completely boxed it out that there's a chance that that treated pine might not get involved in a bushfire, although nothing's ever certain. But don't forget, if it does get involved in a fire, you do have a real toxic-ash local load issue like I highlighted last time. So it's always preferred to do the change-out whenever you find that appropriate.

8. Material for filling gaps

Filling-in gaps to prevent ember entry. Are there preferences for ones that are better than others?

Justin Leonard

Silicon is a pretty good go-to gap filler. And, I guess, when you move on to other approaches to fill gaps, any joining strips between AC sheets and things like that—that are typically things like PVC joining-strips—you should actually think about all of those polymer systems that attempt to join boards together as being quite likely that they may melt and fall away during those events too. So, not only think about gaps that are there that you need to fill or seal, but actually gaps that can develop when a modest amount of heat is applied to your house. And, I guess, embers don't have

a predominant direction they come at. So, look at the gaps from all angles, look up underneath the seals of windows, look along the bases of doors, and I guess your active openings are going to be one of your biggest issues to address. And there's actually quite a good range of weather seals that work on, obviously, around door jambs and along the bases of doors, and those active weather seals are really handy. And you can get high temperature versions of those in almost any type of seal.

9. Protecting timber fascias

Will 4mm thick cements sheet screwed to soft wood fascias help to prevent radiant heat igniting the timber? And if not, what treatment would you recommend for protecting exposed soft wood?

Justin Leonard

A 4mm AC sheet is non-combustible itself, but under a modest amount of radiant heat, say, something like 19kW/m^2 , so BAL-19 and up is enough to heat up the thin AC sheet, and it will start to distort and curl at the edges. And of course, AC sheet's one of those typical sheeting that's put up and joined using a H-section join, and those joins are critical because quite often the go-to material is a PVC H-joining strip between the two sheets, which really does nothing to actually keep the sheets joined effectively, and prevent that lifting and peeling away and opening up of gaps between the sheets. So, the way to deal with that is to move to an overlapping-join approach, where you actually use multiple layers of 4mm sheet, and then you start to get into quite a reasonable-performing system.

The softwood framing underneath the AC sheet is vulnerable when it reaches a temperature of approximately 180 degrees. It will char and smoke, and possibly start to burn in that cavity, if the AC sheet itself on the back face gets above that temperature. So, the question is how much heat is on it and for how long before that AC sheet actually gets to 180 degrees.

So, when you think about consequential fire sources, like a neighbouring house, or a retaining wall, or a motor vehicle, there's a high possibility that you can definitely get your facade to that temperature. A fast-moving fire that has a fairly good separation that briefly sees 19kW/m^2 possibly you won't get to that temperature.

10. Filling gap priorities

Top priorities for face filling gaps?

Justin Leonard

I would say that roofs, and the weaknesses around roofs and roof access, is probably really the one to emphasize in that there is quite a high degree of loss implication around those roofs, and as a priority getting your roof sorted out is a really good approach, so good to see that one second. And, I guess, yes, the broader issue, I guess, addressing gaps in structures is also a key approach. In a sense, the roofs are a real one I would keep coming back to in that if you happen to be in a house and trying to use it for survival, the last thing you want is it to fail via a roof failure. Because one of the main challenges is that the first thing you know about your roof actually failing is when the ceiling lining starts to fall in. And at that point, you have fractions of minutes to safely get out of that house.

Conversely, if you do have a vulnerable roof, you really need to think about ways of managing it actively during a fire, like having a really good water source near the manhole and a safe way of accessing and constantly scanning that roof cavity.

11. Fire rated wall

What's a 60/60/60 wall between a house, a shed, and is it useful?

Justin Leonard

A 60/60/60 is a number designation that describes a fire rating, and the 60 actually refers to 60 minutes. The three numbers involved in that designation deal with integrity, so one has to do with the whether the wall will collapse in 60 minutes, whether a hole will form through it in 60 minutes, or whether the back face of the wall will exceed the magic 160/180 degrees I was talking about for that softwood ignition within the 60 minutes. So, a 60/60/60 rate of wall won't fail in any of those three key ways, so therefore has a reasonable chance of surviving against an adjacent consequential fire source.

Now, you might be thinking that houses can burn for actually longer than an hour, and that's actually true. But, what's considered, or why those fire ratings are used in commercial premises, and in some cases in residential buildings, is that the fire brigade is certainly going to turn up and have a fair chance of putting that fire out during that time period. The challenge in a bushfire is: will that happen? So, it's worth considering that the 60/60/60 probably works in most circumstances but not all.

The other thing is, it doesn't rule out the fact that that wall could actually be combustible. So, one of the most interesting versions of a 60/60/60 wall is a thick log cabin wall. And it's fair enough because the log cabin will take more than 60 minutes to burn completely through those thick logs, but in a bushfire context, that wall will definitely burn down eventually, and whatever's behind it will be lost unless the fire agencies turn up. So, if you want to create a really adequate barrier, it should be non-combustible and 60/60/60, then you've got a fair chance.

12. Stone mulch debris build up

How do you prevent debris build up over the years? This person's found that their gravel and stone mulch is actually just disappearing.

Justin Leonard

It is a bit tricky because it does all infuse and meld into one, and I guess some of the more innovative approaches involve an old bed frame and some hard yakka with a shovel, where you actually dig it up and re-filter it all through the mesh of one of those old steel bed frames, or something similar to try and separate it all. But I find that most people end up sort of removing it and laying down some fresh stuff.

13. Petrol pump Vs generator

We've got a person here who's concerned that their petrol pump is the weak link in the event that they have to defend their house. Have you got any advice about using a generator instead to maintain power and enhance their water supply?

Justin Leonard

In a Black Saturday context, 90% of the pumping systems for houses that were supplying water for active defence or spray systems failed during the peak of the event. And that was everything to do with ingestion of embers into the filter, fuel lock because the pump itself got too hot, embers and debris landing on the electrical systems and burning it out like everything possible, and/or simply the air was too hot that was ingested into the pump and the pump simply stopped functioning either temporarily and needed to be manually restarted.

So, the idea of putting your pump in a protected enclosure that not only provides ember- but thermal-protection so it's a cool operating location for the pump, needs a fair bit of work. But one of

the ideal solution is you can put an electric pump out there in an enclosure and protect the electrical supply and whatnot. It can actually handle quite a lot of heat and doesn't need to breathe air through it to operate. Run your cables underground to a good safe location, like in an adequate spot where you can build an enclosure or run it in a shed or something like that, and have a generator run in that remote, more viable location rather than a location right out near your water source.

14. Poly pipe

A gravity-fed petrol pump from a dam to the pump functioned perfectly, but the poly pipe leading down to the pump was only 150mm under the ground, and when the tree roots caught fire, it put holes through the poly pipe, and so the supply failed. Lost the house, learnt the lesson.

Justin Leonard

A lot of people actually think that water-filled poly pipe will do okay because it's got water on the other side. But, in fact, it prolifically fails when it's exposed to direct flame. And I guess the other angle to think about with pumps is: a lot of them are supplied with enough fuel to operate for an hour, possibly two, and they're often connected to a water supply that can last much, much longer than that. And having that tank full in the first place is step one, but the prospects of refuelling it while there's active embers in the air isn't very exciting, particularly if it's a petrol pump. So, that's another tick for the remote generator with a fairly significant-sized tank. Or, it's in a relatively protected environment that you can safely refuel it.

15. Ember attack on windows

What can you do to prevent ember build up, or prevent the adverse effect of ember build up, on timber window sills with single-glazed glass?

Justin Leonard

Protect them with a screen that actually fits flush with the outside of the entire frame, so the screen protects ember entry to the actual timber surface as well. The other one to consider is some novel painting products that provide some degree of combustion protection, spray systems that are dedicated to spraying on that window itself, shutters, are all reasonable options to pursue.

A few side benefits of screens are the debris impact protection and a bit of radiant-heat protection from your plain glass windows, and a few other things.

16. Steel mesh window protection

How can we do our best in a do-it-yourself window protection at a more affordable price than roller shutters? If we don't consider heat flux the main vector of threat, will steel mesh be the best for protecting against branches and debris?

Justin Leonard

A steel-mesh system offers you quite good radiant-heat protection, and a good rule-of-thumb is that if you look at the mesh you're possibly going to use, it'll have a shade rating, which is the amount of light filtering it offers. So, let's say it's a 50% shade rating, that actually means that it halves the radiant heat or filters out 50% of the radiant heat that's trying to get through it to your window glass. So, it does provide a significant amount of protection. You can get higher-rated and lower-rated shade ratings than that. The critical thing though with installing mesh screens is that obviously the pore size has to be smaller than 2mm to offer some ember protection, but the framing that it's secured to needs to be metal as well, and the means that it's joined to that frame needs to be metal.

So, some of the really common cheap framing systems that have a push-in polymer bead to secure them just simply don't hold up in a bushfire, because that polymer bead melts out when any degree of radiant-heat's applied to them. So, you need to move on to some type of crimping or some better secured screen system. And they're definitely around if you look hard enough, and you can get some sort of DIY frames and mesh systems.

17. Preparation and response capability

In 2009, when our home in Strathewen was threatened, I thought I was reasonably well prepared. I mowed the grass down to the dirt and there was a lot of bushes nearby, and I had no idea of what it would really be like in that sort of sandstorm of embers that just keeps coming and coming and coming up. I was imagining being outside and going around putting out spot fires for some reason. I guess lots of people did. And one of the things I discovered pretty quickly was I actually needed a team of people.

I watched the fire move slowly towards a shed and burn a \$100,000 worth of tractors, but I couldn't leave the house because that was the thing that I wanted to protect the most. And then when my water pipe failed, of course, the house was lost. And so, I was naive, but I guess one of the things that came back to me was I had focused on putting out fires rather than what you've been talking about, which is stopping them from starting. And I suspect that there's a lot of people around like me who start to think about having lots of water and lots of hoses, and, yes, you can find yourself in trouble pretty quickly.

Justin Leonard

We do certainly find that houses with one active adult looking after them certainly has one level of likelihood of survival. But you go and add two or three adults to that house and its prospect of survival more than doubles and triples. And it's simply because of that not-enough-hands prospect. And I guess that is a really important aspect is you're going to have simultaneous ignitions and processes unfolding and the question is: can you recognize them early enough and get to all the all of them quick enough in a safe way for that to be the case? So, elimination and passive is the golden rule, and that's the best way also to be able to confidently leave your house in a bushfire event and feel confident that it's going to be there when you get back? An ideal house is one that just doesn't need you helping it.

18. Landscaping

Can the upslope be protected by landscaping and planting trees and shrubs that provide a potential slowing effect on the fire?

Justin Leonard

Most definitely. And not just a slowing effect, but actually a significant radiant-heat barrier between you and the active fire that's coming up the slope. So, if you remove, like following the 10/30 and the 10/50 rule if you remove all the surface fire and have either a green lawn under tree canopy or low flammability plantings, the trees and the tree trunks will offer you radiant-heat protection from that fire that's further back. And that's actually, in virtually all cases, much better than having complete clearance between you and that unmanaged bush that's at the 30m or 50m mark. So strategic planning of low-flammability plants and hand-established canopy trees are a really good asset to have between you and the fire.