Alternative Technology Association
Presentation at the Melbourne Branch Meeting
21 Oct 2009

Building Sustainably in Bushfire Prone Areas

This summary of the three presentations was made in good faith by Paul Fritze pafritze@gmail.com, based on notes taken at the meeting. Always refer to official regulations & communications.

1. Rob Freeland
Amcer Earth Building Technology P/L[1]

Rob's business is in earth bricks and buildings. Immediately after the February 2009 fires, he was given permission to survey buildings in bushfire areas to determine how different materials survived. He spent ten weeks taking hundreds and hundreds of photos and has prepared a submission to the Bushfires Royal Submission[2].

His property is at Nutfield about 4k from Strathewen. Last year he spent eight days preparing the property as he knew the season was going to be bad. Ironically, during the fires the wind changed when the front was just 4 min away; if it hadn't, it may have caused major damage in Hurstbridge, Diamond Creek, Wattle Glen, then Eltham, Research, Park Orchards and on to the Dandenongs.

People need to be aware of and manage their risks – the level is a lot higher than previously thought. It is not just about the appliances and staff. There is a lot of luck involved: some people were lost while others survived; cedar houses survived while brick ones next door were lost. In bushfire areas we have to accept there is a high risk, just as in the city there may be risk of pollution. We've got to look at how much warning we need – and how much was given. On the ground we need to prepare by clearing ground fuel, preparing firebreaks, hoses, pumps, equipment, etc.

There have been Royal Commissions, hearings and recommendations from the 1940s onward but how well have these been utilized? For example, the question of deciduous trees around houses. Governments needs to be up front with problems and what we can do so that people are warned. We need planning and adequate warnings.

We've always been told that the sustained part of a fire front would last ten minutes. Now we are seeing fronts of 45 mins – and then after saving the house, a wind shift brings the fire back and it's destroyed. One of the problems has always been whether to stay and defend, or leave. We now have a third factor: how to survive in a bushfire. Many existing houses had lightweight glass or inappropriate construction. We need to learn from this, but unfortunately a lot of technical information was lost in the immediate cleanup after the fires.

Rob's experience of going into Strathewen immediately after the fires: not a noise, no life, no leaves. He showed remnants of aluminum window frames melted into a puddle (640°C). Glass bricks also can melt (1500°C) as can window shutters over windows. Steel frame buildings distort if heated in one corner. Besser bricks explode exposing the internal wall to the fire. Normal fired bricks de-laminate, losing 10-15mm. Cement mortar was destroyed and bricks drop vertically into a heap. Double brick faired much better than brick veneer. Earth bricks are better and earth walls better again. Many people seemed to survive in the latter. They did not report loss of oxygen quality as the fire went through. We need more research into exploding houses. Gas cylinders appeared to blow out, rather than splitting suggesting that they would have flared rather than exploded.

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[1] AMCER Earth Building Technology http://www.amcer.com.au/

[2] http://www.amcer.com.au/articles/articles.htm

In one earth-walled house, the family of five sheltered in the pantry as the fire front went through. The internal temperature rose only 1°C. After the front came through a second time, they mopped down the window sills etc, thinking they'd saved the house, until a puff of smoke from the ceiling appeared. They had no ladders or tools so the house was lost: "the house saved us but we couldn't save the house". The sad thing was that two other people were due to shelter in the house also, saying they'd be back in a couple of minutes but never make it.

Fires go over, under and around houses. The biggest issue is to shelter from radiant heat – an internal stud wall doesn't offer much protection once the outer wall is breached. Rob observed how even the ground was burnt, in some case exposing pipes 600mm under the surface.

The Australian Standards for building in bushfire prone areas have lots of good points but problems with some recommendations. Some businesses are pushing products. The code needs to be renewed but we should learn from the recent experience. We need to look at what can be done; how to design buildings, and what materials to use. One of the biggest problems is that there are so many inappropriate plans being pushed for these areas. Our rating system in fire areas needs to be looked at – there is too much expediency overriding practical assessment and design consideration. Rob observed that many people in earth buildings seemed to have survived, but there are still a lot of lightweight buildings going up. Of course there are many exceptions, but we can't rely on good luck in the future.

Questions:
Shelters? None of the people Rob spoke to seemed very supportive of shelters – people were injured or just couldn't get to the shelter. His recommendation is that no building is going to be 100% safe, but there should be at least have one room with a fire door to the outside and another to the inside of the house, with 4 hour rating earth walls and ceiling. We need to look at remote shelters, e.g. in converted septic tanks, but if over 15m away you may not make it. If it's within the roofline, it can be equipped with water and communications, etc.

Concrete spalls very badly but a 6" thick concrete water tank will stand up to the fire. With a ferro-cement tank however, the outside blows off back to the reinforcement, then the inside blows off and it's useless. With good design, fire brick, autoclaved [concrete], even Besser blocks protected by another layer, are ok. Fibro cement sheets these days are very good. There are options available, but you need to do your research. Government specifications refer to a range of 1090°K but these fires may have been up to double that.

Concrete tanks could be protected with an earth mound or wall – this is easy to do in the country.

Links:
Rob's submission and other technical articles prepared by AMCER http://www.amcer.com.au/articles/articles.htm

2. Sven Maxa
Maxa Design Pty Ltd
http://www.maxadesign.com.au/

Sven has been in building industry for 13 yrs and is interested in sustainable building design and has applied this to building in bush fire areas. He began by discussing the new building regulations. It is tricky to summarise the discussion here so please refer to the links below for more info. This is a related extract from 'A guide to assessing your property's Bushfire Attack Level (BAL)', Building Commission 2009[3]…

> *"Victoria acted to become the first State to adopt the Australian Standard AS 3959-2009 through its Building Regulations 2006 on 11 March 2009. The new Australian Standard applies to the whole State, and sites are now defined under six Bushfire Attack Level (BAL) categories from low to extreme. There are increasing construction requirements ranging from ember protection to direct flame contact protection."*

Sven went on to indicate how different construction materials might meet the requirements of different BALs. These range from Low, 12.5, 19, 29, 40 to FZ reflecting increasing levelsof risk from ember attack, radiation and direct flames. For example, bushfire resistant timbers are acceptable up to BAL 29. Be careful with recycled timber, which may be drier. Steel cladding is OK up to BAL 40. Masonry, mud brick, Hebel blocks are suitable for all BALs, 6mm Fibro cement sheet OK for BAL 29, 9mm to BAL 40.

The new Green Energy Brick[4] has been tested to insulative rating of R8 and is scarcely marked by an oxy torch running flat out on it for five min. Cutting edge stuff – look at closely as an option in fire prone areas.

The BAL system allows you to have any material you like tested. You need a letter from CSIRO or other testing authority. then you can use the material. For example, one company had a 300mm solid cypress wall certified for use in a FZ.

Sven outlined a project he is working on near Gembrook that will commence soon. They first did a Wildfire Management Assessment to determine the threat of fire. As it was in grassland this was relatively low - the planning permit came back from the CFA with a BAL 12.5 rating. The design uses corrugated iron cladding - should be good for ember attack and keeps cost down. Limited timber is used for doors and window frames. Interestingly, the Australian Standards only require certain timber species to be used within 400mm of deck or ground. Timber decks are permitted. The design is based on a wool shed style and uses passive design techniques, such as internal thermal mass walls.

Alternative walling systems may be suitable, but are yet to be tested. Some fire testing has been done on straw bales (a "fantastic material") but he doesn't think the testing is reliable enough at this stage. There are no Australian Standards defined yet but a lot of potential. Similarly with rammed earth! Typical roof materials of tiles or sheets need to be non-combustible and fully sarked to provide a good shell giving ember resistance.

The Australian standard makes no reference to bushfire sprinklers or gutter guards, other than to say if present, they must be non-combustible. Generally the Standards state that gaps need to be less than 3mm throughout the home. Interestingly, timber storm molds can be used with all BAL levels.

Note that the Australian Standards are the minimum standards - don't be afraid to go further!

Questions:
Timber decking: Depends on BAL rating. Need to get literature that says a certain flooring 'system' meets test criteria to comply with AS 1538.2. The standards suggest that the decking "shall be either

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[3] A guide to assessing your property's Bushfire Attack Level (BAL): http://www.buildingcommission.com.au/resources/documents/Building_Commission-BAL_Guide_(3).pdf

[4] Green Energy Bricks http://www.greenenergybricks.com/

spaced or continuous" [laughter] and there is no requirement to enclose the sub floor space. You could use cement sheet product but it won't look like a traditional deck.

Flame retardant paint: Several around, but need to do your own research on whether these are suitable, particularly within Flame Zones. The fires in February were beyond 'Flame Zone' – 'Flame Zone Plus…'

Links:

- The Bushfire Recovery and Reconstruction Authority - a central point of contact for all recovery and reconstruction information. www.wewillrebuild.vic.gov.au/
- CSIRO articles and research: http://csiro.au/science/bushfires.html
- Timber design and construction in bushfire prone areas http://timber.net.au/bushfire/
- Yourhome Technical Guide: fact sheet outlines essential design issues for buildings in bushfire prone locations http://yourhome.gov.au/technical/fs35.html
- Building Commission consumer bushfire advice http://www.buildingcommission.com.au/

3. Lynne Stone
Marysville resident
http://www.bloomingthreads.info/

Lynne is an artist and was a member of the Marysville Sustainability Committee. She was a resident in a retirement village destroyed in the February fires. In this presentation she offered some first-hand experiences of rebuilding in a bushfire area. She is working with members of the Melbourne Branch of the ATA to plan and build 8 new units in the strata development.

The BALs[5] seem mainly commonsense, however there are issues. For example, anything above BAL 12.5 requires toughened glass, which sounds good, but not if it shatters every time you shut the window. People are making compliant products but because they've fast-tracked the BAL system a year earlier than planned, manufacturers haven't yet come up to speed. The main problem is that everything takes ten times longer than you think. To get the building permit takes one month, even if fast tracked – important as there/s limited good weather.

A solution to the problem of town amenities was to fit out the empty car museum as a supermarket. The negotiations to buy it however took six months and hope to finish by December – and that's one of the 'quick fixes'. People have been very helpful, but "I'd wish they'd ask us what we need". Sometime the scale of constructions have not fitted with the needs of the town. 15 houses have now been rebuilt out of the 420 destroyed (another 18-30 survived). Better than none! Lynne showed a map of the rebuild[6], slides[7] of her property after the "Grocon constructor fleet had been through" and flatpack dwellings that have been put up. The "great piece of architectural delight" of the Motel survived, as well as a little timber cottage – goodness knows why. Next door the 80yo resident climbed into his empty swimming pool and survived. Talking about straw bale houses – one in town did very well through the fire, until the vinyl weatherboards on the house next door set it off with radiant heat.

Politicians have been wonderful. Fran Bailey just hasn't stopped. The council has had 60% of their shire go up in flames, so has the income from rates. The Government has stepped in with an administration committee to keep them going.

On the subject of bunkers, she "wouldn't go near one in a fit". Her plan is to put everything into her camper van and go. She feels badly for areas that weren't touched this year as they'll facing it this year big time. Will they get the outpouring of help they got? People have been wonderful, but "if I get another cake of soap or toothpaste, I don't know what I'll do!"

Questions:
Rebuilding the retirement village: She's had several false starts with help developing plans for the village, although recently an architectural student from Melbourne University came up with some "beautiful ideas" as part of a student project. 8 months on, she's still trying to work out what they'll do. She's ready to reinstall the replacement 3kW PV system, although is still getting odd letters from the electricity company saying they still trying to work out her bill from the last one, which was installed in Sept 08. The property got a BAL rating of 12.5 kindly done by an ATA volunteer.

If you look with a microscope, things are happening, but only just!

Postscript:
Lynne forgot to mention during her presentation that businesses in Marysville need business to keep them going. There were lots of visitors during the ski season which helped greatly, but numbers have been dropping off. She would like to remind people that summer is a lovely time to visit!

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[5] A guide to assessing your property's Bushfire Attack Level (BAL): http://www.buildingcommission.com.au/resources/documents/Building_Commission-BAL_Guide_(3).pdf

[6] Marysville map of rebuild http://www.ata.org.au/wp-content/uploads/Marysville-8MonthsOn.jpg

[7] Marysville - after the cleanup http://www.ata.org.au/wp-content/uploads/Marysville-North.jpg