

Topic 5 Roofs Polycarbonate, fiberglass, skylights, solar panels, evaporative coolers



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Chair

Here's one that I'm concerned a lot of people do. Do polycarbonate roofing products like SUNTUF guard adequately against bushfire embers?

Justin Leonard

Really interesting question. So, what we've found is the all polycarbonate materials, where they're used externally as a pergola, shade or an extension off the side of a house unenclosed, when there's a local flame source acting on it, it can melt and drip away like honey from that flame source. But it doesn't burn in situ or carry a fire or an additional heat load to its adjacent elements, it just simply melts and falls out of the way. And the only times we've really seen it burn and act as a flame source is when it's formed quite a significant wet molten puddle on the ground and then continued to be heated by an external source until you finally get that puddle to burn.

So, it doesn't seem to be a particularly problematic thing but, certainly, the fact that it melts away from a heat source means that if it's used as a skylight in the house itself, or as a window glazing element, it's going to potentially melt or fall away from a relatively small heat source and therefore open up the house and not act as a barrier for embers to get into things. But, certainly, a good go to material for external material that hangs off or has some external connection to the house.

Justin Leonard

There's also many other ways debris builds up and interacts with other features on our roofs. In this case, we're showing the interaction between a gutter and an overhang which has a polycarbonate roof covering. This scenario here is not of a particular issue, but it just shows you how a small source of fire can interact with such a glazing element. Now, if those glazing elements are actually fiberglass reinforced skylights they're the ones that have a matte finish and you can see fiber through those coverings, they are extremely ignitable and will, in themselves, carry a fire from a gutter line all the way to a house. So, if these are present, or used in your house, they should be removed and replaced by a polycarbonate alternative, which acts in a far more benign way because it doesn't burn in situ and carry a fire across the roofline to your house.

And, in fact, here's an extreme scenario where quite an aggressive fire arrived and exposed this polycarbonate covered patio area. And, in each case, the polycarbonate did not burn in situ, but melted and drooped in position, but did not add any additional fuel load to the house itself. So, while it does melt and droop, the risk that it presents is benign in a bushfire.

Chair

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.

Chair

We've got a question here about bushfire proofing skylights. What do we know about that?

Justin Leonard

Well, skylights come in every shape and size but, unfortunately, they create an inconsistency in the roof profile. So, any inconsistency or protrusion is a place for debris to build up on and prop against. So it's another potential place where localized flames can start to play on the adjacent sky lighting elements. And I guess skylights are made from a whole gamut of weird and wonderful things, from acrylic plastic to polycarbonate plastic to different types of glass and glass framing and whatnot. So, it's a little bit like looking at the diversity of windows and approaches with windows, that you can have many different design elements that's part of a skylight that then play out as potential issues if flames can attack it, radiation from an adjacent fire front. So we really have to put that on the table as a sensitive or vulnerable element to whatever the house is being dished up with.

Justin Leonard

And wind and wind-blown debris is another one of those really key factors that can drive embers up. And I've purposefully put a skylight in here because they're probably underrepresented in our broader context, and it was great to hear a question specifically about them. Addressing the details of how wind actions can play up, it might disturb a skylight or it might blow debris up against it that's readily ignited from an ember attack. And just looking at all of those actions in combination I think is really key.

And I thought this was a really great photo set that actually showed a recognition that a skylight by design could be an inherent weakness on the roof. And the top picture is actually the drop over protection box that's put over these skylights during the peak summer season as a direct way to address that factor, from wind actions acting on it, and I guess all the other it's also an effective radiant heat and ember attack factor. It's a real multifaceted design mitigation feature for this particular element.

Chair

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 firefighters 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.

Chair

Here's some people that are thinking of putting solar panels on a Colorbond roof. What's your thoughts about that?

Justin Leonard

Obviously the way it's fixed and the way the cables are routed into the roof cavity are potential details where you don't want to create gaps by the addition of the solar panels. The wide range of solar panels on the market don't really represent a significant problematic fuel load added to the roof. And there's not a lot of evidence to show that that the ignition of the little amounts of combustible material that is represented by the solar panels is enough to cause a problem to the adjacent Colorbond roof, so I would say it's a relatively neutral thing to consider and add to the process. It'd be interesting to look at the specific ways the tracking and fixings are put on and whether they are relatively sympathetic to letting the debris land but blow off, so they're not put on in a way that allows significant debris to build up on the roof.

Chair

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 actually fit an override switch to them that allows you to re-circulate 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.

Chair

That method, is that just for a clever electrician and plumber or is it possible to purchase that approach off the shelf?

Justin Leonard

I'm not sure. I haven't seen a kit specifically aimed for that but I have seen a couple of models that have a self-cleaning cycle that does something similar.

Chair

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 75 kilometers 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.