Your details

Title	Mr
First name	Max
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Submission details

I am making this submission as	An academic/researcher
Submission type	I am making a personal submission
Consent to make submission public	I give my consent for this submission to be made public

Share your experience or tell your story

Your story	I won the Bushfire Resistant House Design competition after the Sah Wednesday fires of 1983. Since then I have researched the subject, written several publications, lectured, and served as a member of the Standards Australia Committee that prepared AS 3959 -2009 Construction of buildings in bushfire-prone areas. I am concerned at the amount of misinfomation and lack of adequate public response to the increasing problem of bushfire destruction.

Terms of Reference (optional)

The Inquiry welcomes submissions that address the particular matters identified in its Terms of Reference.

Supporting documents or images

Attach files	• NSW Independent Bushfire Inquiry.docx

NSW Independent Bushfire Inquiry

1.1 Causes and contributing factors …

of buildings (predominately houses) being destroyed or badly damaged by bushfire.

1.1.1 Although it is not difficult or expensive, houses and buildings are not being built or modified to become more bushfire resistant. It can simply be a matter of applying ***Australian Standard AS 3959-2009 Construction of buildings in bushfire prone areas.*** This Standard is one of the best resources on the subject, yet it is rarely if ever, mentioned in media reports on bushfires. All Councils and building authorities must require the application of AS 3959 for all building work on bushfire prone sites. All owners of existing buildings on such sites must be encouraged (by insurance premiums or civic responsibility to neighbours) to upgrade the external finish materials of their buildings to AS 3959 provisions.

1.1.2 Failure of individuals or community groups to receive proper advice on appropriate landscaping of buildings in bushfire prone areas.

> A current TV advertisement for YOUi Insurance implies that bushfire premiums reduce **"… if there are no tall trees within 20 metres of the subject house."**

This is the sort of vague, incorrect, sweeping statement that has led to community misunderstandings of landscaping in relation to buildings in bushfire prone areas. Many native Australian tree, shrub and grass species ignite easily and burn furiously. There are a few Australian natives that are evergreen and do not have leaves that exude flammable oils, and so act as fire-modifiers or shields. There are many more European, Asian and American trees and shrubs with this quality.
In my experience, many houses have been protected from fire-damage by close-planted evergreen trees, hedges and shrubs. Such trees and shrubs will moderate fire exposure and act as a deflector of winds, specifically those carrying flying embers in times of bushfires. Planting, even within one metre of building walls need not be considered 'fuel load' – if the species are right and are well-watered, they become a fire retardant and a wind-borne ember douser or deflector.
The same effect applies to buildings on town or suburb perimeters with cleared fire breaks, these should best be fringed with fire-retardant tree/shrub species.

This is an easy recommendation to make because people do not want 20 metres of bare or paved open ground around their house or town. They want gardens and foliage. Twenty metres of bare ground can positively help a bushfire to ignite a building since having no wind breaks or ember traps, house walls trap wind-borne leaves, twigs and paper. As the fire approaches there are wind-borne embers that ignite this flammable load blown against the walls or doors.

Fire-resistant varieties of vegetation must be widely recommended for bushfire prone sites. Insurance companies need to be informed, not left to spread misinformation.

1.1.3 In respect to **"weather, drought, climate change … and … human activity".**

Predictions that climate change will cause most weather-related events to be more frequent, more severe, or both, appear to be correct. Australia's bushfire-prone areas will have an increasing severity of droughts, creating increasing bushfire fuel.

In bushfire conditions water and time is usually very limited. Yet some 'official' advice given, or just knee-jerk reaction by home owners when bushfires threaten, is to hose the walls and pavements around a house.
Generally, it is counter-productive to wet walls and pavements as bushfires approach. If it is painted or oiled boards or sheeting the wet surface will be dried by the heat well in advance of the fire striking.
If the wall or pavement is clay or concrete masonry and well-wetted before a bushfire strikes, the absorbed moisture in the masonry material, boils and expands causing the surface to fret or spall to a depth up to 5mm. The worst problem from bushfire exposure is mortar joints. Raked mortar joints spall to a depth up to 25mm and turn pink and weaken to a further depth, up to 50mm. Such damage causes walls that would have remained stable, if raked or wetted, to fall, or be so unstable as to have to be demolished.

It is a waste of time and water to wet walls or pavements as bushfire prevention.
If water and time permit wet the grass, shrubs and hedges around the house most especially on the side from where the fire approaches. This moist vegetation retains the water longer and the potential effect of the moist understory is to douse the trapped wind-borne embers before ignition.

2.1 Preparation and planning …

2.1.1 Refer to item 1.1.1 herein.

Councils etc. must apply AS 3959 to all new buildings, alterations and additions. Owners of existing buildings on bushfire-prone sites must be encouraged to upgrade their buildings to AS 3959 standard. This may be done by savings on insurance premiums, and/or by media, Council, and State Government information literature.

3.1 Response to bushfires …

3.1.1 Evacuation of people and animals is important. But where a house is built to the appropriate fire-resistant standards and the occupants intending to stay are over 15 and under 55 years old and are fit and healthy, they should be allowed to stay if they wish to protect their property. Capable residents who stay in a bushfire resistant house have been successful in dousing residual fires around their and their neighbours houses in the half-hour after the fire front has passed.
Evacuate (forcibly if necessary) anyone who does not want to stay, anyone too young, too old, or too unfit from all houses and everyone from houses not built for bushfire resistance. To assist in evacuation procedures some obvious sign should be devised and placed on the front gate or letter box of approved bushfire resistant houses.

4.1 Any other matters …

Exploding houses - caused when a major bushfire front advances over a house.

Having inspected of over fifty houses within a few days of them being destroyed by bushfire it became obvious that many of these houses had experienced a sudden 'explosive' effect when hit by a major bushfire front. Evidence showed that the 'explosion' occurred seconds before the house interior was suddenly (seemingly explosively) consumed in fire. The result, for an eye witness, would seem like a 3-second explosion.

Subsequent research was made of eye witness accounts from serious bushfire events in the 1920s, 1930s, Tasmanian fires of 1972, Ash Wednesday and Black Saturday. Numerous eye witnesses gave accounts of seeing houses instantaneously erupting into flame. A sight they frequently described as 'exploding'.

In the past bushfire authorities have not given credit to such accounts. They put these many reports down as exaggerated accounts by individuals under extreme stress.

However, these accounts were too frequent and consistent to be ignored. They were backed-up by personal observations of bushfire-destroyed houses in the week after the Ash Wednesday bushfires of 1983 in both Victoria and South Australia.

So, the question was: - **why do houses 'explode' when hit by a major bushfire front?**

Together with a number of experienced Engineers, we inspected bushfire damaged and destroyed houses and other buildings around Mount Macedon and Anglesea in Victoria and in the Adelaide Hills of South Australia in the week after the 1983 Ash Wednesday fires. We carefully assessed about 20 houses that should have performed well in a bushfire, yet they were totally destroyed. The following observations were made: -

- Large windows or sliding doors had been sucked outwards from their frames. Most were lying flat and undamaged on grass front or back yards. Around them the grass was singed or burnt. Under the glass the grass was unburnt. These glazed panels, up to 4 square metres area, were 3- to 4-metres outside the window/door opening from which they came, with the interior side facing up. They were always on the side of the house from where the fire front approached.

- Steel roller garage doors that had been destroyed were found, in every case, to be in a crumpled heap, 0.5- to 1-meter outside of the garage entry. The first thought was that differential heat expansion of the metal caused an outward bowing of the steel confined at the sides by the door tracks. However, this theory failed because the steel was less than 1mm thick and would be heated through before significant differential movement could occur. The best answer was, that these doors, like the windows were sucked outward just before the fire struck.

- What was happening was that the largest area, weakest element of a building's exterior was being sucked outward by a sudden impact of low-pressure air – the very hot air pocket that enveloped the actual flame of the fire front. When this low-pressure air pocket hit a reasonably well sealed building with almost normal air pressure inside the weakest plug in the wall was sucked out. This left the fire, directly behind, to rapidly seek the relatively oxygen-rich interior air. The flame actually 'explodes' into the building. Once inside furniture and any combustibles ignite, the fire front moves on and the building burns down from the inside.

- This being the case, houses built to AS 3959 standards with non-flammable exterior materials and correct fire-proof details, and with appropriate, well-watered, surrounding landscaping **are not bushfire resistant** when a major bushfire front engulfs them.

- There was a report of a cul-de-sac with 11 houses in Macedon. The 1983 bushfire threatened, so all residents were evacuated. Before leaving, all residents closed their windows, put damp towels at the inside base of external doors. All the houses were well sealed, except one, occupied by a widow lady who was understandably stressed and forgot to close the bathroom and laundry windows at the back of her house. Fortunately, these small windows were fitted with external metal wire fly screens.
  As had been feared, a major fire front came through and destroyed 10 of the 11 houses. The widow lady's house was almost undamaged. The fire had advanced on the cul-de-sac from the rear of the lady's house. The air-pressure of that one house was quickly equalised with the low-pressure, fire-pocket air – that house, unlike the others, did not have its weakest element sucked out by differential air pressure.
  This illustrates what should be recommended for all buildings threatened by a major fire front. All fly screens on windows or doors must be metal mesh and the windows with such screens should be left partially open (50 to 100mm gap). When a major fire strikes, the metal mesh fly screen and the outrush of air from inside to outside appears to prevent fire ingress.
- This leaves the potential problem of burning wind-borne debris striking and breaking windows or metal fly screened windows in advance of a major bushfire front. Where appropriate perforated metal shutters made from expanded steel sheet with 3mm expansion gaps, will protect windows and allow air movement and thus air pressure equalisation.

Following is a select list of some of the 42 technical publications researched and authored by me over the past 40 years.
I would welcome an opportunity to personally present my bushfire evidence and findings to the Inquiry.

1 Granger, Max. (one of three authors/illustrators) ***Fire and Acoustic Ratings for Masonry Construction***, Concrete Masonry Association of Australia, August 1980.

2 Granger, Max. ***Comment on Draft Standard DR80111 – Thermal Insulation of Dwellings***, Cement & Concrete Association of Australia, Nov. 1980.

3 Granger, Max. ***Exploitation of the Masses –a poor man's guide to energy efficient building design***, Technical Paper (Vic.1), Cement & Concrete Association of Australia (Victorian Office), October 1982 (Two reprints).

4 Granger, Max. ***Passive Solar Design – Temperate & Cool Temperate*****,** Cement& Concrete Association of Australia, July 1983. (Used by energy info. offices in three States, six reprints).

5 Granger, Max. ***Design & Construction of the Bushfire-Resistant Display House, Anglesea*****.** Technical Paper/F18, Cement & Concrete Association of Australia, February 1985.

6 Granger, Max. ***Full Brick Construction Detailing***, Paper at First National Masonry Seminar, The University of Newcastle, November 1991. (Co-organiser of this seminar series).

7 Granger, Max, ***Houses for Bushfire-prone Sites,*** Cement Concrete & Aggregates Australia –Technical Note 66, February 2005 (Updated 2010).

From 2007 to 2009 I was a member of the Standards Australia Committee that prepared ***AS 3959-2009 Construction of buildings in bushfire-prone areas.***

In 1983 I won an international architectural design competition for a **Bushfire Resistant House**, sponsored by Boral. In 1985/6 that house design was built by the Victorian Housing Department under my supervision. It served as a display house for two years. Subsequently I designed several private houses in bushfire-prone areas.

From 1983 to 2010 I lectured at universities and HIA or MBA conferences in every State, on the design and construction of bushfire resistant houses. From 1988 to 1990 I was a Senior Lecturer in Design and Construction at the Faculty of Architecture, University of Sydney.