Bushfire Resilience Inc. Webinar 1 2021. Presentation 1

Reduce your house and property risk

Chair: Malcolm Hackett OAM

Presenter: Dr Justin Leonard

Chair

Our presenter tonight is Justin Leonard from the CSIRO. Justin has dedicated his 26-year research career to the understanding of how bushfire risk to life and infrastructure can be managed. This research combines learnings from bushfire exposure experiments with bushfire survey investigations and computer modelling of bushfire interactions with buildings. Justin's 2020 presentations were very informative and engaging and the audience responses were overwhelmingly positive we are very grateful for his continuing contribution.

Justin Leonard

Thanks for that introduction Malcolm. It's great to be back.

I think opening this forum I thought I'd try to do a bit of framing around bushfire, from a context that really bushfire's driven by not what we managed to tackle or put on the plate, but it's defined more by what we might have missed or overlooked in a preparation, or in the actions we take on a given day.

So, I wanted to really start with the concept of a checklist. And not the traditional checklist that we talk about on what we prepare for and what we do on the day, or how we how we plan our hierarchy of approaches on the day. I'm talking about a checklist of what actions a house might be faced with, and what considerations we might use that checklist of mechanisms that could attack a house to really deeply consider how our house and surroundings might respond.

So, here's my checklist to cover off the various attack mechanisms that could interact with the house. Now, I've broken it into some deliberate categories. We've got the large fire front, which is that big archetypal thing that we commonly associate with the fire that brings that radiant heat and potential flame contact. We've got ember attack and all of that wind-blown debris that is yet to burn. So, that ember storm but also the debris field that comes and fills up everything during the event.

The combustion of adjacent buildings. So that might be your neighbour, might be adjacent sheds, adjacent combustible objects. This could be anything, this could be a fence, retaining wall, a wood heap, a wheelie bin, pretty much any combustible object that's either mobile or fixed that then acts out and acts as another heat source to either your house or your egress paths on your property.

Surface fire isn't spoken about very often, but it's actually a very ubiquitous action, which is the burning of any surface fuels adjacent to, or under, or against your building. And those surface fires are also very challenging because they present real difficulty for you to navigate the surrounding landscape around your house if you're forced to leave your house, if your house happens to burn. So, these surface fires are different to large fire fronts.

Large fire fronts move through very big structured fuels but surface fires burn out that low level surface material, it might be dry grass, mulch, tanbark, any combustible surface. And in a sense that debris that comes with an ember attack that blows over the ground can actually build up and cause small surface fires on things like decks and walkways that would otherwise not be combustible.

Tree and large branch strike. The fire actions themselves can play up against trees, they can find and exploit knots and defects in trees, and, if anyone's been through a major bushfire event, the constant sound of trees falling over in the distance, hopefully quite distant, is quite ubiquitous throughout the fire event itself and for hours and hours afterwards, because the fires are acting on the trees. And that's not accounting for the wind and the wind loadings that push those trees around as well. That's another layer of question and issue.

The wind and wind-blown debris has an action and an attack mechanism in itself, and this is deliberately brought out as an individual line item because the winds are always associated with the reason why it's a bad fire day, but the winds themselves and the debris that they can carry with them act on the houses as their own attack mechanism. So the wind-borne debris can impact and break windows, the winds can dislodge and shift any facade or roof tile or system. So depending on the load they can cause this superficial damage that makes all the other actions potentially quite challenging for an otherwise fairly robust house to get through the process.

I've also included smoke, which isn't really an action that upsets a house itself, but because these houses are inherently a shelter, or potentially a shelter for its occupants, the smoke and how the smoke plays or gets into a house or whether the house itself is a source of smoke plays out in that human exposure dimension. So it's an important factor when considering how we prepare our houses and how we act on the day, and what type of PPE and preparedness and physical health context we consider around that smoke human exposure factor.

Now, this checklist, all things aren't created equal and certainly, as Malcolm duly pointed out, everyone's circumstance is not created equal by any stretch of the imagination. And as well as every fire event comes with its own specific level of intensity and direction and how it unfolds. So out of this checklist, what's really important is to understand which aspects of those actions are actually ubiquitous to every fire. So what I've done here is really highlighted and emboldened the things on this checklist which you pretty much cannot untick. You have to have to deeply consider these attack mechanisms because they are ubiquitous with every fire event and every process.

There's always embers, there's always surface fires acting around your property, there's always wind and wind-blown debris context that either is intense enough to be a direct action in itself or simply adds an important additional context to everything else and smoke exposure is ubiquitous to all fires. So we pretty much have to keep them all completely ticked and not overlook their importance and ever presence. And I guess these things are also ubiquitous because they persist for a certain time before the main fire event comes and passes, and during the event, and for hours and hours after the event. So they're ubiquitous for a whole range of reasons and I can't over emphasize these four of the checklist enough.

The other ones are highly contextual, and for a number of fortunate circumstances, some of these ones can be either never ticked because you might not have a close enough or intimate exposure to a large fire front, you might have sufficient separation distance, and there's lots of different ways to have that discussion about how far you need to be from certain types of bush and in certain types of circumstance.

There's adjacent buildings and the fact that separation we might be fortunate enough to have sufficient separation from neighbouring properties and property boundaries, and we may have a good setup where we're at least 6m or more from other buildings and structures on our actual property, but in some cases we don't and therefore we have to include that and deal with it.

Adjacent combustible objects could be fixed, like fences, or they could be movable, like caravans and wheelie bins and things. And I guess that context of fixed ones means we have to tick it, but also, I guess, those ever present mobile things can't be overlooked, and particularly in that preparation phase where we're really lining ourselves up and getting our thoughts and actions in place around being ready and configured well for a fire season.

I guess trees and large branches is another one that really comes into its own when we're within tree striking distance of adjacent large trees, and obviously it's not that hard to work out whether we're at least one tree height away from these things, so as a tree falls down it doesn't actually physically impact the house, although there is that small context of where, under very extreme wind events you can actually snap a branch off a tree and, even though it's quite a heavy branch, you could travel something like one and a half to two tree heights laterally before it hits your house under those really extreme wind conditions. So a little bit more clearance as always adds a bit of comfort.

Now, what's important out of this list is to really consider the iconic large fire front and the radiant heat that it brings is certainly the poster child of really what happens in a bush fire. The news and the imagery certainly draws us to that very iconic aspect of the fire, but what's really important to emphasize is that well over 80% of all the houses that are lost in these bushfires is actually lost without any of that large fire-front action actually playing a role in the house. It doesn't get close enough to present the radiant heat and it doesn't get close enough for the flames to physically interact with the house.

So, 80% of loss actually is left to these non greyed out line items. So ember attack, adjacent buildings, adjacent combustible objects are the factors that actually end up playing out and being most responsible for loss in fire. So, once again, these are particularly useful ones to highlight if they're a tick for you specifically.

And I guess what's also quite interesting, there's quite a lot of us in different circumstances, whether we've got a house that's been built to regulation, or we're using regulation as a bit of a guide to what we need to do in our preparations, or we're anticipating building to regulation, what's really important is regulation, both planning and building regulations, deal with the first two line items. So they deeply consider how far we are from the bushfire, so you would have heard of Bushfire Attack Level assessments and BAL assessments and things, all deal with how large could the fire be, and how close I am to it, therefore what have I got to design for. And they also implicitly try to design for and consider ember attack within some bounds. They certainly only try to specify and do that within 100m from identified problematic fuels and then not really deal with it after, but that's an internal regulation issue.

All the lower line items are only partially or not considered at all by building regulation, so they really fall to dealing with these things on an individual due diligence basis, which is quite a lot of deep consideration to work through really.

Adjacent buildings beyond property boundaries are simply ignored by regulation. Adjacent combustible objects are the responsibility to manage.

Relocatable adjacent objects are not a factor in consideration for regulation. The combustibility of fences and retaining walls is not considered as something that regulation attempts to recognize or design for. It doesn't really account for surface fires and how they play out, so a mulch garden up against a house is a fire source not really considered within regulation.

Trees and large branch strike: not really considered at all.

The wind actions and wind borne debris are not considered at all in regulation. In fact, they just assume that the Wind Loading Codes and the requirements of how Wind Loading Codes are dealt with for your given region are enough to not deal with that superficial damage to the house. But when you actually open a Wind Loading Code and really unpack it, the Wind Loading Codes are more about preventing your roof being blown off your house, and not dealing with the issues of superficial damage. So, really, that then falls to thinking about additional measures and being quite detailed about how we design the specific aspects and features around our house to deal with that.

And smoke and human exposure is not a factor in building regulations. It's not a design objective when we're looking at building and planning regulations, so once again it falls to individuals and individual circumstances.