

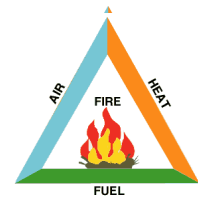
# **BAL Assessments**

[www.BAL.net.au](http://www.BAL.net.au)

**John Burke**

0417 885 747 [John@BAL.net.au](mailto:John@BAL.net.au)

in association with Andrew Burke



## **Determining the Bushfire Attack Level (BAL)**

*In accordance with Australian Standard AS 3959-2009*

### **Contact us for a quote to do your BAL report**

*We work all over Victoria; John & Andrew specialize in rural environments and Allan helps out with suburban areas*

#### **Simplified Procedure for determining the BAL - Method 1**

- Simple Suburban Sites within 15km of Melbourne 3124
  - Rural areas up to 20 degrees slope
- Wildfire Management Overlay (WMO) – Site and Vegetation assessments

**or**

**Detailed Method for determining the BAL - Method 2 (Appendix B)**  
*(Method 2 is a complex methodology and can be used for steeper sites)*

The written report will include photos and be suitable for lodging with your Building Permit

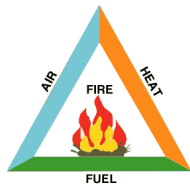
Ideally what our Assessors need to undertake a BAL assessment:

- 1 Dimensioned Site Plan showing footprint of proposed building works and other structures and works. An electronic copy is preferred.
- 2 External footprint and other structures should be pegged or marked-out.
- 3 Site address and basic access directions sufficient to accurately locate the property.
- 4 Site location data sufficient to accurately locate the site on web based services such as Government Maps and Aerial Photo suppliers.
- 5 Title particulars if available.
- 6 Contact details including; mobile number, email address,
- 7 Postal address.
- 8 Can we get access to the site at any time? Are gates locked – animals on the property etc?

#### **Notes:**

The BAL rating sets minimum standards for design and construction. However we would always recommend that, particularly in a rural environment, you should endeavor to comply with higher levels of protection, ember protection should always be a priority.

**Available 7 days a week – ring us on 0417 885 747**



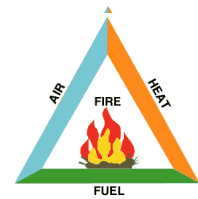
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### Methodology:

The determination of “*classifiable*” vegetation and in-particular the “*edge*” of *classifiable* vegetation under AS3959-2009 is still somewhat subjective when just Method 1 under AS3559-2009 is taken in isolation. However when taking into account an understanding of AS3959-2009 Appendix B, the complex Method 2, and other industry publications we find that we can bring science into play, most notably with the measurement of the surface fine fuel hazard.

In assessing *classifiable* vegetation and in-particular the *edge* of *classifiable* vegetation, account is taken of the *Overall Fuel Hazard* = (the sum of the influences of) Bark Hazard + Elevated Fuel Hazard + Surface Fine Fuel Hazard and the *Fuel Continuity*, both Horizontal and Vertical ie Density, Canopy, Understorey and Litter-Bed build up.

In some cases the *edge* of the *classifiable* vegetation can be some distance from the first vegetation (including trees) encountered, when taking into account the *Overall Fuel Hazard* and *Fuel Continuity*.

There are a number of exclusions to *classifiable* vegetation (clause 2.2.3.2), perhaps the most significant is “*Low threat vegetation*, including managed ....., maintained .....” . This is taken to include areas of minimal surface fine fuel hazard as assessed by litter-bed height.

As such areas of trees with low density, minimal understory and sparse litter-bed build up are often considered to be *low threat vegetation* and may be excludable from the assessment.

Trees on managed residential blocks as well as isolated trees are also generally considered to be *low threat vegetation* and may be excludable from the assessment.

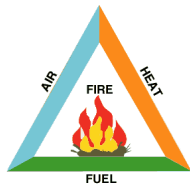
Areas of Fire Damaged / Fire Killed vegetation are more difficult to assess. Fundamental questions are: i) “*Is it likely this area will ever return to a steady state fuel load typical of its pre-fire vegetation classification within say the next 10 years?*” (project Vesta demonstrated that the majority of fuel load had returned and a significant leveling off occurs after 10 years) ii) “*If not, why not???*” iii) “*If not, what steady state fuel load is it likely to return to?*”.

The majority of publicly available aerial photos including Google etc are greater than 5 years old and in a lot of cases they bear little semblance to the current situation.

It should be noted that even our own photos taken at the site have a compressing effect and do not accurately show the distance to and the density of the vegetation.

A site inspection including measurement of both distance and slope and a assessment of vegetation is the only realistic way to carry-out or verify a BAL assessment.

**We would welcome the opportunity of expanding on any of the points mentioned above.**



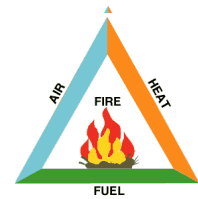
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## Bushfire Attack Level (BAL) Ratings and indicative Costs

As a rough guide, indicatively the industry generally is reporting the following addition building cost for every increase in BAL rating level (some companies seem to be charging approx \$1000 x BAL number ie BAL-12.5 can cost an additional \$12,500 – we think this is unwarranted):

➤ **BAL-Low** no special construction requirements

➤ **BAL-12.5** similar to BAL Low

The risk is considered to be LOW.

There is a risk of Ember Attack.

The construction elements are expected to be exposed to a heat flux not greater than 12.5 kW/m<sup>2</sup>

➤ **BAL-19** **+\$1,500 to \$5,000**

The risk is considered to be MODERATE.

There is a risk of Ember Attack and burning debris ignited by wind borne embers and a likelihood of exposure to radiant heat.

The construction elements are expected to be exposed to a heat flux not greater than 19 kW/m<sup>2</sup>

➤ **BAL-29** **+\$5,00 to \$10,000**

The risk is considered to be HIGH.

There is an increased risk of Ember Attack and burning debris ignited by windborne embers and a likelihood of exposure to an increased level of radiant heat.

The construction elements are expected to be exposed to a heat flux not greater than 29 kW/m<sup>2</sup>

➤ **BAL-40** **+\$20,000**

The risk is considered to be VERY HIGH.

There is a much increased risk of Ember Attack and burning debris ignited by windborne embers, a likelihood of exposure to a high level of radiant heat and some likelihood of direct exposure to flames from the fire front.

The construction elements are expected to be exposed to a heat flux not greater than 40kW/m<sup>2</sup>

➤ **BAL-FZ (Flame Zone)** **+\$30,000 to \$60,000**

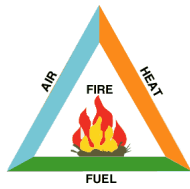
The Risk is considered to be EXTREME

There is an extremely high risk of ember attack and burning debris ignited by windborne embers, and a likelihood of an extreme level of radiant heat and direct exposure to flames from the fire front.

The construction elements are expected to be exposed to a heat flux greater than 40kW/m<sup>2</sup>

*As yet limited FZ elements have been developed and approved, additional costs could possible reduce to say \$30-\$40k depending on the future solutions developed. Only a limited number of FZ roofing solutions have been accepted by the Building Commission. Flame Zone window solutions are slowly becoming available. In particular a lot of Kit Home suppliers and other Builders cannot comply with BAL-FZ and BAL-40 and possibly BAL-29.*

With the additional cost (and current uncertainty with material approvals) associated with the higher BAL levels it may be prudent to spend additional time with various scenarios to see if a different BAL can be justified.



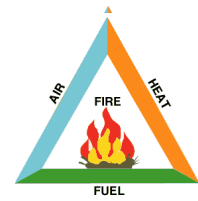
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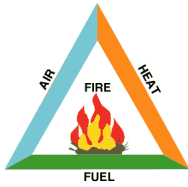
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## Equipment our Assessors have available for conducting Site assessments

- Hand held DigiPas digital level / clinometers with sight, for slope measurements
- Measuring (trundle) wheels; 12 inch and 6 inch (3 inch are ok for suburban streets)
- Stanley open face fiberglass tape measures; 60m and 30m  
Note for slopes of 10 degrees and over we adjust the measurements to equate to a horizontal distance (AS3959-2009 requires a horizontal distance of 100m)
- Garmin eTrex GPS receivers with MapSource and OziExplorer software
- Silva Compasses
- Leica Disto D5 laser distance and slope measuring instrument  
Tripod mounted or hand-held plus a Reflective Target
- Bosch DLE 50 Professional laser distance measuring instruments  
Tripod mounted or hand-held plus a Reflective Target
- Tripod mounted Total Station Pentax pts-2 20f,
- Digital cameras
- 250mm Discs and ruler for measuring Litter Bed build-up
- 5 metre Survey Staff
- a Square Metre measuring frame
- *Proprietary* detailed worksheets for documenting site measurements, calculations and assessments
- Various industry publications on fuel assessment and vegetation identification
- Copies of Australian Standard AS3959-2009 and all amendments

*A point of interest is that our hand held measurements correlate extremely well with the tripod mounted equipment.*



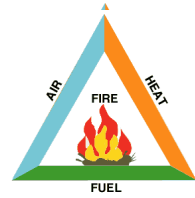
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**Certificate from CFA Training Day**

## ***Continuing Professional Development***

### ***Statement of Attendance***

**John Burke**

**Bushfire Attack Level (BAL)  
Assessment Training**

17 June 2009



*Building Commission*



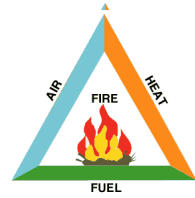
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Fire Australia is a joint publication of the Bushfire Cooperative Research Centre (Bushfire CRC), the Australasian Fire and Emergency Services Authorities Council (AFAC), the Fire Protection Association Australia (FPA Australia) and the Institution of Fire Engineers Australia (IFE Australia).



Autumn 2010

# FIRE AUSTRALIA

Although their research interests are very different, Cara, Alex, Andrew and Kelly have something in common – each of them applied their keen scientific minds to an important task as part of the Bushfire CRC Vacation Scholarship Program.

Bushfire CRC Project Leader Justin Leonard, who supervised Andrew Burke at CSIRO Sustainable Ecosystems, said the 22-year-old civil engineering student exceeded expectations. "We only set out to create an Excel spreadsheet calculator, more of an in-house tool for agencies," Leonard said. "And what we ended up with is a full html working web interface – a basic one, and one that works for us as an enhanced research tool and can calculate things like flame spread rates and height, which aren't needed in a site assessment but can help us with our research modelling. This work wouldn't have been able to happen any other way than through this Vacation Scholarship."

Andrew Burke, working with the CSIRO team at Highett, looked at the current building site assessment procedures in bushfire-prone areas. And Kelly Paterson, on the other side of the country at the University of Western Australia, did something different again, working on a project analysing spatial data for fire history and vegetation mapping.

## ANDREW BURKE

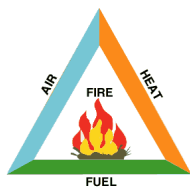
A 22-year-old from Caulfield (Victoria), Andrew Burke is in the final year of a Bachelor of Civil Engineering degree from Victoria University, and completed his Vacation Scholarship under the supervision of Bushfire CRC Project Leader Justin Leonard, of CSIRO Sustainable Ecosystems.

"My family had a property in Buxton that got burned down in the 7 February 2009 bushfires, and my research initially came about through going to public seminars about rebuilding. They were talking about bushfire assessments, and my father ended up doing some volunteer work with the Building Commission who were running free bushfire attack level assessments for people affected by the fires and I went along with him. There were basically two methods for doing site assessments – a simple one and a complicated one.

In the Australian Standards (AS3959 *Building in Bushfire Prone Areas*), the detailed calculation method is known as the Appendix B method, and it's basically around 11 pages of calculations you have to wade through. I really couldn't figure it out, so I contacted Justin Leonard in order to try to figure out how to do it, and he suggested the possibility of studying this area as a research project.

As part of the civil engineering course, you're required to do some work experience over the summer, so that tied in quite well with the Bushfire CRC Vacation Scholarship. I essentially went into CSIRO Sustainable Ecosystems and worked alongside Justin, taking this complex assessment method – which is made up of a series of nuanced calculations – and I put them all together into an online tool where someone can simply type in their inputs, such as the distance between a house and the surrounding vegetation, the type of vegetation, the slope of the land, and it will calculate the results for radiant heat and the corresponding Bushfire Attack Levels. To get a building permit, you need to have this assessment done, so my hope is that this automated calculator will help people with the rebuilding process following Black Saturday, whether that means building surveyors, community members or people in the fire industry.

The whole experience has definitely expanded my knowledge of bushfires, and how the environment effects the characteristics of bushfires. It's definitely improved my Excel skills, and has given me an appreciation for fire science and raised the possibility of working in that field."



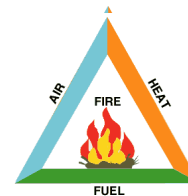
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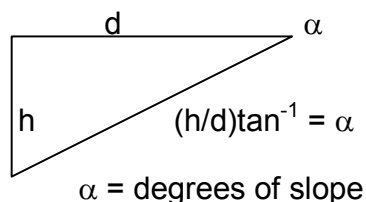


## **AS3959-2209 requires a horizontal distance of 100 metres to be assessed**

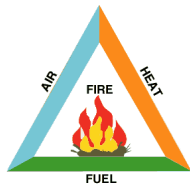
We use this simple conversion table for slopes of 10 degrees and over to adjust the measurements to equate to a horizontal distance as required by the Australian Standard.

<b>BAL Slope Adjustment</b>			
<u>100metres Horizontal</u>			<b>% of Horizontal</b>
<b>On a Slope of</b>	<b>= on the Ground</b>	<b>+</b>	
5 <sup>o</sup>	100.4	0.4	99.6%
10 <sup>o</sup>	101.5	1.5	98.5%
12 <sup>o</sup>	102.2	2.2	97.8%
15 <sup>o</sup>	103.5	3.5	96.6%
17 <sup>o</sup>	104.6	4.6	95.6%
20 <sup>o</sup>	106.4	6.4	94.0%
22 <sup>o</sup>	107.9	7.9	92.7%
25 <sup>o</sup>	110.3	10.3	90.6%
27 <sup>o</sup>	112.2	12.2	89.1%
30 <sup>o</sup>	115.5	15.5	86.6%
32 <sup>o</sup>	117.9	17.9	84.9%
35 <sup>o</sup>	122.1	22.1	81.9%

We have specific equipment to measure the slope however you might find this formula useful to estimate the slope:



- 10<sup>o</sup> slope is approximately a 1:5.5 height (h) to distance (d) gradient ratio or 18%
- 15<sup>o</sup> slope is approximately a 1:3.5 height (h) to distance (d) gradient ratio or 28%
- 20<sup>o</sup> slope is approximately a 1:2.5 height (h) to distance (d) gradient ratio or 40%
- 30<sup>o</sup> slope is approximately a 1:1.5 height (h) to distance (d) gradient ratio or 60%



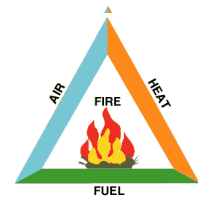
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## BAL BLOG

*a collection of bits and pieces*



**Disclaimer:** We Do Not assert that we have expertise in the design & building method under the standard or the building material requirements. However in an effort to assist our clients and others, particularly those in Bushfire Affected areas we have listed in these pages bits and pieces of information that has been passed on to us. We do Not endorse or recommend anything on this page

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*If you have anything to share please email it to John and at our discretion we may post it here.*

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If I have learnt anything from the loss of my place (see pix above), it is to keep embers out!

### **Simple low cost things you can do to decrease the risk from Embers**

Seal roof/wall junctions. Openings fitted with non-combustible ember guards. Roof to be fully sarked. Ensure sarking completely seals the roof space. In particular that sarking is rolled over *all Ridges, Hips and Valleys*. Also ensure that sarking is installed and secured at the gutters in a way that it is not susceptible to damage during gutter installation or gutter replacement.

Enclosed sub-floor space do not use open slats on decks and the facing of the sub-floor

### **Sarking ie reflective foil laminate insulation membrane (commonly called sisalation)**

We understand that [www.tbafirefly.com.au/](http://www.tbafirefly.com.au/) will be bringing to market a new fire resistant sarking material. If it is as good as they say it will be going in my place.

### **BAL FZ roofing**

We are confused; is it correct that only one system has passed the AS1530.8.2 Roof Test?? Yes I have read the Building Commission media release ..... but ??

### **BAL FZ windows**

It seems window and shutter solutions are slowly becoming available for BAL-40 and BAL-FZ. I imagine the cost and lead time will still hurt.

### **Slopes over the limits of AS3959-2009;**

We have a few ideas; nothing guaranteed however ring us to discuss.

### **Fire Damaged / Fire Killed Trees**

Your property is full of dead trees that have been assessed as “classifiable” vegetation and that has resulted in a high BAL rating. We have a few ideas; nothing guaranteed however ring us to discuss.

### **Suburbs**

You live in the suburbs, back onto a park and have been assessed at BAL-19 or above. We have a few ideas; nothing guaranteed however ring us to discuss.