

## **Topic 7 Building Elements Subfloor, windows, doors, paint**

Chair: Malcolm Hackett OAM

Presenter: Dr Justin Leonard



### **Justin Leonard**

Stored material under houses is a massive issue. The best design houses are simply not designed to handle the types of fuel loads that are possible to store under them. So, don't do it unless the subfloor space is fully enclosed and ember tight to the same standard as your living area.

### **Chair**

Here's a person who said, "We're often faced with two or more priorities to be balanced. For example, do we protect our house from ember attack, in which case the house might not be inspectable for termite attack. How do we rationally balance which hazard to protect against?"

### **Justin Leonard**

No straight answer except that I guess when you look at the ways to ember proof a house, there's, say, we're talking about ember proofing a subfloor, you can fully enclose your subfloor and then obviously get into that termite access challenge. Or you can line out the entire subfloor area, assuming that debris can get in there, but if it gets in there and burns, to some extent it can only act on a shield or a barrier. But that barrier again is an inspection question around it. So, I think you really just have to look at the whole gamut of questions and make those independent trade-offs and pick your path.

### **Chair**

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.

### **Chair**

The screen sounds like a good idea, it does not rely on anything else other than the screen itself, which kind of appeals a bit.

### **Justin Leonard**

And a few side benefits like the debris impact protection and a bit of radiant heat protection from your plain glass windows, and a few other things.

## Chair

Here's another question really about windows. 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 two mil 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 DIY frames and mesh systems.

## Chair

We've got a question here from someone who has a lot of windows facing north, not double glazed. What's the cheapest way they can do something to help reduce the risk of them breaking and letting in embers. They can spend more in the long term, but they want to know something that's quick and affordable and a way of doing something now. Perhaps window and door screening that's removable and storable, and they could bring it out on extreme days when they leave the area. What do you think about that?

### Justin Leonard

Yes, certainly, they're DIY homemade metal mesh screens, like flywire screens. A flywire screen, when you buy the flywire itself, it gives you a shading factor. So, a percentage shading factor might be 30 percent, might be 50, well that's actually the percentage of radiant heat that will prevent reaching a window. So that already gives you some degree of protection, and in the event that the window still breaks, you've got an ember screen trying to prevent rapid ember ingress into the house itself, so it gives it that angle.

And, I guess, next level up from that is actually the DIY non-combustible robust shutter that gets clipped in place as well. Either way, it should be all metal in terms of framing the element that's held in with the framing, and the fixings that hold it to the windows. And, I guess, the question of "take them all out of the shed and put them on," that's quite a bit of work. Even better are the types that kind of fix to the house and they're kind of readily deployable, and out there invisible, but not necessarily suitable for all house designs.

## Chair

How does double glazing and safety glass help or hinder fire protection. And how much do window frame materials matter?

## Justin Leonard

Really good questions. Interestingly, double glazing itself doesn't necessarily offer significant more protection than single glazing. It's actually the type of glass that has the most influence on the likely survival of that window to radiant heat. So, plain or normal float glass, the common plain glass, doesn't really stand up to more than around  $12\text{kW/m}^2$  of radiant heat before it cracks, and can crack so prolifically it can fall out. So if you think of a double glazed window that's simply got two layers of plain glass, the first one will take most of the heat and crack and fall away, and if the radiant heat persists it simply then acts on the second sheet and it eventually cracks and falls away as well. So, a double glazed unit is a marginal improvement because it's a two-stage process. But, in reality, the most important thing is that you've got a more robust type of glass in place.

And the obvious and most common one is toughened glass, which survives to a much higher radiant heat. So we're talking about more like  $40\text{kW/m}^2$  of radiant heat before it could crack. And it seems to do that because the edges are all ground nice and smooth and it's got a special treatment in it which is the reason why it's called toughened glass. So it breaks into small crumbs, and for some unusual reason the way they heat treat that glass gives it its special performance to the radiant heat from the fire.

There's some pretty other really cool glazing elements that do really well, and that is things like glass bricks and wired glass, are very high performing and even much higher performing than toughened glass and can be actually quite cheap depending on the application. And it's also worth, on that topic of glass, saying that laminated safety glass, the glass where it's two layers of plain glass with a plastic between it to make it a laminated safety glass, isn't any significantly better than plain glass.

## Chair

What about the frame materials?

## Justin Leonard

Obviously the frames, as you've mentioned before in your example, the debris can build up on it and act on the frame and cause it to burn. The localized burning is another heat action on the glass, which can cause early failure. So it's much more important to move to a non-combustible framing material than a combustible one. And, if you're really looking for the ultimate performance, a non-combustible one with high temperature seals in that non-combustible framing gives you the ultimate protection. We've seen quite conventional aluminium windows with toughened glass in them, they can actually start to fail because the plastic beading between the aluminium and the toughened glass melts and allows the glass to drop. So there's certain window manufacturers actually offer a higher temperature seal to really make that a complete system.

## Chair

I was looking at that slide of the garage roller door, and I'm listening to you but I'm trying to work out now: how would I deal with that? 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**

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.

## **Chair**

What's your view on fire retardant paints?

## **Justin Leonard**

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.