

INTEGRATED DESIGN FOR BUSHFIRE RESILIENT HOUSING



Dr Ian Weir Research Architect

Issues discussed

Cost savings through holistic design: landscape, buildings, components and human behaviour.

Strategies for reconciling biodiversity conservation and bush fire safety.

Affordable BAL-40 house design approaches (with reference to the 'Karri Fire House', Denmark WA)

Examples of bush fire responsive architecture in Australia and overseas.

Bushfire Research

- Adviser to Black Saturday Royal Commission
- Adviser to survivors of Black Saturday
- Invited appearances on ABC New Inventors, SBS Insight
- Expert Advisor Bushfire Building Council of Australia
- Committee member of AS3959 Bushfire Standard (FP-020)
- Advisor to Local Government
- Volunteer Fire Fighter
- Advocate for architecture + bushfire in public and professional media (radio, television, newspapers, trade journals, expert opinion pieces).



- Misinformation on Cost
- Poor application of AS3959
- Poor Planning Regulations
- False Sense of Security Myth
- Passive & Active Design

We can build homes to survive bushfires, so why don't we?

January 8, 2015 6.27am AEDT

Bushfire Practice

- *Ford House*, Bremer Bay, 1997
- *H House*, Bremer Bay, 2007
- *McLean House*, Steels Creek House, Vic, 2009
- *Wormald House*, Murrindindi, Vic, 2009 (unbuilt)
- *Downie House*, Nornalup , 2012 (unbuilt)
- *Karri Fire House*, Denmark, 2014 (with Kylie Feher Architect)
- *Camera Botanica*, Bremer Bay WA
- *Lightsite Permanent*, Bremer Bay WA
- *Pursell House*, Bremer Bay WA
- *Longbreak*, Denmark, WA



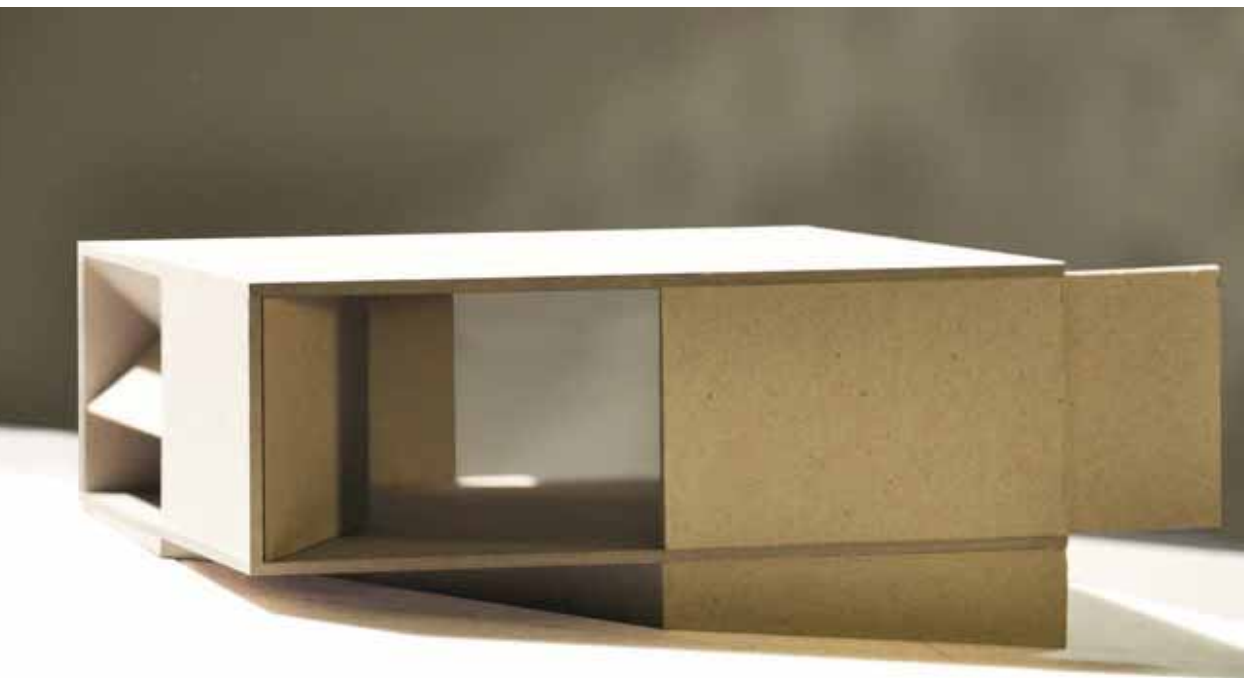
H (heath) House 2007



Karri Fire House (BAL-40) (with Kylie Feher Architect)



Camera Botanica (BAL-40+) 2105



Lightsite Permanent (BAL-Flame Zone)







Houses burn trees!

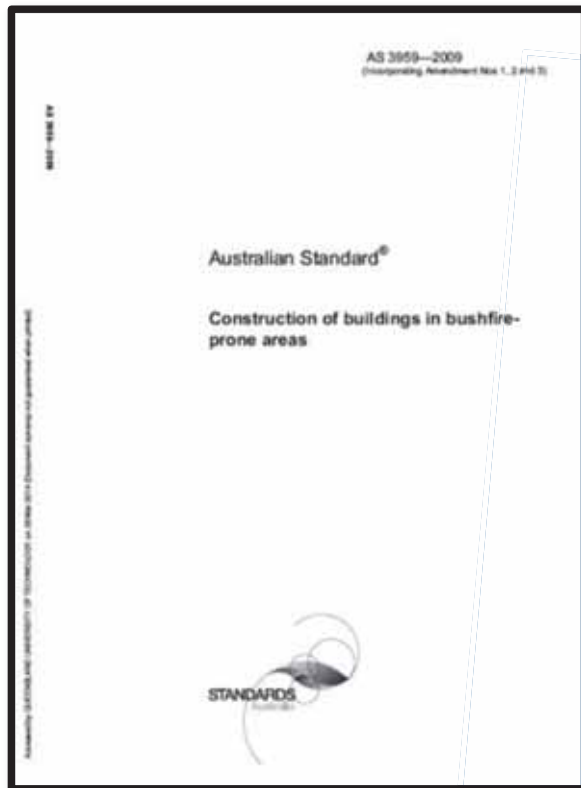


Problem of National Significance



Photograph: Julian Smith/Corbis

AS3959:2009



Part 1
Assessment
Bushfire
Attack Level
(6)

Part 2
Construction
Standards
(6)

AS3959 – Bushfire Attack Levels

BAL-LOW **Very Low risk**

BAL-12.5 **Low Risk**
Ember attack & radiant heat up to and including 12.5 kW/m²

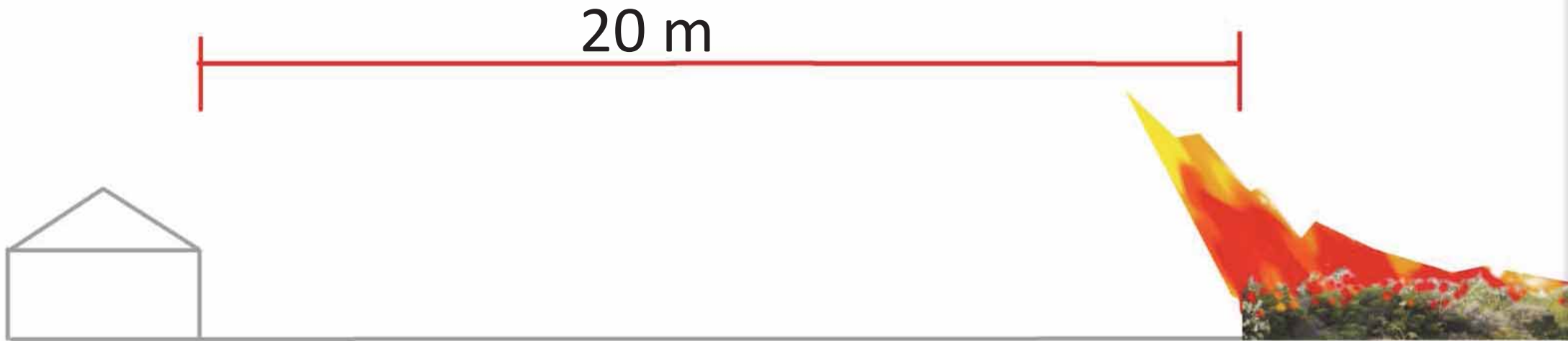
BAL-19 **Moderate**
12.5 – 19 kW/m²

BAL-29 **High**
19 – 29 kW/m²

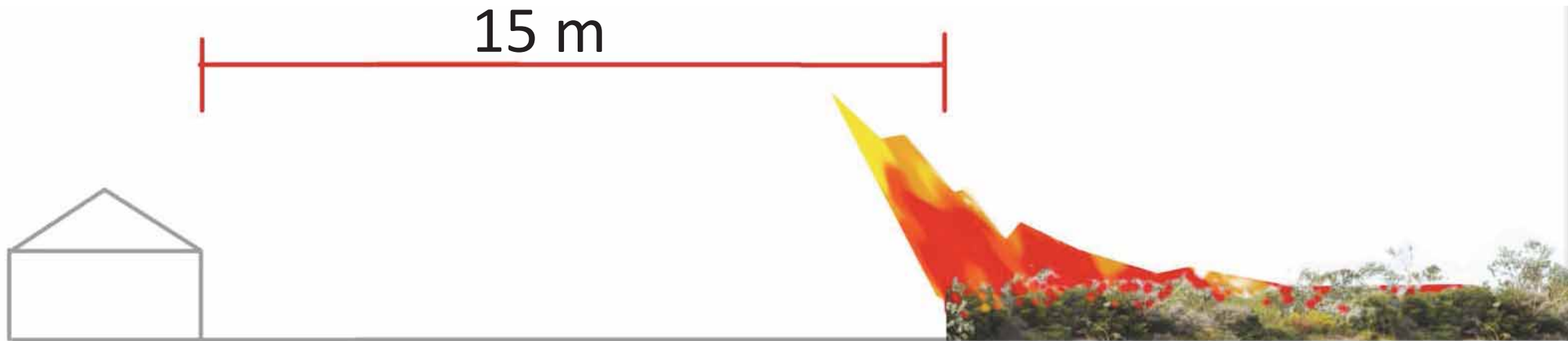
BAL-40 **Very High**
Ember attack, increased likelihood of flame contact & radiant heat 29 – 40 kW/m²

BAL-FZ **Extreme – Flame Zone**
40+ kW/m² - ember attack, burning debris, direct exposure of flames from the fire

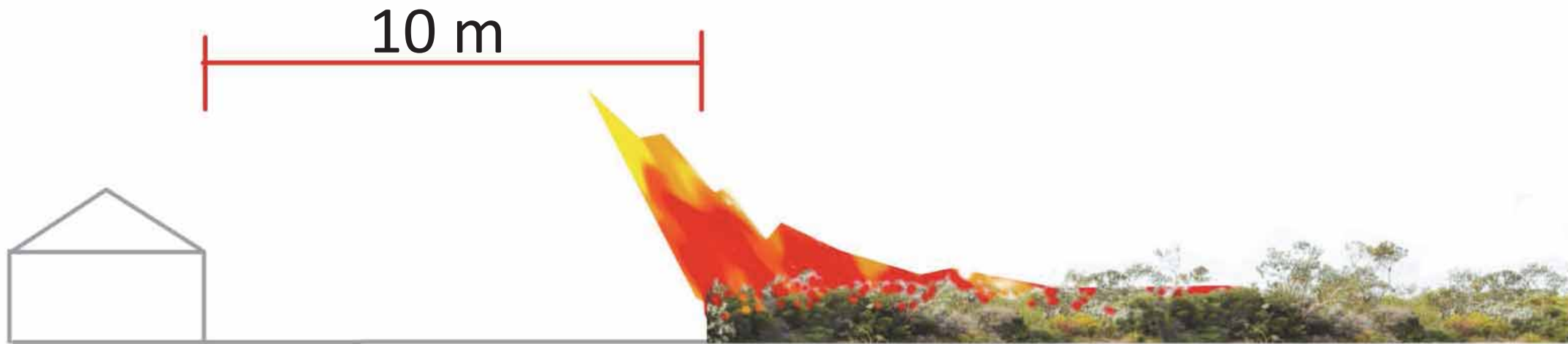
BAL – 12.5 (@ 15 t/ha)



BAL – 19 (@ 15 t/ha)



BAL – 29 (@ 15 t/ha)



BAL – 40 @ 15 t/ha)



BAL – FZ (@ 15 t/ha)



	BAL-LOW	BAL-12.5	BAL-19	BAL-29	BAL-40	BAL-FZ (FLAME ZONE)
SUBFLOOR SUPPORTS	No special construction requirements	No special construction requirements	No special construction requirements	Enclosure by external wall or by steel, bronze or aluminium mesh, non-combustible supports where the subfloor is anchored, naturally fire resistant timber stumps or posts on 75 mm metal slappings	If enclosed by external wall refer below 'External Walls' section to table or non-combustible subfloor supports or tested for bushfire resistance to AS 1530.8.1	Subfloor supports - enclosure by external wall or non-combustible with an FRL of 30/- or be tested for bushfire resistance to AS 1530.8.2
FLOORS	No special construction requirements	No special construction requirements	No special construction requirements	Concrete slab on ground or enclosure by external wall, metal mesh as above or flooring less than 400 mm above ground level to be non-combustible, naturally fire resistant timber or protected on the underside with sarking or mineral wool insulation	Concrete slab on ground or enclosure by external wall or protection of underside with a non-combustible material such as fibre cement sheet or be non-combustible or be tested for bushfire resistance to AS 1530.8.1	Concrete slab on ground or enclosure by external wall or an FRL of 30/30/30 or protection of underside with 30 minute intumescent spread of fire system or be tested for bushfire resistance to AS 1530.8.2
EXTERNAL WALLS	No special construction requirements	As for BAL-19	External walls - Parts less than 400 mm above ground or decks etc to be of non-combustible material, 6 mm fibre cement clad or bushfire resistant/naturally fire resistant timber	Non-combustible material (masonry, brick veneer, mud brick, aerated concrete, concrete), timber framed, steel framed walls sarked on the outside and clad with 6 mm fibre cement sheeting or steel sheeting or bushfire resistant timber	Non-combustible material (masonry, brick veneer, mud brick, aerated concrete, concrete) or timber framed or steel framed walls sarked on the outside and clad with 9 mm fibre cement sheeting or steel sheeting or be tested for bushfire resistance to AS 1530.8.1	Non-combustible material (masonry, brick veneer, mud brick, aerated concrete, concrete) with minimum thickness of 90 mm or an FRL of <30/30 when tested from outside or be tested for bushfire resistance to AS 1530.8.2
EXTERNAL WINDOWS	No special construction requirements	As for BAL-19 except that 4 mm Grade A safety glass can be used in place of 5 mm toughened glass	5 mm toughened glass or glass blocks within 400 mm of ground, deck etc. Operable portion metal screened with frame of metal or metal reinforced PVC-U or bushfire resisting timber	5 mm toughened glass with operable portion screened and frame of metal or metal reinforced PVC-U or bushfire resisting timber and portion within 400 mm of ground, deck etc screened	5 mm toughened glass. Fixed and Operable portion screened with steel or bronze mesh	Protected by bushfire shutter or FRL of <30/- and operable portion screened with steel or bronze mesh or be tested for bushfire resistance to AS 1530.8.2
EXTERNAL DOORS	No special construction requirements	As for BAL-19 except that door framing can be naturally fire resistant (high density) timber	Protected by bushfire shutter, or screened with steel, bronze or aluminium mesh or glazed with 5 mm toughened glass, non-combustible or 35 mm solid timber for 400 mm above threshold, metal or bushfire resisting timber framed for 400 mm above ground, decking, etc, tight-fitting with weather strips at base	Protected by bushfire shutter, or screened with steel, bronze or aluminium mesh or non-combustible, or 35 mm solid timber for 400 mm above threshold. Metal or bushfire resisting timber framed tight-fitting with weather strips at base	Protected by bushfire shutter, non-combustible or 35 mm solid timber, metal framed tight-fitting with weather strips at base	Protected by bushfire shutter or tight-fitting with weather strips at base and an FRL of <30/-
ROOFS	No special construction requirements	As for BAL-19 (including roof to be fully sarked)	Non-combustible covering. Roof/wall junction sealed. Openings fitted with non-combustible ember guards. Roof to be fully sarked	Non-combustible covering. Roof/wall junction sealed. Openings fitted with non-combustible ember guards. Roof to be fully sarked	Non-combustible covering. Roof/wall junction sealed. Openings fitted with non-combustible ember guards. Roofs to be fully sarked and no roof mounted evaporative coolers	Roof with FRL of 30/30/30 or tested for bushfire resistance to AS 1530.8.2. Roof/wall junction sealed. Openings fitted with non-combustible ember guards. No roof mounted evaporative coolers
VERANDAS DECKS ETC.	No special construction requirements	As for BAL-19	Enclosed sub-floor space - no special requirement for materials except within 400 mm of ground. No special requirements for supports or framing. Decking to be non-combustible or bushfire resistant within 300 mm horizontally and 400 mm vertically from a glazed element	Enclosed sub-floor space or non-combustible or bushfire resistant timber supports. Decking to be non-combustible or bushfire-resistant timber	Enclosed sub-floor space or non-combustible supports. Decking to be non-combustible	Enclosed sub-floor space or non-combustible supports. Decking to have no gaps and be non-combustible



BAL-12.5

Ember attack
radiant heat below
 12.5 kW/m^2 .

BAL-19

Increasing ember
attack and
windborne debris,
radiant heat
between
 12.5 kW/m^2
and 19 kW/m^2 .

BAL-29

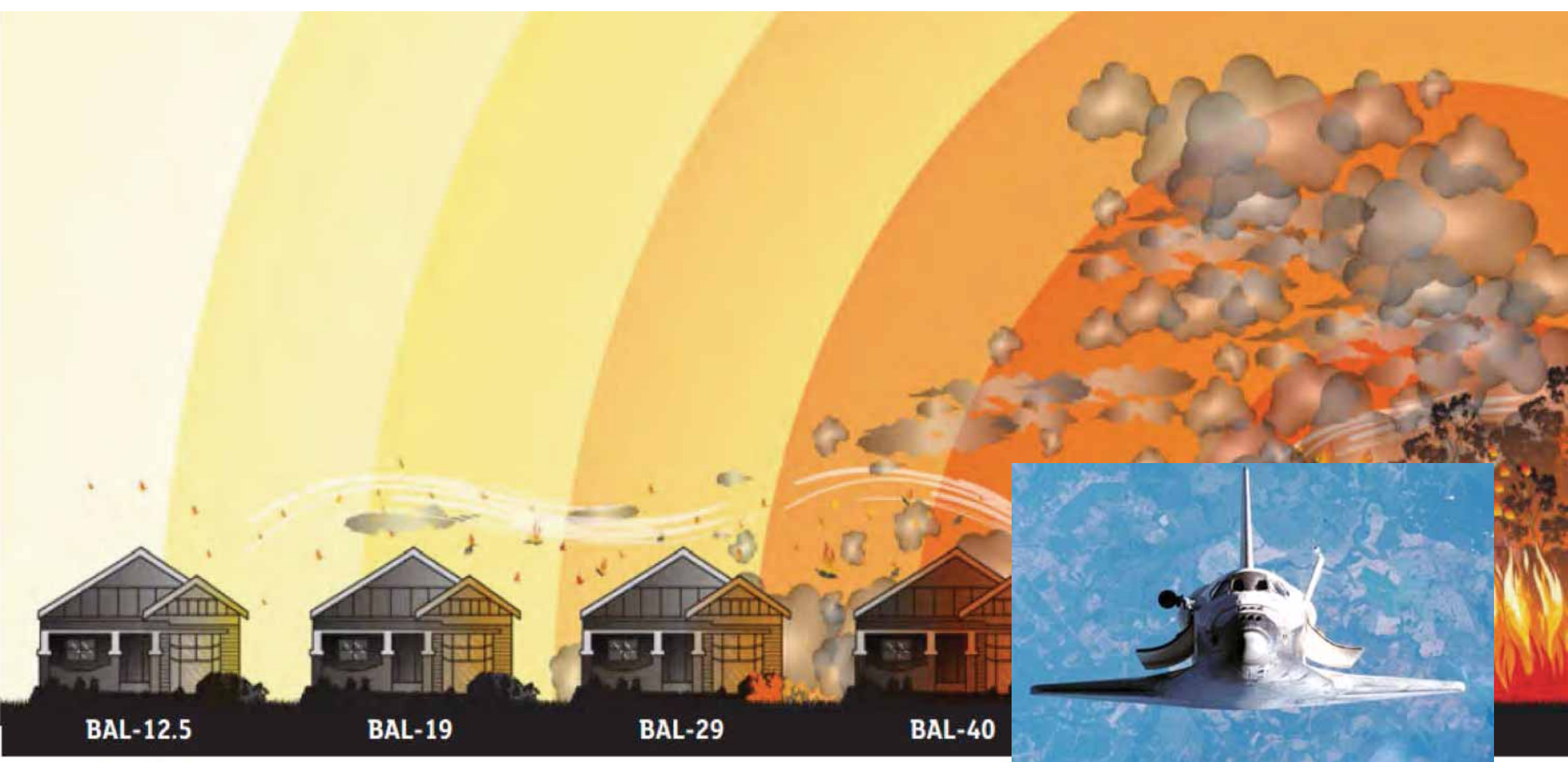
Increasing ember
attack and
windborne debris,
radiant heat
between 19 kW/m^2
and 29 kW/m^2 .

BAL-40

Increasing ember
attack and
windborne debris,
radiant heat
between 29 kW/m^2
and 40 kW/m^2 .
Exposure to
flames from fire
front likely.

BAL-FZ

Direct exposure to
flames, radiant
heat and embers
from the fire front.



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Ember attack
radiant heat below
 12.5 kW/m^2 .

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BAL-29

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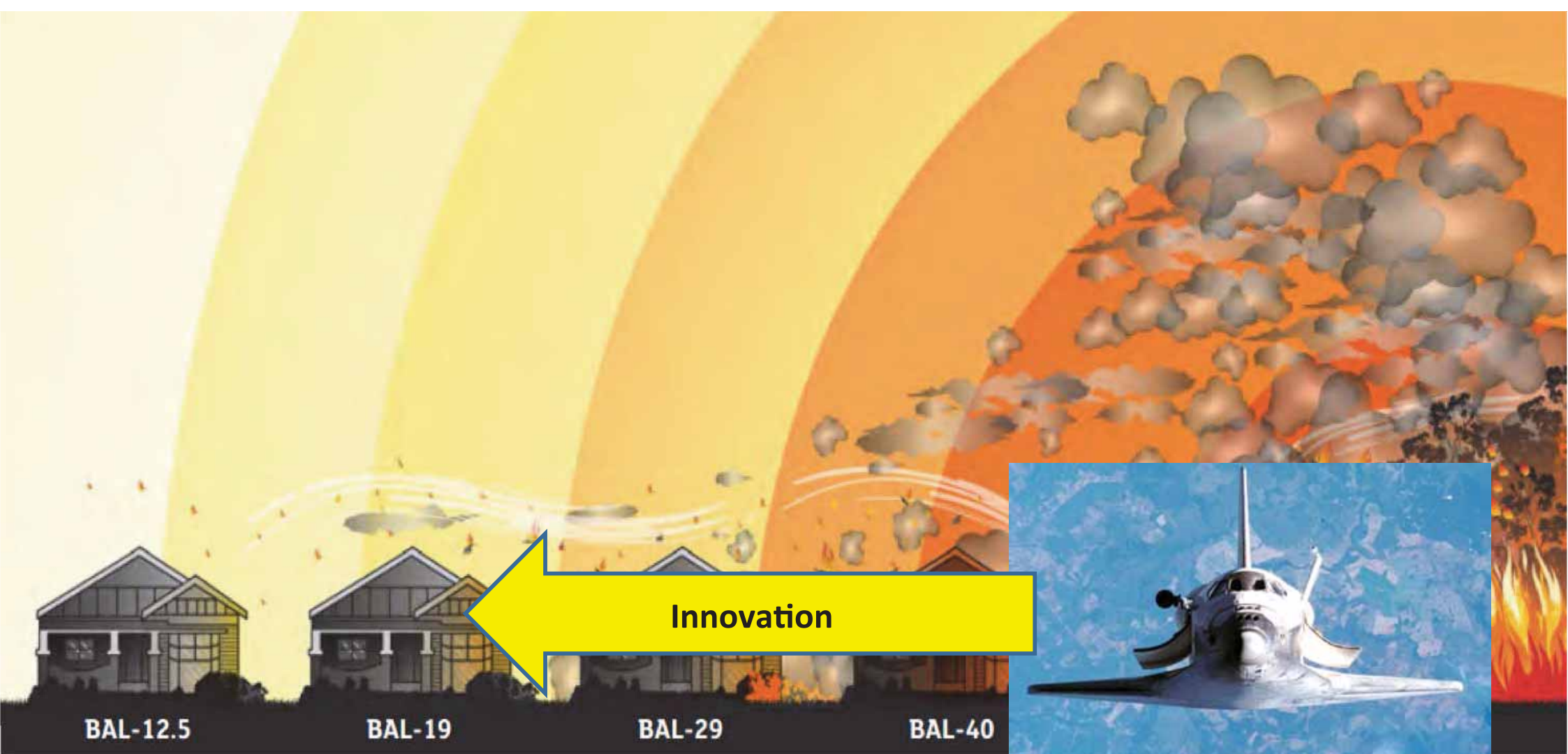
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Direct exposure to
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Direct exposure to
flames, radiant
heat and embers
from the fire front.



Rosco McGlashan and the Aussie Invader
1000 MPH



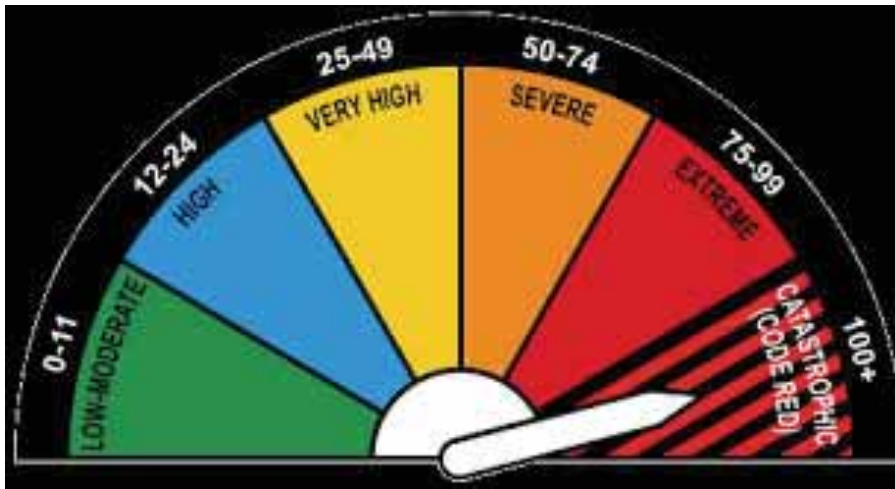
Solid Aluminum Wheels:
10,000 RPM.
50,000G @ 1000MpH



A weathered wooden signpost stands in a dry, hilly landscape. The sign is dark brown and shows significant wear, with a large section of the top left corner missing, revealing a lighter, textured material underneath. The words "FIRE DANGER TODAY" are painted in large, bold, black letters across the top. Below the text is a circular gauge with a needle pointing to the "CRITICAL" level. The gauge is divided into four colored sections: red (top right), orange (bottom right), yellow (bottom left), and green (top left). The needle is positioned in the red section. The background shows a dry, hilly landscape with sparse vegetation and a clear blue sky.

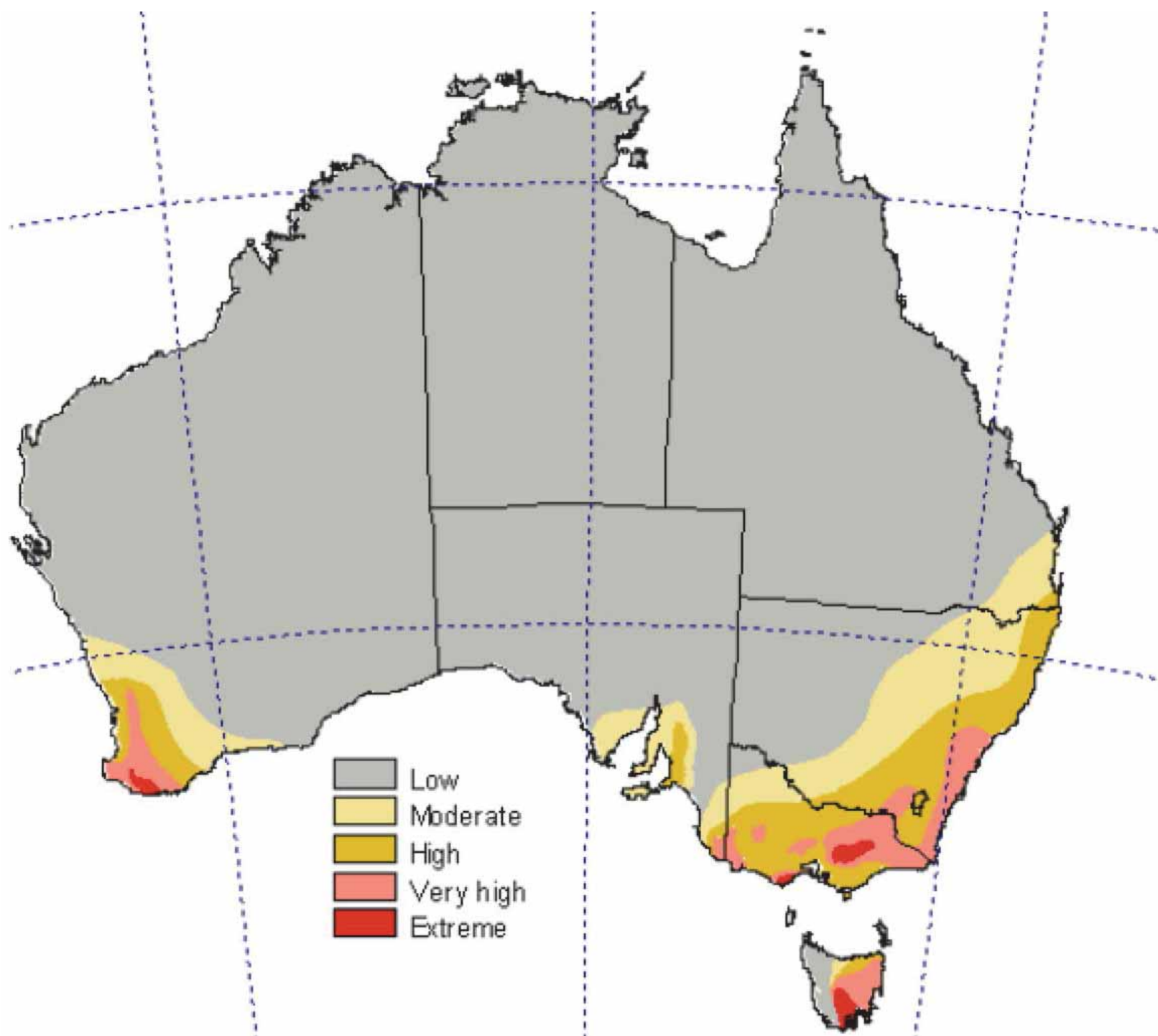
Fire Danger Index (FDI)

Fire Danger Index (FDI)

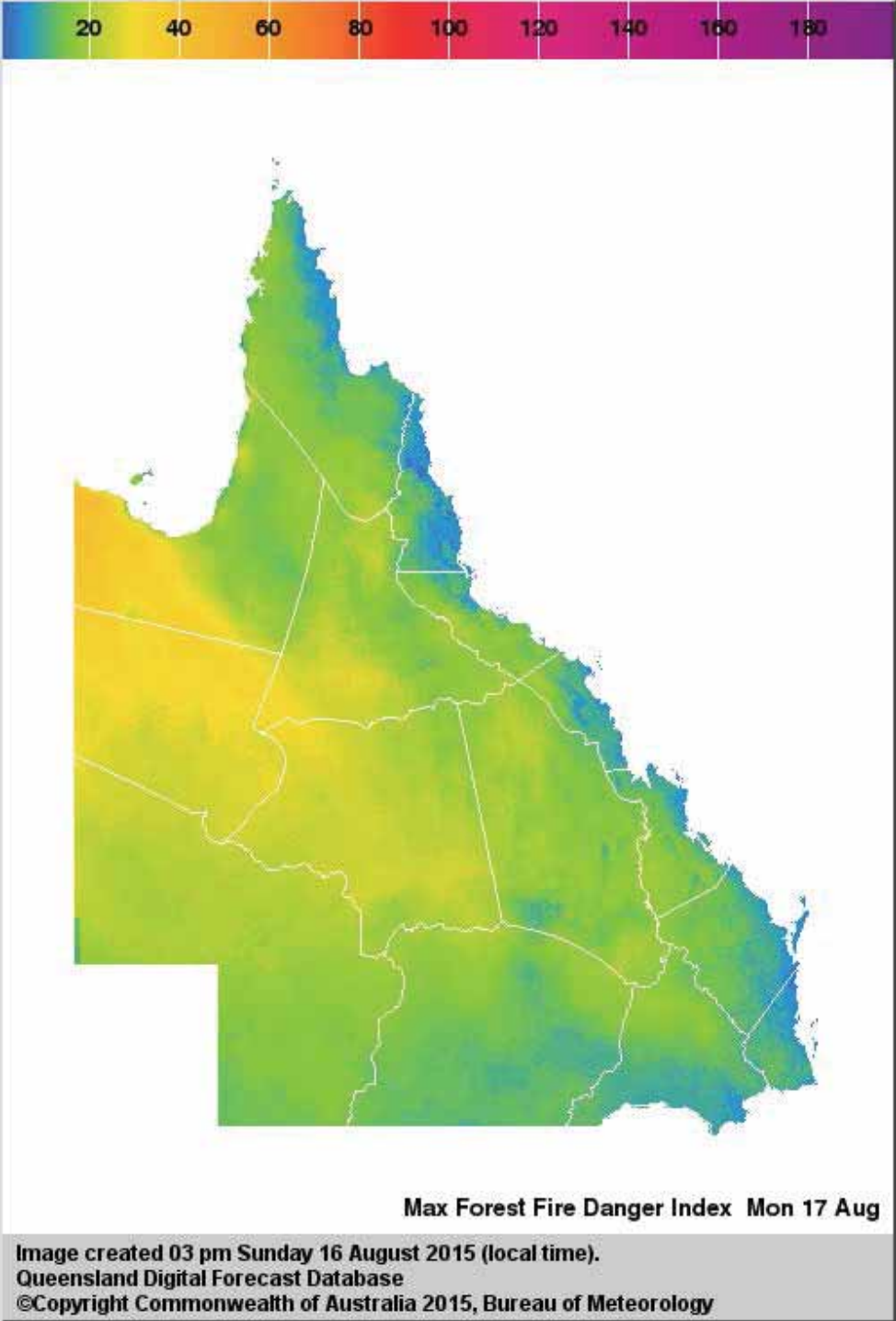


AS3959 FDI Classifications

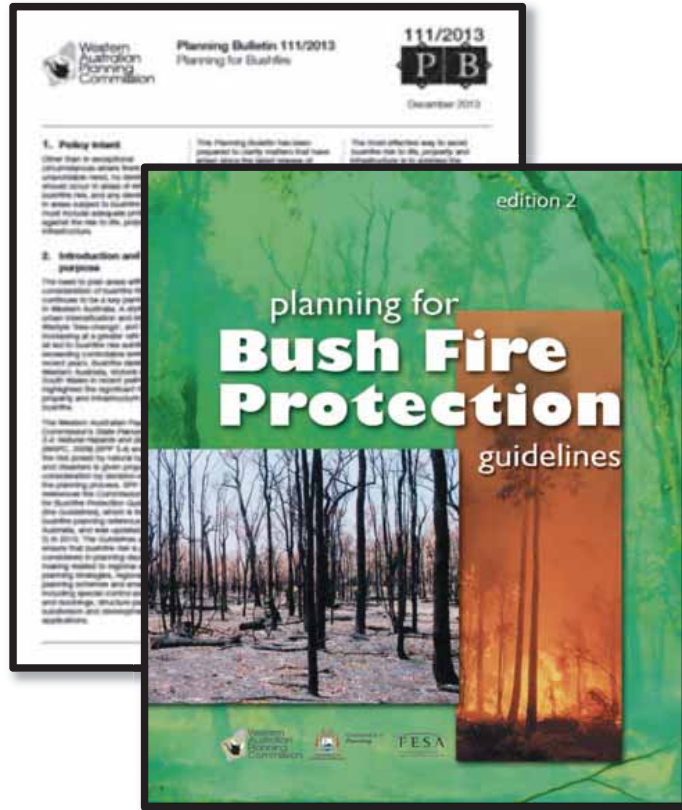
State	FDI
NSW	100, 80 and 50 (alpine areas)
NT	40
QLD	40
SA	80
Tas	50
Vic	100 & 50 (alpine areas)
WA	80



<http://www.bom.gov.au/qld/forecasts/fire-map.shtml>



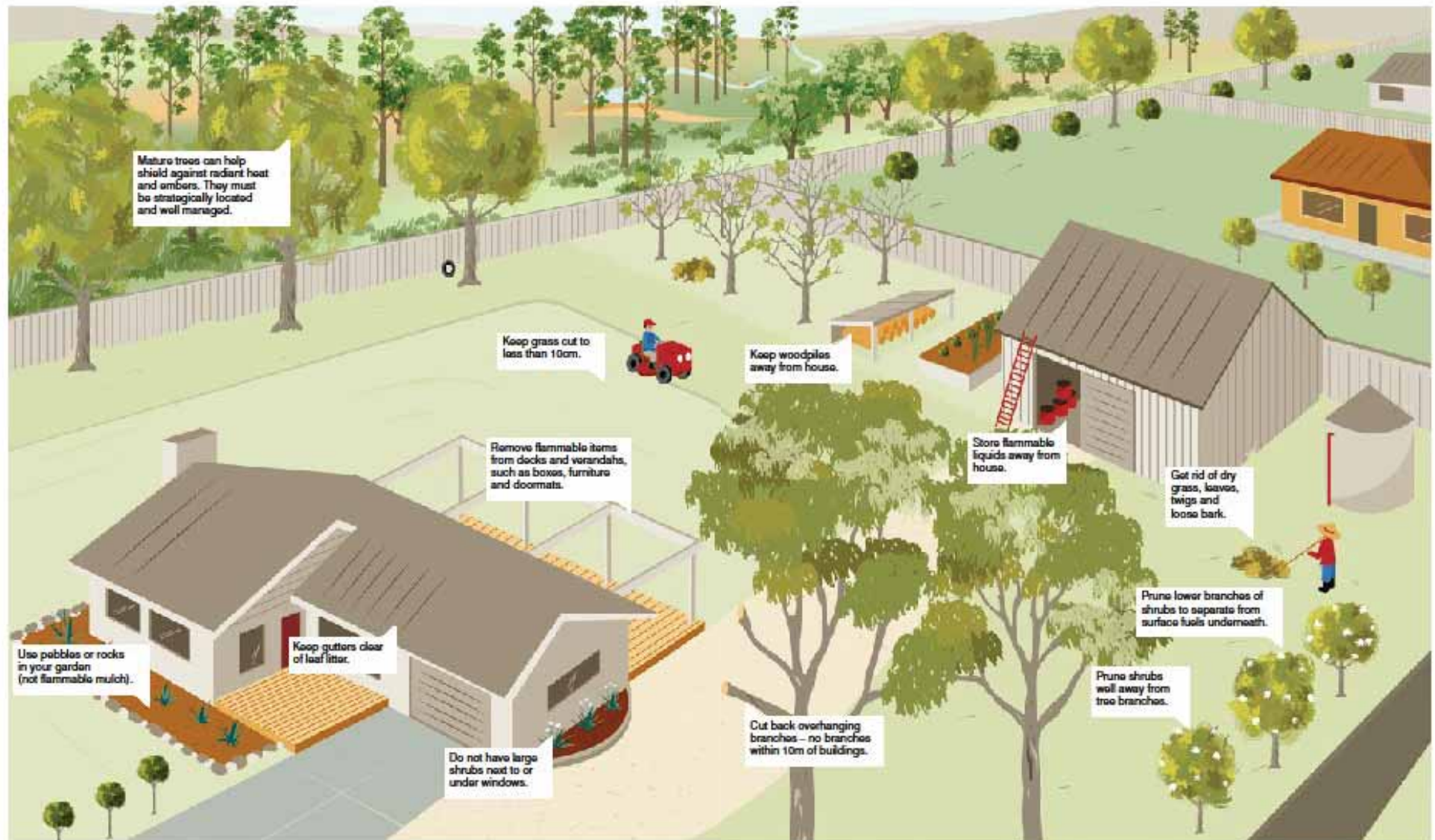
State Planning Policies



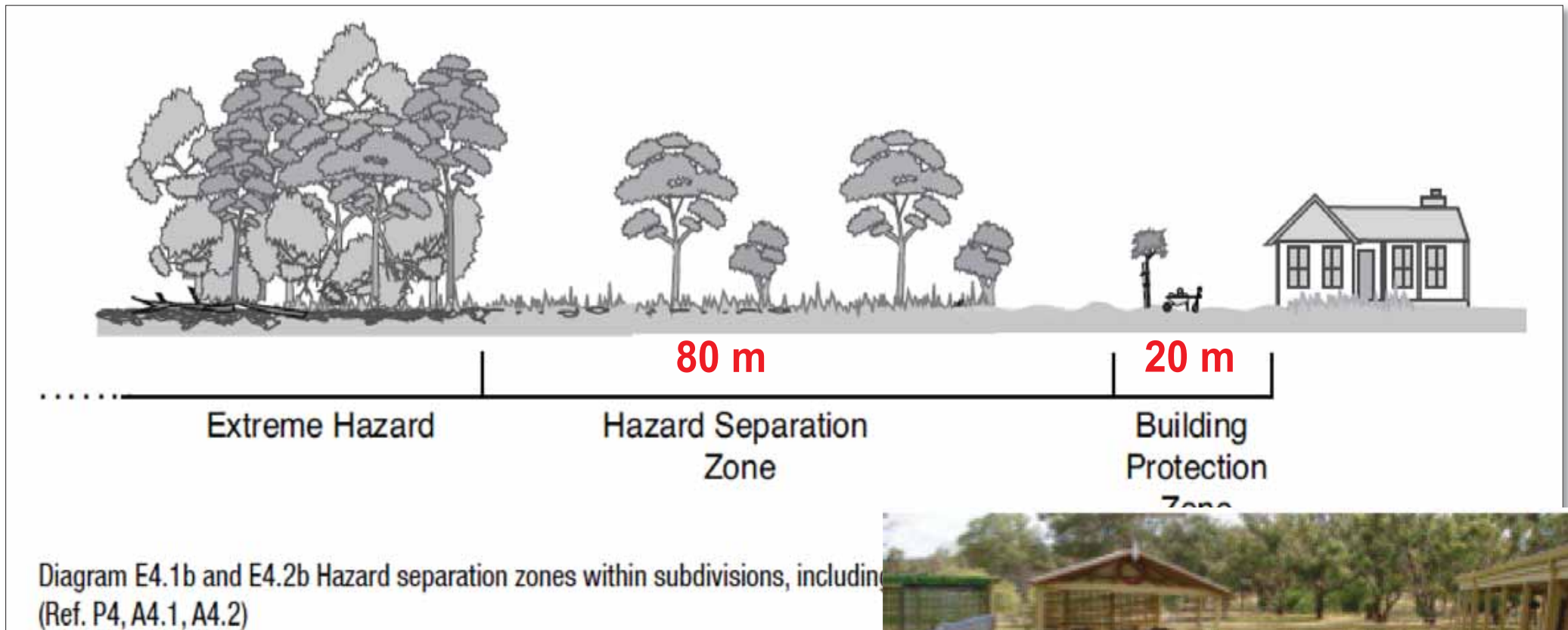
- Building Protection Zones
- Asset Protection Zones
- Low Threat Vegetation
- Emergency Vehicle Access
- Water Supply
- Constraints on Development
- Bans on BAL 40 and Flame Zone
- State based variations
- Conflation of Hazard and Risk
- Unrealistic requirements on landowners and their neighbours

Well-prepared property

You can reduce the impact of fire on your home by preparing your property before summer.



Bushfire Planning Conditions



BPZ 2 t/ha

