BUSH FIRES AND TROPICAL CYCLONES

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INTRODUCTION

The two main natural disasters that Australia has to contend with are Bush Fires (USA Wild fires, Europe Forest Fires) and Tropical Cyclones (USA Hurricanes, Asia Typhoons). This paper is on how studies from these two types of disaters have resulted in changes to building regulations in designs to resist damage from these events and how emergency services are coordinated to manage these events prior during and post their occurrence.

BUSH FIRES

These play a part in the ecology of the Australian vegetation. Some of the eucalypts require their seeds to be heated well over 100°C to germinate. Unless there is a fire within these forests the seeds from these tress will not germinate. As cities expand the fringe is continually impinging into the adjoining forest areas. The following gives a history of the major fires over the past 150 years. It must be understood that European settlement of Australia occurred less than 220 years ago.

1851 Port Phillip Black Thursday, Victoria – 100+ left homeless (Aust. Population 430,000)
1939 Black Friday, Victoria -– 71 lives lost, 1300 buildings lost (Population 7,000,000)
1962 Dandenong Ranges Fires, Victoria – 41 lives lost, 452 houses lost (Population 13,500,000)
1967 Hobart Fires, Tasmania – 62 lives lost, 1300 homes, 128 other major buildings (Population 15,000,000)
1983 Ash Wednesday Fires – 75 lives lost 1511 houses lost (Population 17,500,00)
2002-2003 New South Wales – burnt for 151 days, 459 fires with a total perimeter of 10,340 kilometres
2003 Canberra Fires, ACT – 4 lives lost 519 houses lost (Population 22,000,000)

Since 1983 Ash Wednesday fires the CSIRO have been gathering data on how these fires cause loss of buildings. My former colleagues at CSIRO have provided most of the data, on damage to buildings from bush fires presented in this paper. They are still collecting data and I thank them for their valuable contribution. What has been learnt so far:

- Houses do not explode into balls of fire as the bush fire passes. This was a common myth that the press commonly reinforced in their reporting on fires. It was the most difficult myth to correct as owners who lost all their possessions like to believe that there was nothing they could have done to prevent the loss.
- Embers are the principle attack to buildings and simple design considerations can limit ignition from the ember attack.
- The bush fire front passes in minutes while houses burn down in hours.
- Most buildings ignite and burn down many hours after the fire front has passed.
- Human behavior factors increase the risk of injury or loss of life:
- Last minute evacuation places the community at greater risk than staying with their homes. There are many recorded cases where the occupants have panicked making a last minute decision to evacuate and have perished when they were involved in a motor vehicle accident while the building they evacuated survived the fire.
- Occupant behavior during the fire event by attending to small ignitions from embers is the single largest impact on the building survival from the fire.
- Perceived risk has played a major role in influencing human behavior during the fire event.

Figure 1 shows the typical environment that late evacuators can face. If you are not going to stay and protect your property it is essential that you leave early so you are not confronted with driving through the fire front.

Figure 1 – Typical of the environment across a fire front

We are a nation that enjoys living in or near the bush, and accordingly must grow to accept the risk. The design & siting of buildings is of paramount importance in order to reduce the risk of property damage and loss. The challenge to the building industry, is to attempt to reduce the risk of ignition during fires, at the same time as not causing undue restriction in the lives of our citizens. The Bushfire standard AS 3959 – 1999 'Construction of buildings in bushfire prone areas' does not require a building to be a concrete bunker or significantly different to standard construction, but there must be more focus on the design details of the building to restrict areas where embers can land and result in ignition. The first edition of this code was published in 1991 as a direct result of the research undertaken after the Ash Wednesday fires in 1983. Designing buildings specifically for bush fire areas can reduce the chance of ignition in the first place, but it cannot guarantee that the building will not suffer during a large fire event.

Figures 3 to 4 give typical examples of ember attack found on buildings after being subjected to a bush fire event. They show how the fire can progress from what was initially a small ignition source.

The random occurrence of buildings that are lost to bush fires a shown in Figure 5 is more evidence that the main cause of fires is ember attack and not radiant heat. If it was radiant heat those closest to the forest would have been lost not as the results shown in Figure 5.

Figure 2 – Ember attack at a doorway

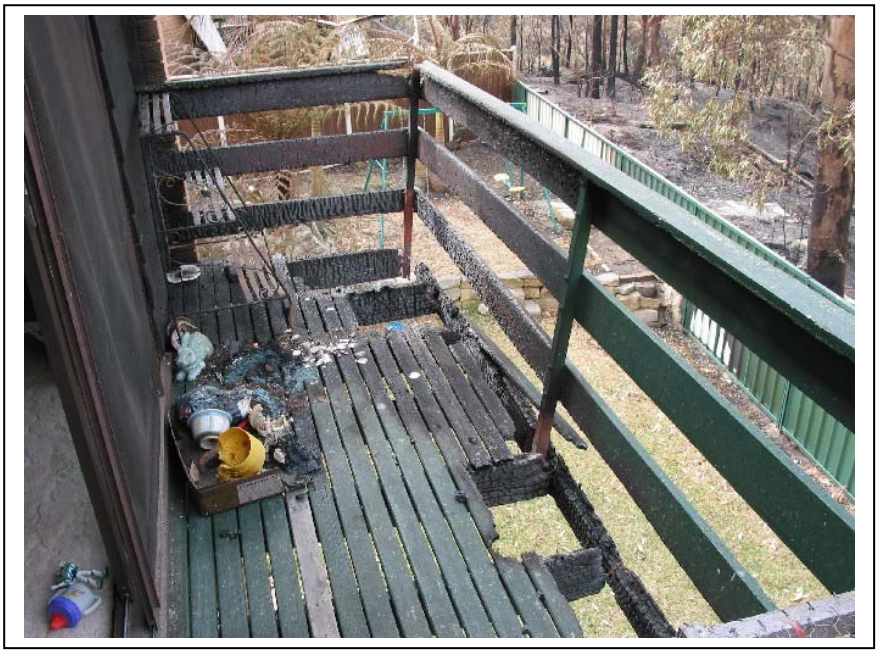

Figure 3 – Ember attack on a timber deck

Figure 4 – Ember attack at an eve lining

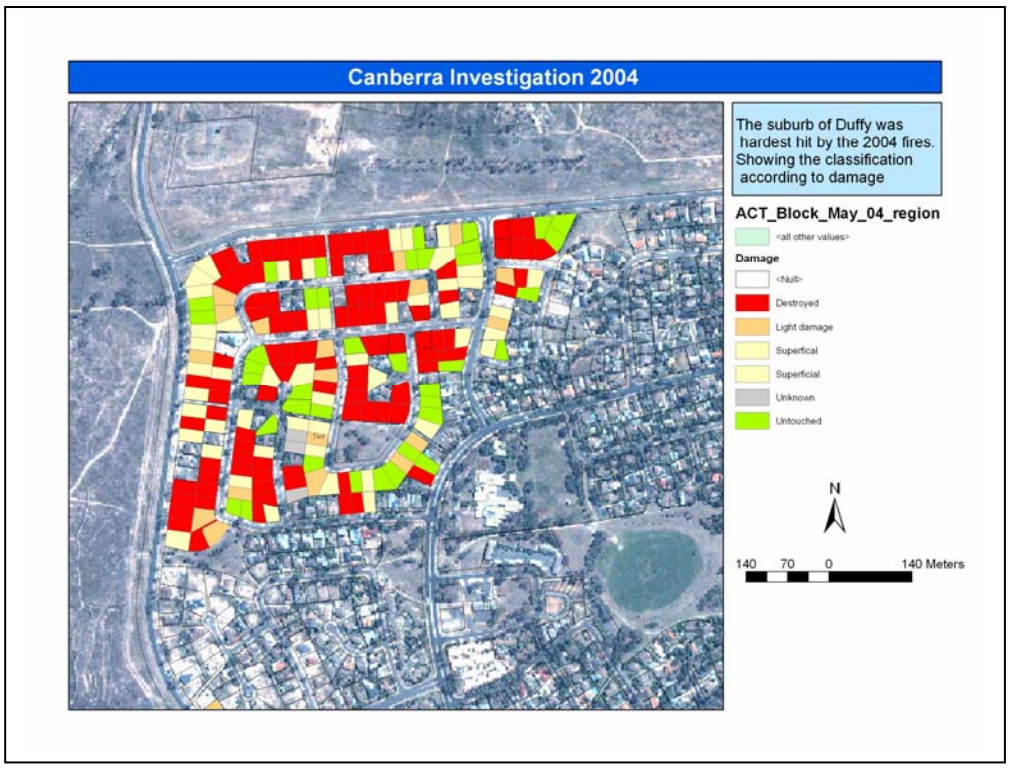

Figure 5 – Typical of the random nature of buildings lost from ember attack

Tropical Cyclones

There about 6 to 8 cyclone crossings of the Australian coastline each season which runs from mid November until late April or early May. Most cross the coast along northern Western Australian that is sparsely populated. The cyclone that caused most recorded damage was Cyclone Tracy that hit Darwin, the capital of the Northern Territory, in the early hours of Christmas morning 1974. It destroyed or severely damage over 70% of the buildings in Darwin leaving a population of 40,000 with very little shelter. Figure 1 is typical of what was left after that cyclone.

Figure 6 – Typical of the damage left in Darwin after Cyclone Tracy

The electricity supply was severely damaged which resulted in loss of water supply and sewerage. It was somewhat fortunate that earlier in 1974 the Federal Government set up a National Disasters Organisation. Major General Stretton was placed as the head of this organisation. He flew into Darwin late on December

25th. Darwin was, and still is, under Federal Government control. While Stretton did come into conflict with some civil and judicial authorities he was given total control of organising the initial disaster relief. He arranged the evacuation of about ¾ of the population to southern cities of Brisbane, Sydney, Melbourne, Adelaide and Perth. As these were all some travel distance (Brisbane the closest 3400km) most were air lifted between 27th and 31st December. On 31st December at 1:00 pm Stretton handed back control of Darwin to "Normal administration". At this stage only about 10,000 of the 40,000 original residents were left. Even to this day this is probably the single biggest airlift evacuation ever undertaken in such a short period of time. Having one person in charge initially enabled a rapid response and being totally under one level of government enabled the cutting of red tape to permit purchases of emergency supplies and other mobilization of resources with minimum delay. The death toll for such a devastated city was very small, 49 within the city and another 16 were lost at sea. There were only 112 admitted to hospital although another 400 were treated in emergency casualty facilities. The armed forces were mainly used in the resulting clean up with clearing of rotting food from both domestic and commercial freezers being a priority. Twice weekly aerial spaying was undertaken to control the mosquito population. The fast evacuation and resultant clean up without question contributed to the virtual absence of disease. Most of the above information has been derived from the following web site www.ntlib.nt.gov.au/tracy.

The aftermath resulted in a revised wind load code for the areas affected by tropical Cyclones and new design rules for construction within these areas. The initial construction that followed Tracy in Darwin tended towards fortress type designs. These have proven not very popular as in the tropical climate they are very energy hungry in keeping them cool. The reconstruction took place between 1975 and 1978 with a total of $150 million AUD awarded in contracts in 1975 dollars. The current designs built in Darwin tend to be more lightweight but rigidly braced to resist the wind loads and the living areas very open to allow cross-flow ventilation reducing the energy needs significantly.

I think it is interesting to compare the results of Tracy to that of Katrina in New Orleans some forty years later.

Statistic	Darwin	Katrina
Population	40,000	1.5 Mil
Closest City of the same size not affected	2700 km	560 km
Deaths	49 or 0.12% of population	1500 or 0.12% of population
Evacuation complete	6 days	Over 3 weeks
Number heads of departments in charge initially	1	6+
Main health problem	No sanitation or clean water supply No electricity	No sanitation or clean water supply No electricity
Main cause of devastation	Wind damage to buildings	Flooding
Warning time	Approximately 20 hours	> 5 days

From the above table it is interesting to note that the only statistics that are common is the death toll per head of population and the main health problem of lack of sanitation and clean water supply.

One of the main lessons learnt from Darwin is that while it was advantageous for immediate health reasons to evacuate most of the population, it took several years for the population to re-establish itself. The main problem with Darwin was that due to its isolation for about 12 months after the cyclone occurred the population consisted mainly of either contactors involved in the reconstruction or those supporting them. This left a very skewed population that resulted in lack of community involvement. As the permanent population slowly returned all of the community support services, sporting clubs, youth groups, school communities etc, that are highly reliant on volunteer support had to be re-established from the ground up. One female resident, Dawn Laurie, who stayed on to help with the re-construction had her two children staying with relatives in one of the southern cities. In an interview with a national radio station she reported that when the children returned after some months as they formed part of only a handful of children in Darwin, they were in continual center of interest in helping the community fill the void of a community left with so few children. She in fact stated in the interview that if she was faced with the same problem again she would never send the children away even for a few months. This disruption to a community is a cost that is hard to put a value on,

but it is a cost that we as building officials need to consider in the overall scheme of things. In the planning of places of habitation that can be devastated by natural disasters the infrastructure needs to be designed that if the need arises that an evacuation is required that it can be restored in the shortest possible time to minimize the disruption to the community so it can return to a normal state in the shortest possible time.

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Dawn Laurie – Her full interviews are available on the web site www.ntlib.nt.gov.au/tracy.