AS 3959 Bushfire Attack Level Assessment

73-75 Maritime Drive,

Jindalee WA 6304

DATE: 22 February 2024

REV: 2

BCSWA Pty Ltd

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DOCUMENT CONTROL

Description:		AS 3959 Bushfire Attack Level Assessment		
Revision	**Date**	**Certified By**		**BMS Reviewed & Checked By**
1	27 October 2023 AS 3959 Bushfire Attack Level Assessment	Name:	Matthew Sobelik Senior Building Surveyor BPAD Level 1 - 36534	Rene Hutter Xero Fire BPAD Level 2 - 38247
		Signature:		
2	22 February 2024 AS 3959 Bushfire Attack Level Assessment	Name:	Matthew Sobelik Senior Building Surveyor BPAD Level 1 - 36534	Rene Hutter Xero Fire BPAD Level 2 - 38247
		Signature:		

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JOB DETAILS

Client:	DTG Development
Address:	73-75 Maritime Drive, Jindalee
Local Government Area:	City of Wanneroo
Building Classification:	1A, 2, 5
Description of Building Works:	Proposed Mixed Use Development

ASSESSMENT DETAILS

Assessment Date:	4 September 2023
Determined BAL Rating:	Refer to Table 2
Indicative BAL Rating:	Refer to Table 3
Applicable Construction:	Refer to Appendix 3

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SITE ASSESSMENT & SITE PLAN

The assessment of this site / development was undertaken on 04/09/23 by Building Certification Services WA for the purpose of determining the Bushfire Attack Level on the Proposed Mixed Use Development in accordance with AS 3959-2018 Simplified Procedure (Method 1).

Designated Bushfire Prone Area

The following map identifies the area designated by the Department of Fire and Emergency Services (DFES) as being subject, or likely to be subject, to bushfire attack.

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Proposed Site Plan

The site assessment has been undertaken in conjunction with the site plan provided by the client, as detailed below, and is limited to the surrounding environment within 150m of the proposed building at the time of the inspection.

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The following map identifies the plots that impact on the bushfire attack level assessment of the subject lot.

LEGEND

North Point

- 100m Assessment Area
- 150m Assessment Area
- Subject lot and works
- Photo ID
- Plot A - Class C Shrubland
- Plot B - Exclusion 2.2.3.2(f)
- Plot C - Class G Grassland
- Plot D - Exclusion 2.2.3.2(f)
- Plot E - Class D Scrub
- Plot F - Exclusion 2.2.3.2(f)
- Plot G - Class G Grassland
- Plot H - Class G Grassland
- Plot I - Exclusion 2.2.3.2(f)
- Plot J - Class G Grassland

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VEGETATION CLASSIFICATION

All vegetation within 150m of the site / proposed development was classified in accordance with Clause 2.2.3 of AS 3959-2018. Each distinguishable vegetation plot with the potential to determine the Bushfire Attack Level is identified below.

Plot :	A	Classification or Exclusion Clause:	Class C Shrubland
Description / Justification for Classification:			
Shrubs less than 2m high, more than 30% foliage cover, understorey contains grasses			

Photo ID: 1

Photo ID: 2

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Plot :	B	Classification or Exclusion Clause:	Exclusion 2.2.3.2(f)

Description / Justification for Classification:

Low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks

Photo ID: 3

Plot :	C	Classification or Exclusion Clause:	Class G Grassland

Description / Justification for Classification:

Grass over 100mm high, overstorey foliage less than 10%

Photo ID: 4

Photo ID: 5

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Plot :	D	Classification or Exclusion Clause:	Exclusion 2.2.3.2(f)

Description / Justification for Classification:

Low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks

Photo ID: 6

Plot :	E	Classification or Exclusion Clause:	Class D Scrub

Description / Justification for Classification:

Shrubs greater than 2m high, 10-30% foliage cover, poor sandy soil

Photo ID: 7

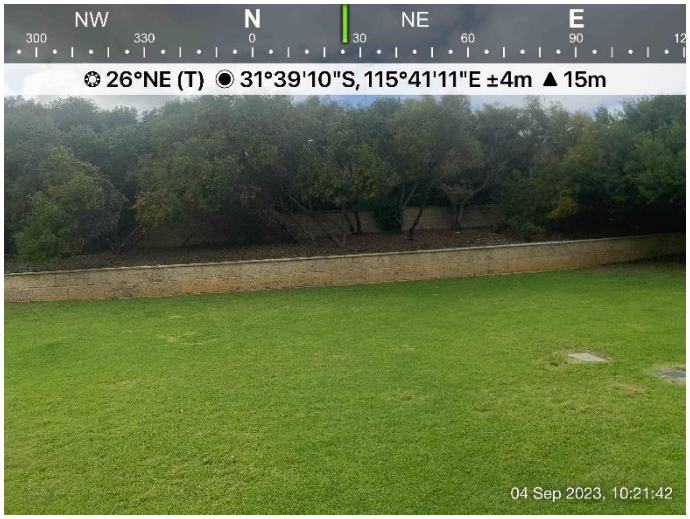

Photo ID: 8

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Plot :	F	Classification or Exclusion Clause:	Exclusion 2.2.3.2(f)

Description / Justification for Classification:

Low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks

Photo ID: 9

Plot :	G	Classification or Exclusion Clause:	Class G Grassland

Description / Justification for Classification:

Grass over 100mm high, overstorey foliage less than 10%

Photo ID: 10

Photo ID: 11

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Plot :	H	Classification or Exclusion Clause:	Class G Grassland

Description / Justification for Classification:

Grass over 100mm high, overstorey foliage less than 10%

Photo ID: 12

Photo ID: 13

Plot :	I	Classification or Exclusion Clause:	Exclusion 2.2.3.2(f)

Description / Justification for Classification:

Low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks

Photo ID: 14

Photo ID: 15

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Plot :	J	Classification or Exclusion Clause:	Class G Grassland

Description / Justification for Classification:

Grass over 100mm high, overstorey foliage less than 10%

Photo ID: 16

Photo ID: 17

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RELEVANT FIRE DANGER INDEX

The fire danger index for this site has been determined in accordance with Table 2.1 or otherwise determined in accordance with a jurisdictional variation applicable to the site.

Fire Danger Index			
FDI 100 - Table 2.4 ☐	FDI 80 - Table 2.5 ☒	FDI 50 - Table 2.6 ☐	FDI 40 - Table 2.7 ☐

Potential Bushfire Impacts

The potential bushfire impact to the site / proposed development from each of the identified vegetation plots are identified below

Plot	Vegetation Classification	Effective Slope		
A	Class C Shrubland	Downslope >0 to 5 Degrees		
B	Exclusion 2.2.3.2(f)			
C	Class G Grassland	Downslope >0 to 5 Degrees		
D	Exclusion 2.2.3.2(f)			
E	Class D Scrub	All Upslopes and Flat Land		
F	Exclusion 2.2.3.2(f)			
G	Class G Grassland	All Upslopes and Flat Land		
H	Class G Grassland	All Upslopes and Flat Land		
I	Exclusion 2.2.3.2(f)			
J	Class G Grassland	All Upslopes and Flat Land		

Table 1: BAL Analysis

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Determined Bushfire Attack Level (BAL)

The determined bushfire attack level has been calculated using the above Table 1: BAL Analysis and represents the highest BAL rating for the site/development where there is no requirement for additional vegetation to be modified or cleared. Table 2 below details the maximum BAL rating applicable to each building, the rating represents the site's current state.

Determined Bushfire Attack Level (BAL)				
Building	Vegetation	Effective Slope	Separation (m)	BAL
Townhouse 1	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Townhouse 2	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Townhouse 3	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Townhouse 4	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Townhouse 5	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Townhouse 6	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Townhouse 7	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Townhouse 8	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Townhouse 9	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Townhouse 10	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Townhouse 11	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Townhouse 12	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Townhouse 13	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Townhouse 14	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Townhouse 15	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Townhouse 16	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
GP Clinic	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Apartment 3/7/11	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Apartment 2/5/6/9/10	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ
Apartment 1/4/8	Plot C - Class G Grassland	Downslope >0 to 5 Degrees	0.0	FZ

Table 2: Determined BAL Ratings

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Indicative Bushfire Attack Level (BAL)

The indicative bushfire attack level has been calculated using the above Table 1: BAL Analysis and the Bushfire Management Statement provisions in this report, specifically the implementation of an asset protection zone across the subject lot. The indicative BAL is determined in support of the planning application only and serves to illustrate what BAL may be achieved across the site. Table 3 below details the maximum potential BAL rating applicable to each building.

Where the indicative bushfire attack level is intended to be used for the building approval process a site inspection is required to confirm the Bushfire Management Statement provisions have been implemented and the indicative bushfire attack level is achieved. Upon confirmation, a BAL compliance report and certificate will be issued to confirm the new determined bushfire attack level.

Indicative Bushfire Attack Level (BAL)				
Building	Vegetation	Effective Slope	Separation (m)	BAL
Townhouse 1	Plot A - Class C Shrubland	Downslope >0 to 5 Degrees	8.4	40*
Townhouse 2	Plot A - Class C Shrubland	Downslope >0 to 5 Degrees	8.8	40*
Townhouse 3	Plot A - Class C Shrubland	Downslope >0 to 5 Degrees	8.8	40*
Townhouse 4	Plot A - Class C Shrubland	Downslope >0 to 5 Degrees	8.8	40*
Townhouse 5	Plot A - Class C Shrubland	Downslope >0 to 5 Degrees	8.8	40*
Townhouse 6	Plot A - Class C Shrubland	Downslope >0 to 5 Degrees	8.8	40*
Townhouse 7	Plot A - Class C Shrubland	Downslope >0 to 5 Degrees	8.8	40*
Townhouse 8	Plot A - Class C Shrubland	Downslope >0 to 5 Degrees	8.8	40*
Townhouse 9	Plot A - Class C Shrubland	Downslope >0 to 5 Degrees	8.8	40*
Townhouse 10	Plot A - Class C Shrubland	Downslope >0 to 5 Degrees	8.8	40*
Townhouse 11	Plot A - Class C Shrubland	Downslope >0 to 5 Degrees	8.8	40*
Townhouse 12	Plot A - Class C Shrubland	Downslope >0 to 5 Degrees	8.8	40*
Townhouse 13	Plot A - Class C Shrubland	Downslope >0 to 5 Degrees	8.8	40*
Townhouse 14	Plot A - Class C Shrubland	Downslope >0 to 5 Degrees	44.0	12.5
Townhouse 15	Plot A - Class C Shrubland	Downslope >0 to 5 Degrees	51.4	12.5
Townhouse 16	Plot J - Class G Grassland	All Upslopes and Flat Land	26.0	12.5
GP Clinic	Plot J - Class G Grassland	All Upslopes and Flat Land	13.0	19
Apartment 3/7/11	Plot J - Class G Grassland	All Upslopes and Flat Land	15.9	19
Apartment 2/5/6/9/10	Plot J - Class G Grassland	All Upslopes and Flat Land	15.9	19
Apartment 1/4/8	Plot J - Class G Grassland	All Upslopes and Flat Land	15.9	19

Table 3: Indicative BAL Ratings

**Townhouses achieve BAL 40 based on a Method 1 assessment. Refer to Xero Fire's Fire Engineering Report Dated 26th February 2024 confirming townhouses will be a subject to a BAL rating of 29 based on the stated setback, refer to Appendix 4*

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BUSHFIRE MANAGEMENT STATEMENT

In accordance with City of Wanneroo requirements, the following bushfire management statement (BMS) has been prepared to identify the ongoing measures to reduce bushfire risk. The BMS comprises of an assessment against the bushfire protection criteria as per the Guidelines for the Planning in Bushire Prone Areas Version 1.4. The information used to prepare this BMS is contained in the existing BAL report for the subject site prepared by BCSWA, dated 27/10/23.

ELEMENT 1: LOCATION

The report demonstrates that the proposed development will be located in an area of high hazard on the subject site, with the maximum BAL that the Proposed Mixed Use Development will be subject to is 40.

ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

A2.1 Asset protection zone (APZ)

The site shall incorporate an APZ across the entire subject lot.

Performance criterion can be met within the Lot as a result of the management of bushfire hazards through programmed maintenance of the Lot by landowner/s in perpetuity, providing a low fuel buffer around the subject building site. The Landowner is to maintain an APZ standard within the Lot as depicted on the BMS. The APZ is to be managed in accordance with the requirements of Guidelines for Planning in Bushfire Prone Areas version 1.4, refer to Bushfire Management Statement - Technical Specifications in this report.

ELEMENT 3: VEHICULAR ACCESS

A3.1 Public roads

Existing public road network, constructed in accordance with previously approved subdivision and City of Wanneroo.

A3.2a Multiple access routes

Lot is connected to existing public road which provides travel in two different directions with an all-weather surface, refer to aerial photo below.

A3.2b Emergency access way

Not applicable, access to existing public road provided in accordance with A3.2a.

A3.6 Private driveways

There are no technical requirements for the private driveway as it is within a lot serviced by reticulated water, is no greater than 70.0m in length (between the most distant part of the development site and public road) and is access by a public road with a speed limit no greater than 70km/h.

ELEMENT 4: WATER

A4.2 Provision of Water for Firefighting Purposes

There is no requirement for a water tank on site as the lot is serviced by existing street hydrants, refer to aerial photo below.

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LEGEND

- North Point
- 100m Assessment Area
- 150m Assessment Area
- Subject lot and works
- Photo ID
- Asset Protection Zone
- H — Hydrant
- Plot A - Class C Shrubland
- Plot B - Exclusion 2.2.3.2(f)
- Plot C - Class G Grassland
- Plot D - Exclusion 2.2.3.2(f)
- Plot E - Class D Scrub
- Plot F - Exclusion 2.2.3.2(f)
- Plot G - Class G Grassland
- Plot H - Class G Grassland
- Plot I - Exclusion 2.2.3.2(f)
- Plot J - Class G Grassland

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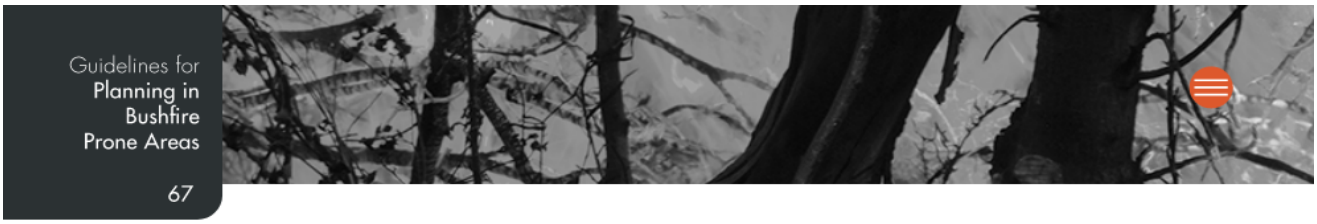

ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

EXPLANATORY NOTES

E2 Managing an Asset Protection Zone (APZ) to a low threat state

An APZ is a low fuel area maintained around a habitable building to increase the likelihood that it will survive a bushfire, by providing a defendable space and reducing the potential for direct flame contact, radiant heat exposure and ember attack.

Vegetation management within an APZ should provide defendable space and be maintained to a low threat state, in perpetuity, in accordance with the requirements outlined in Schedule 1.

The width of an APZ varies with slope and vegetation type, however it should only be as wide as needed to ensure the potential radiant heat impact of a bushfire does not exceed 29kW/m² (BAL-29), or 10kW/m² where a building is identified for use as an on-site shelter. An APZ is generally not required where a building or development site achieves 29kW/m² (BAL-29) or lower in its pre-development state (prior to any vegetation clearing or modification).

An APZ should include an area of defendable space immediately adjoining a building, that is kept free from combustible items and obstructions, within which firefighting operations can be undertaken to defend the structure. Where a lot contains a building envelope, it may not be necessary for the entire building envelope to achieve 29kW/m² (BAL-29) as this may result in significant unnecessary clearing. It is recommended that the BMP identifies that a sufficient APZ can be accommodated within the building envelope, with the development site and associated APZ to be determined at the development approval stage.

An APZ should be contained within the boundaries of the lot on which the building is situated, except in instances where it is demonstrated that the vegetation on the adjoining land is managed in a low threat state, as per cl. 2.2.3.2 of AS 3959, such as a road, managed park, rocky outcrop or a water body.

The siting of a habitable building and associated APZ should aim to minimise the clearing of vegetation. The BMP should demonstrate that the proposed APZ has minimised the unnecessary loss of vegetation or potential for conflict with landscape or environmental objectives; and complies with environmental approvals/exemptions (where necessary). A re-design or reduction in lot yield may be necessary to minimise the removal and modification of remnant vegetation.

It is recommended that development be located on flat areas or slopes less than 20 degrees (especially where classified vegetation is located downslope to a building) and away from ridge tops, crests or narrow gullies, as bushfire can spread rapidly in these areas. Circumstances where these locations may be suitable for development to occur include where the land is already cleared, and 29kW/m² (BAL-29) or lower can be achieved for the whole development site without the use of an APZ. To ensure soil stability within an APZ, vegetation removal on slopes exceeding 18 degrees is discouraged.

Figure 17: Topography considerations for building locations

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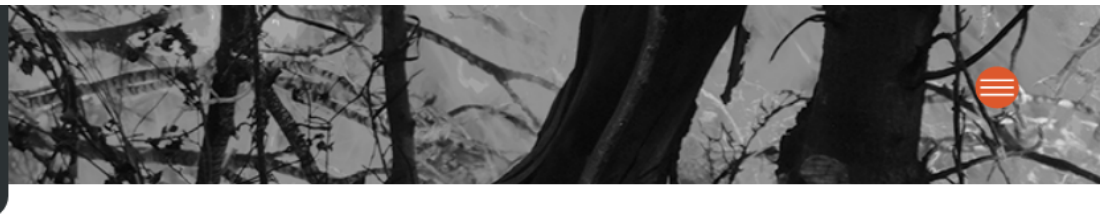

ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

EXPLANATORY NOTES

Fine fuel load should be maintained to less than two tonnes per hectare, however this is often a subjective assessment. Reducing fuel load levels does not necessarily require the removal of existing vegetation. A combination of methods can be utilised to reduce fuel load such as raking, weed removal, pruning, mulching and/or the removal of plant material.

A simple method to estimate fuel load is to roughly equate one tonne of fuel load per hectare as 100 grams per square metre. For example, two tonnes per hectare of leaf litter is roughly 200 grams of leaf litter per square metre and eight tonnes per hectare is roughly 800 grams. Eucalyptus leaf litter is approximately 100 grams per handful, so two handfuls of litter per square metre will roughly equate to two tonnes per hectare. Different types of fine fuel, like mulch or pine needles may be more or less than a handful, however the 100 grams per square metre rule of thumb can still be used.

The landowner or proponent is responsible for maintaining an APZ in accordance with Schedule 1 - Standards for Asset Protection Zones. Ongoing maintenance of an APZ is usually enforced through the local government firebreak notice issued under section 33 of the *Bushfires Act 1954*, and/or through a condition of a development approval, which requires the implementation of measures identified within a BMP.

A copy of the firebreak notice and Schedule 1 should be included in a BMP specifically as a how-to guide for the landowner, and to demonstrate to decision-makers that the measures outlined in the BMP to achieve the appropriate BAL rating through provision and ongoing management of an APZ, can be implemented.

Regardless of whether an Asset Protection Zone exists in accordance with the acceptable solutions and is appropriately maintained, it should be noted that fire fighters are not obliged to protect an asset if they think the separation distance between the dwelling and vegetation is unsafe.

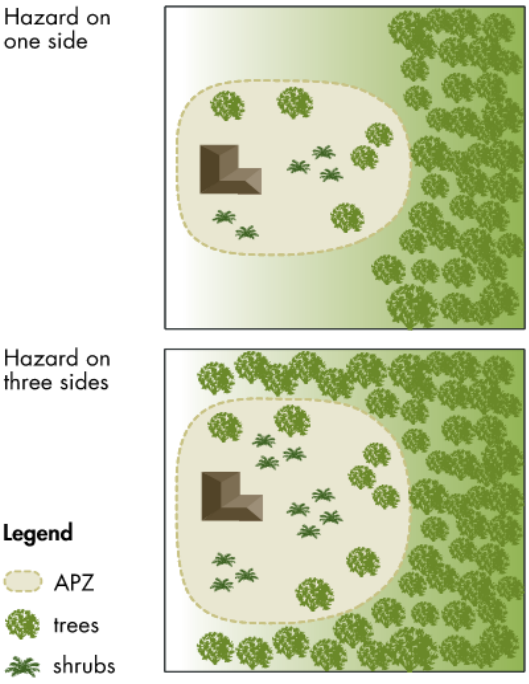

Figure 18: Design of Asset Protection Zone

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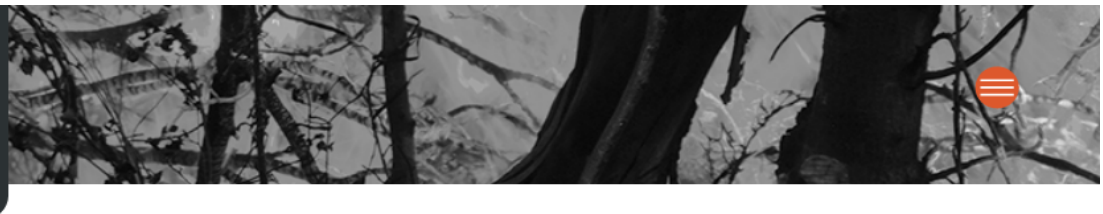

ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

EXPLANATORY NOTES

E2 Landscaping and design of an asset protection zone

Landscaping, design, and maintenance of an APZ in a bushfire prone area can significantly improve the bushfire resilience of a building. An APZ should not be seen as an area entirely cleared of vegetation, but as a strategically designed space that gives holistic consideration to how existing or proposed vegetation or non-combustible features interact with, or affect the building's bushfire resilience.

A well designed APZ provides a greater level of vegetation management within the first few metres of a building with, for example, less vegetation or inclusion of non-combustible materials. The vegetation within the remainder of an APZ can increase further away from the building with carefully considered plant selection and landscaping techniques.

Strategic landscaping measures can be applied, such as replacing weeds with low flammability vegetation (refer to E2 Plant Flammability) to create horizontal and vertical separations between the retained vegetation. The accumulation of fine fuel load from different plants is an important consideration for ongoing maintenance in accordance with Schedule 1. For example, when planting ground covers under deciduous trees within an APZ, the total fine fuel load prescribed in Schedule 1 will include any dead plant material from ground covers and leaf litter from the trees.

Plant density and final structure and form of mature vegetation should be considered in the initial landscaping stages. For example, clumps of sapling shrubs planted at a density without consideration of future growth, may increase the bushfire risk as a clump will quickly grow to exceed 5m^2. It should be noted that in some cases, a single shrub in a mature state may be so dense as to fill a 5m^2 clump alone.

The location of plants within an APZ is a key design technique. Separation of garden beds with areas of low fuel or non-combustible material, will break up fuel continuity and reduce the likelihood of a bushfire running through an APZ and subjecting a dwelling to radiant heat or direct flame contact. It is important to note, where mature trees are separated from a building by six metres, but the canopy has grown to extend or overhang a building, maintenance and pruning to remove the overhanging branches should be undertaken without the entirety of the tree being removed.

Mulches used within the APZ should be non-combustible. The use of stone, gravel, rock and crushed mineral earth is encouraged. Wood mulch >6mm in thickness may be used, however it is recommended that it is used in garden beds or areas where the moisture level is higher by regular irrigation. These materials could be sourced from non-toxic construction and demolition waste giving the added benefit of reducing the environmental impact of any 'hard landscaping' actions.

Combustible objects, plants, garden supplies such as mulches, fences made from combustible material, should be avoided within 10 metres of a building. Vines or climbing plants on pergolas, posts or beams, should be located away from vulnerable parts of the building, such as windows and doors. Non-flammable features can be used to provide hazard separation from classified vegetation, such as tennis courts, pools, lawns and driveways or paths that use inorganic mulches (gravel or crushed rock). Consider locating firewood stacks away from trees and habitable buildings.

Incorporation of landscaping features, such as masonry feature walls can provide habitable buildings with barriers to wind, radiant heat and embers. These features can include noise walls or wind breaks. Use of Appendix F of AS 3959 for bushfire resistant timber selection within areas of 29kW/m^2 (BAL-29) or below, or the use of non-combustible fencing materials such as iron, brick, limestone, metal post and wire is encouraged.

In addition to regular maintenance of an APZ, further bushfire protection can be provided at any time by:

- ensuring gutters are free from vegetation;
- installing gutter guards or plugs;
- regular cleaning of underfloor spaces, or enclosing them to prevent gaps;
- trimming and removing dead plants or leaf litter;
- pruning climbing vegetation (such as vines) on a trellis, to ensure it does not connect to a building, particularly near windows and doors;
- removing vegetation in close proximity to a water tank to ensure it is not touching the sides of a tank; and/or
- following the requirements of the relevant local government section 33 fire break notice, which may include additional provisions such as locating wood piles more than 10 metres from a building.

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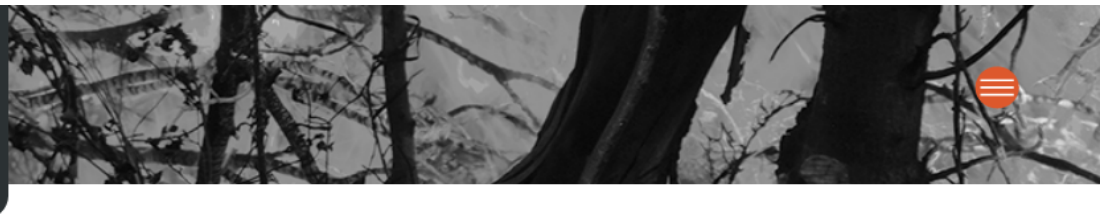

ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

EXPLANATORY NOTES

Preparation of a property prior to the bushfire season and/or in anticipation of a bushfire is beneficial even if your plan is to evacuate. As embers can travel up to several kilometres from a bushfire and fall into small spaces and crevices or land against the external walls of a building, best practice recommends that objects within the APZ are moved away from the building prior to any bushfire event. Objects may include, but are not limited to:

- door mats;
- outdoor furniture;
- potted plants;
- shade sails or umbrellas;
- plastic garbage bins;
- firewood stacks;
- flammable sculptures; and/or
- playground equipment and children's toys.

E2 Plant flammability

There are certain plant characteristics that are known to influence flammability, such as moisture or oil content and the presence and type of bark. Plants with lower flammability properties may still burn during a bushfire event, but may be more resistant to burning and some may regenerate faster post-bushfire.

There are many terms for plant flammability that should not be confused, including:

- Fire resistant – plant species that survive being burnt and will regrow after a bushfire and therefore may be highly flammable and inappropriate for a garden in areas of high bushfire risk.
- Fire retardant – plants that may not burn readily or may slow the passage of a bushfire.
- Fire wise – plants that have been identified and selected based on their flammability properties and linked to maintenance advice and planting location within a garden.

Although not a requirement of these Guidelines, local governments may develop their own list of fire wise or fire-retardant plant species that suit the environmental characteristics of an area. When developing a recommended plant species list, local governments should consult with ecologists, land care officers or environmental authorities to ensure the plants do not present a risk to endangered ecological communities, threatened, or endangered species or their habitat.

When selecting plants, private landholders and developers should aim for plants within the APZ that have the following characteristics:

- grow in a predicted structure, shape and height;
- are open and loose branching with leaves that are thinly spread;
- have a coarse texture and low surface-area-to-volume ratio;
- will not drop large amounts of leaves or limbs, that require regular maintenance;
- have wide, flat, and thick or succulent leaves;
- trees that have bark attached tightly to their trunk or have smooth bark;
- have low amounts of oils, waxes, and resins (which will often have a strong scent when crushed);
- do not produce or hold large amounts of fine dead material in their crowns; and/or
- will not become a weed in the area.

Refer to the WAPC Bushfire and Vegetation Fact Sheet for further information on clearing and vegetation management and APZ landscaping, design and plant selection reference material.

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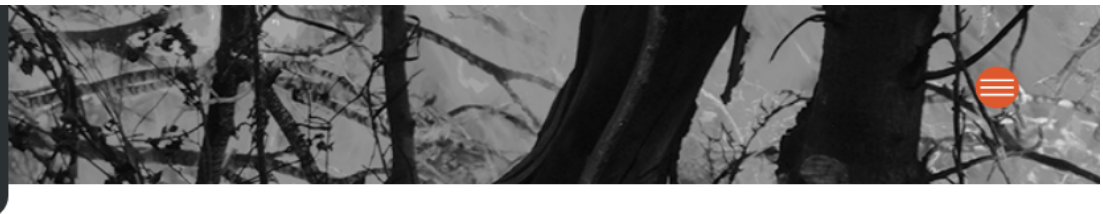
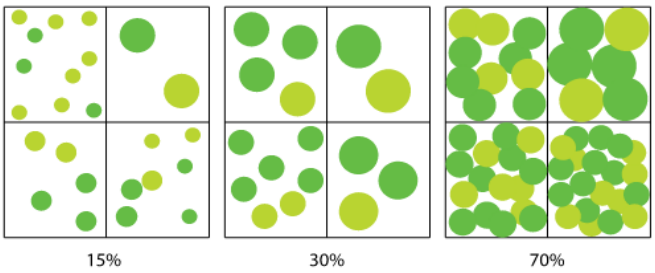


ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

SCHEDULE 1: STANDARDS FOR ASSET PROTECTION ZONES

OBJECT	REQUIREMENT
Fences within the APZ	• Should be constructed from non-combustible materials (for example, iron, brick, limestone, metal post and wire, or bushfire-resisting timber referenced in Appendix F of AS 3959).
Fine fuel load (Combustible, dead vegetation matter <6 millimetres in thickness)	• Should be managed and removed on a regular basis to maintain a low threat state. • Should be maintained at <2 tonnes per hectare (on average). • Mulches should be non-combustible such as stone, gravel or crushed mineral earth or wood mulch >6 millimetres in thickness.
Trees* (>6 metres in height)	• Trunks at maturity should be a minimum distance of six metres from all elevations of the building. • Branches at maturity should not touch or overhang a building or powerline. • Lower branches and loose bark should be removed to a height of two metres above the ground and/or surface vegetation. • Canopy cover within the APZ should be <15 per cent of the total APZ area. • Tree canopies at maturity should be at least five metres apart to avoid forming a continuous canopy. Stands of existing mature trees with interlocking canopies may be treated as an individual canopy provided that the total canopy cover within the APZ will not exceed 15 per cent and are not connected to the tree canopy outside the APZ. **Figure 19:** Tree canopy cover – ranging from 15 to 70 per cent at maturity  15% 30% 70%
Shrub* and scrub* (0.5 metres to six metres in height). Shrub and scrub >6 metres in height are to be treated as trees.	• Should not be located under trees or within three metres of buildings. • Should not be planted in clumps >5 square metres in area. • Clumps should be separated from each other and any exposed window or door by at least 10 metres.
Ground covers* (<0.5 metres in height. Ground covers >0.5 metres in height are to be treated as shrubs)	• Can be planted under trees but must be maintained to remove dead plant material, as prescribed in 'Fine fuel load' above. • Can be located within two metres of a structure, but three metres from windows or doors if >100 millimetres in height.

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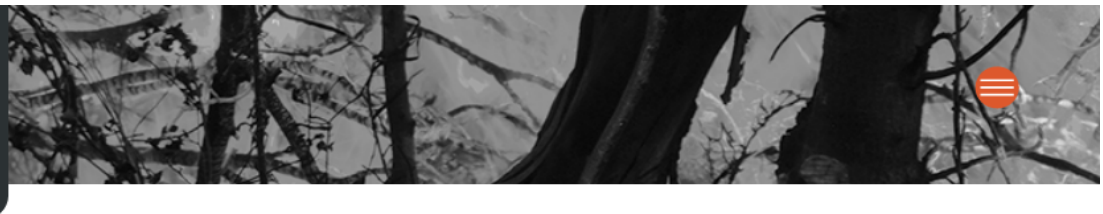

ELEMENT 2: SITING AND DESIGN OF DEVELOPMENT

SCHEDULE 1: STANDARDS FOR ASSET PROTECTION ZONES

OBJECT	REQUIREMENT
Grass	• Grass should be maintained at a height of 100 millimetres or less, at all times. • Wherever possible, perennial grasses should be used and well-hydrated with regular application of wetting agents and efficient irrigation.
Defendable space	• Within three metres of each wall or supporting post of a habitable building, the area is kept free from vegetation, but can include ground covers, grass and non-combustible mulches as prescribed above.
LP Gas Cylinders	• Should be located on the side of a building furthest from the likely direction of a bushfire or on the side of a building where surrounding classified vegetation is upslope, at least one metre from vulnerable parts of a building. • The pressure relief valve should point away from the house. • No flammable material within six metres from the front of the valve. • Must sit on a firm, level and non-combustible base and be secured to a solid structure.

** Plant flammability, landscaping design and maintenance should be considered – refer to explanatory notes*

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APPENDIX 1 - VEGETATION CLASSIFICATION

Vegetation Classification

Vegetation shall be classified in accordance with Table 2.3 and Figures 2.4(A) to 2.4(G). Where there is more than one vegetation type, each type shall be classified separately with the worst case scenario (predominant vegetation is not necessarily the worst case scenario) applied.

2.2.3.2 *Exclusions - Low threat vegetation and non-vegetated areas*

The Bushfire Attack Level shall be classified BAL - LOW where the vegetation is one or a combination of any of the following:

(a) Vegetation of any type that is more than 100m from the site

(b) Single areas of vegetation less than 1ha in area and not within 100m of other areas of vegetation being classified

(c) Multiple areas of vegetation less than 0.25ha in area and not within 20m of the site, or each other

(d) Strips of vegetation less than 20m in width regardless of length and not within 20m of the site, or each other, or other areas of vegetation being classified

(e) Non-vegetated areas, including waterways, roads, footpaths, buildings and rocky outcrops

(f) Low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and windbreaks

Table 2.3 Classification of Vegetation

Vegetation Classification	Vegetation Type	Description
A Forest	Tall open forest Tall woodland	Trees over 30m high; 30-70% foliage cover. Found in areas of high reliable rainfall. Typically dominated by eucalyptus
	Open forest Low open forest	Trees 10-30m high; 30-70% foliage cover. Typically dominated by eucalyptus
	Pine Plantation	Trees 10-30m in height at maturity, generally compromising Pinus species or other softwood pieces, planted as a singled species
B Woodland	Woodland Open Woodland	Tress 10-30m high; 10-30% foliage cover dominated by eucalyptus; understorey or low trees to tall shrubs
	Low woodland Low open woodland Open shrubland	Low trees and shrubs 2-10m high; foliage cover less than 10%. Dominated by eucalyptus and Acacias. Often have a grassy understorey or low shrubs
C Shrubland	Closed heath Open heath	Found in wet areas and/or areas affected by poor soil fertility or shallow soils. Shrubs 1-2m high
	Low shrubland	Shrubs <2m high; greater than 30% foliage cover. Understorey may contain grasses
D Scrub	Closed scrub	Found in wet areas and/or areas affected by poor soil fertility or shallow soils; >30% foliage cover. Shrubs >2m high
	Open scrub	Shrubs greater than 2m high; 10-30% foliage cover with a mixed species composition

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E Mallee/ Mulga	Tall shrubland	Vegetation dominated by shrubs with a multi-stemmed habit; usually greater than 2m in height; <30% foliage cover. Understorey of widespread to dense low shrubs or sparse grasses
F Rainforest	Tall closed forest Closed forest Low closed forest	Trees 10-40m in height; >90% foliage cover; understorey may contain a large number of species with a variety of heights
G Grassland	Low open shrubland Tussock grassland Hummock grassland Herbfield	All forms, including situations with shrubs and trees, if the overstorey foliage cover is less than 10%

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APPENDIX 2 - BUSHFIRE ATTACK LEVEL

Bushfire Attack Level Assessment Explained

A Bushfire Attack Level (BAL) Assessment is a means of measuring the severity of a buildings potential exposure to ember attack, radiant heat and direct flam contact in a bushfire event, and thereby determining the construction measures required for the dwelling.

The methodology used for the determination of the BAL rating, and the subsequent building construction standards, are directly referenced from Australian Standard AS 3959-2018 Construction of buildings in bushfire prone areas.

The BAL rating is determined through identification and assessment of the following parameters:

- Fire Danger Index (FDI) rating; assumed to be FDI-80 for WA;
- All classified vegetation within 100m of the subject building;
- Separation distance between the building and the classified vegetation source/s; and
- Slope of the land under the classified vegetation.

AS 3959-2018 has six (6) levels of BAL, based on the radiant heat flux exposure to the building, and also identifies the relevant sections for building construction, as detailed below:

Bushfire Attack Level (BAL)	Heat flux exposure thresholds	Description of predicted bushfire attack and levels of exposure	Construction Section (within AS 3959)
BAL Low	See clause 2.2.3.2	There is insufficient risk to warrant specific construction requirements	4
BAL 12.5	≤ 12.5kW/m²	Ember attack	3 & 5
BAL 19	> 12.5kW/m² ≤ 19kW/m²	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux	3 & 6
BAL 29	> 19kW/m² ≤ 29kW/m²	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux	3 & 7
BAL 40	>29kW/m² ≤ 40kW/m²	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux with the increased likelihood of exposure to flames	3 & 8
BAL FZ	> 40kW/m²	Direct exposure to flames from the front in addition to heat flux and ember attack	3 & 9

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APPENDIX 3 - CONSTRUCTION REQUIREMENTS

SECTION 5 BAL - 12.5

5.1 GENERAL

A building assessed in section 2 as being BAL-12.5 shall conform with section 3 and clauses 5.2 to 5.8

Any element of construction or system that satisfies the test criteria of AS 1530.8.1 may be used in lieu of the applicable requirements contained in clauses 5.2 to 5.8 (see clause 3.8)

5.2 SUB-FLOOR SUPPORTS

This standard does not provide construction requirements for subfloor supports where the subfloor space is enclosed with -

(a) A wall that conforms with clause 5.4; or

(b) A mesh or perforated sheet with a maximum aperture of 2mm, made of corrosion-resistant steel, bronze or aluminium; or

(c) A combination of items (a) and (b)

5.3 FLOORS

5.3.1 General

This standard does not provide construction requirements for concrete slabs on the ground

5.3.2 Elevated floors

5.3.2.1 *Enclosed subfloor space*

This standard does not provide construction requirements for elevated floors, including bearers, joists and flooring, where the subfloor space is enclosed with -

(a) A wall that conforms with clause 5.4; or

(b) A mesh or perforated sheet with a maximum aperture of 2mm, made of corrosion-resistant steel, bronze or aluminium; or

(c) A combination of items (a) and (b) above

5.3.2.2 *Unenclosed subfloor space*

Where the subfloor space is unenclosed, the bearers, joists and flooring, less than 400mm above finished ground level, shall be one of the following:

(a) Materials that conform with the following:

- (i) Bearers and joists shall be -
  - (A) Non-combustible; or
  - (B) Bushfire-resisting timber (see Appendix F); or
  - (C) A combinations of items (A) and (B)
- (ii) Flooring shall be -
  - (A) Non-combustible; or
  - (B) Bushfire-resisting timber (see Appendix F); or
  - (C) Timber (other than bushfire-resisting timber), particleboard or plywood flooring where the underside is lined with sarking-type material or mineral wool insulation; or
  - (D) A combination of any of items (A), (B) or (C); or

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(b) A system conforming with AS 1530.8.1

This standard does not provide construction requirements for elements of elevated floors, including bearers, joists and flooring, if the underside of the element is 400mm or more above finished ground level

5.4 WALLS

5.4.1 General

The exposed components of an external wall that are less than 400mm from the ground or less than 400mm above decks, carport roofs, awnings and similar elements or fittings having an angle of less than 18 degrees to the horizontal and extending more than 110mm in width from the wall shall be one of the following:

(a) Non-combustible material including the following provided with minimum thickness is 90mm:
  (i) Full masonry or masonry veneer walls with an outer leaf of clay, concrete, calcium silicate or natural stone
  (ii) Precast or in situ walls of concrete or aerated concrete
  (iii) Earth wall including mud brick; or

(b) Timber logs of a species with a density of 680kg/m^3 or greater at a 12% moisture content; of a minimum nominal overall thickness of 90mm and a minimum thickness of 70mm (see clause 3.11); and gauge planed; or

(c) Cladding that is fixed externally to a timber-framed or a steel-framed wall and is -
  (i) Non-combustible material; or
  (ii) Fibre-cement a minimum of 6mm in thickness; or
  (iii) Bushfire-resisting timber (see Appendix F); or
  (iv) A timber species as specified in Paragraph E1, Appendix E; or
  (v) A combination of any of items (i), (ii), (iii) or (iv); or

(d) A combination of any of items (a), (b) or (c)

This standard does not provide construction requirements for the exposed components of an external wall that are 400mm or more from the ground or 400mm or more above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110mm in width from the wall

5.4.2 Joints

All joints in the external surface material of walls shall be covered, sealed, overlapped, backed or butt-jointed

5.4.3 Vents and weepholes

Except for exclusions provided in clause 3.6, vents and weepholes in external walls shall be screened with a mesh made of corrosion-resistant steel, bronze or aluminium

5.5 EXTERNAL GLAZED ELEMENTS, ASSEMBLIES AND DOORS

5.5.1 Bushfire shutters

Where fitted, bushfire shutters shall conform with clause 3.7 and be made from -

(a) Non-combustible material; or

(b) A timber species as specified in Paragraph E1, Appendix E; or

(c) Bushfire-resisting timber (see Appendix F); or

(d) A combination of any of items (a), (b) or (c)

5.5.2 Screens for windows and doors

Where fitted, screens for windows and doors shall have a mesh or perforated sheet made of corrosion-resistant steel,

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bronze or aluminium

The frame supporting the mesh or perforated sheet shall be made from -

(a) Metal; or

(b) Bushfire-resisting timber (see Appendix F); or

(c) A timber species as specified in Paragraph E2, Appendix E

5.5.3 Windows and sidelights

Windows assemblies shall:

(a) Be completely protected by a bushfire shutter that conforms with clause 3.7 and clause 5.5.1; or

(b) Be completely protected externally by screens that conform with clause 3.6 and clause 5.5.2; or

(c) Conform with the following:

(i) *Frame material* For window assemblies less than 400mm from the ground or less than 400mm above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110mm in width from the window frame, window frames and window joinery shall be made from one of the following:

(A) Bushfire-resisting timber (see Appendix F); or

(B) A timber species as specified in Paragraph E2, Appendix E; or

(C) Metal; or

(D) Metal-reinforced uPVC. The reinforcing members shall be made from aluminium, stainless steel, or corrosion-resistant steel

There are no specific restrictions on frame material for all other windows

(ii) *Hardware* There are no specific restrictions on hardware for windows

(iii) *Glazing* Where glazing is less than 400mm from the ground or less than 400mm above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110mm in width from the window frame, the glazing shall be Grade A safety glass minimum 4mm thickness or glass blocks with no restriction on glazing methods

(iv) *Seals and weather strips* There are no specific requirements for seals and weather strips at this BAL level

(v) *Screens* The openable portions of window shall be screened internally or externally with screens that conform with clause 3.6 and clause 5.5.2

5.5.4 Doors – Side-hung external doors (including french doors, panel fold and bi-fold doors)

Side-hung external doors, including french doors, panel fold and bi-fold doors, shall -

(a) Be completely protected by bushfire shutters that conform with clause 3.7 and clause 5.5.1; or

(b) Be completely protected externally by screens that conform with clause 3.6 and clause 5.5.2; or

(c) Conform with the following:

(i) *Door panel material* Materials shall be -

(A) Non-combustible; or

(B) A solid timber, laminated timber or reconstituted timber door, having a minimum thickness of 35mm for the first 400mm above the threshold; or

(C) Hollow core, solid timber, laminated timber or reconstituted timber with a non-combustible kickplate on the outside for the first 400mm above the threshold; or

(D) Hollow core, solid timber, laminated timber or reconstituted timber protected externally by a screen that conforms with clause 5.5.2; or

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(E) For fully framed glazed door panels, the framing shall be made from metal or bushfire resisting timber (see Appendix F) or a timber species as specified in Paragraph E2, Appendix E or uPVC

(ii) *Door frame material* Door frame materials shall be -

(A) Bushfire-resisting timber (see Appendix F); or

(B) A timber species as specified in Paragraph E2, Appendix E; or

(C) Metal; or

(D) Metal-reinforced uPVC. The reinforcing members shall be made from aluminium, stainless steel, or corrosion-resistant steel

(iii) *Hardware* There are no specific requirements for hardware at this BAL level

(iv) *Glazing* The glazing shall be Grade A safety glass a minimum of 4mm in thickness or glass blocks with no restriction on glazing methods

(v) *Seals and weather strips* Weather strips, draft excluders or draft seals shall be installed

(vi) *Screens* There are no requirement to screen the openable part of the door at this BAL level

(vii) Doors shall be tight-fitting to the door frame and to an abutting door, if applicable

5.5.5 Doors - Sliding doors

Sliding doors shall -

(a) Be completely protected by a bushfire shutter that conforms with clause 3.7 and clause 5.5.1; or

(b) Be completely protected externally by screens that conform with clause 3.6 and clause 5.5.2; or

(c) Conform with the following:

(i) *Frame material* The material for door frames, including fully framed glazed doors shall be -

(A) Bushfire-resisting timber (see Appendix F); or

(B) A timber species as specified in Paragraph E2, Appendix E; or

(C) Metal; or

(D) Metal-reinforced uPVC. The reinforcing members shall be made from aluminium, stainless steel, or corrosion-resistant steel

(ii) *Hardware* There are no specific requirements for hardware at this BAL level

(iii) *Glazing* Where doors incorporate glazing, the glazing shall be grade A safety glass a minimum of 4mm in thickness

(iv) *Seals and weather strips* There are no specific requirements for seals and weather strips at this BAL level

(v) *Screens* There is no requirement to screen the openable part of the sliding door at this BAL level

(vi) *Sliding panels* Sliding panels shall be tight-fitting in the frames

5.5.6 Doors – Vehicle access doors (garage doors)

The following applies to vehicle access doors:

(a) The lower portion of a vehicle access door that is within 400mm of the ground when the door is closed (see Figure D4, Appendix D) shall be made from -

(i) Non-combustible material; or

(ii) Bushfire-resisting timber (see Appendix F); or

(iii) Fibre-cement sheet a minimum of 6mm in thickness; or

(iv) A timber species as specified in Paragraph E1, Appendix E; or

(v) A combination of any of items (i), (ii), (iii) or (iv)

(b) All vehicle access doors shall be protected with suitable weather strips, draught excluders, draught seals or brushes.

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Door assemblies fitted with guide tracks do not need edge gap protection

(c) Vehicle access doors with ventilation slots shall be protected in accordance with clause 3.6

5.6 ROOFS (INCLUDING PENETRATIONS, EAVES, FASCIAS AND GABLES, AND GUTTERS AND DOWNPIPES)

5.6.1 General

The following applies to all types of roofs and roofing systems:

(a) Roof tiles, roof sheets and roof-covering accessories shall be non-combustible

(b) The roof/wall and roof/roof junction shall be sealed or otherwise protected in accordance with clause 3.6

(c) Roof ventilation openings, such as gable and roof vents, shall be fitted with ember guards made of non-combustible material or a mesh or perforated sheet conforming with clause 3.6 and made of corrosion-resistant steel, bronze or aluminium

(d) Only evaporative coolers manufactured in accordance with AS/NZS 60335.2.98 shall be used. Evaporative coolers with an internal damper to prevent the entry of embers into the roof space need not be screened externally

5.6.2 Tiled roofs

Tiled roofs shall be fully sarked. The sarking shall -

(a) Be located on top of the roof framing, except that the roof battens may be fixed above the sarking;

(b) Cover the entire roof area, including ridges and hips; and

(c) Extend into gutters and valleys

5.6.3 Sheet roofs

Sheet roofs shall -

(a) Be fully sarked in accordance with clause 5.6.2, except that foil-backed insulation blankets may be installed over the battens; or

(b) Have any gaps sealed at the fascia or wall line, hips and ridges by -

  (i) A mesh or perforated sheet that conforms with clause 3.6 and that is made of corrosion-resistant steel, bronze or aluminium; or

  (ii) Mineral wool; or

  (iii) Other non-combustible material; or

  (iv) A combination of any items (i), (ii) or (iii)

5.6.4 Veranda, carport and awning roof

The following applies to veranda, carport and awning roofs:

(a) A veranda, carport or awning roof forming part of the main roof space shall meet all the requirements for the main roof, as specified in clauses 5.6.1 to 5.6.6

(b) A veranda, carport or awning roof separated from the main roof space by an external wall conforming with clause 5.4 shall have a non-combustible roof covering, except where the roof covering is a translucent or transparent material

5.6.5 Roof penetrations

The following applies to roof penetrations:

(a) Roof penetrations, including roof lights, roof ventilators, roof-mounted evaporative cooling units, aerials, vent pipes and supports for solar collectors or the like, shall be sealed. The material used to seal the penetration shall be non-combustible

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(b) Openings in vented roof lights, roof ventilators or vent pipes shall conform with clause 3.6 and be made of corrosion-resistant steel, bronze or aluminium

This requirement does not apply to a room sealed gas appliance

In the case of gas appliance flues, ember guards shall not be fitted

(c) All overhead glazing shall be Grade A safety glass complying with AS 1288

(d) Glazed elements in roof lights and skylights may be of polymer provided a Grade A safety glass diffuser, complying with AS 1288, is installed under the glazing. Where glazing is an insulating glazing unit (IGU), Grade A toughened safety glass of minimum 4mm in thickness shall be used in outer pane of the IGU

(e) Flashing elements of tubular skylights may be of fire-retardant material, provided the roof integrity is maintained by an under-flashing of a material having a flammability index not exceeding five

(f) Evaporative cooling units shall be fitted with non-combustible butterfly closers as close as practicable to the roof level or the unit shall be fitted with non-combustible covers with a mesh or perforated sheet with a maximum aperture of 2mm, made of corrosion-resistant steel, bronze or aluminium

(g) Vent pipes made from PVC are permitted

(h) Eaves lighting shall be adequately sealed and not compromise the performance of the element

5.6.6 Eaves, linings, fascias and gables

The following apply to eaves lining, fascias and gables:

(a) Gables shall comply with clause 5.4

(b) Eaves penetrations shall be protected in the same way as roof penetrations, as specified in clause 5.6.5

(c) Eaves ventilation openings shall be fitted with ember guards in accordance with clause 3.6 and made of corrosion-resistant steel, bronze or aluminium

Joints in eaves linings, fascias and gables may be sealed with plastic joining strips or timber storm moulds

This standard does not provide construction requirements for fascias, bargeboards and eaves linings

5.6.7 Gutters and downpipes

This standard does not provide material requirements for -

(a) Gutters, with the exception of box gutters; and

(b) Downpipes

If installed, gutter and valley leaf guards shall be non-combustible

Box gutters shall be non-combustible and flashed at the junction with the roof with non-combustible material

5.7 VERANDAS, DECKS, STEPS AND LANDINGS

5.7.1 General

Decking may be spaced

There is no requirement to enclose the subfloor spaces of verandas, decks, steps, ramps or landings

5.7.2 Enclosed subfloor spaces of verandas, decks, steps, ramps and landings

5.7.2.1 *Materials to enclose a subfloor space*

This standard does not provide construction requirements for the materials used to enclose a subfloor space except where those materials are less than 400mm from the ground

Where the materials used to enclose a subfloor space are less than 400mm from the ground, they shall conform with clause 5.4

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5.7.2.2 *Supports*

This standard does not provide construction requirements for support posts, columns, stumps, stringers, piers and poles

5.7.2.3 *Framing*

This standard does not provide construction requirements for the framing of verandas, pergolas, decks, ramps or landings (i.e. bearers and joists)

5.7.2.4 *Decking, stair treads and the trafficable surfaces of ramps and landings*

This standard does not provide construction requirements for decking, stair treads and the trafficable surfaces of ramps and landings that are more than 300mm from a glazed element

Decking, stair treads and the trafficable surfaces of ramps and landings less than 300mm (measured horizontally at deck level) from glazed elements that are less than 400mm (measured vertically) from the surface of the deck shall be made from -

(a) Non-combustible material; or
(b) Bushfire-resisting timber (see Appendix F); or
(c) A timber species as specified in Paragraph E1, Appendix E; or
(d) uPVC; or
(e) A combination of any of items (a), (b), (c) or (d)

5.7.3 Unenclosed subfloor spaces of verandas, decks, steps, ramps and landings

5.7.3.1 *Supports*

This standard does not provide construction requirements for support posts, columns, stumps, stringers, piers and poles

5.7.3.2 *Framing*

This standard does not provide construction requirements for the framing of verandas, decks, ramps or landings (i.e. bearers and joists)

5.7.3.3 *Decking, stair treads and trafficable surfaces of ramps and landings*

This standard does not provide construction requirements for decking, stair treads and the trafficable surfaces of ramps and landings that are more than 300mm from a glazed element

Decking, stair treads and the trafficable surfaces of ramps and landings less than 300mm (measured horizontally at deck level) from glazed elements that are less than 400mm (measured vertically) from the surface of the deck shall be made from -

(a) Non-combustible material; or
(b) Bushfire-resisting timber (see Appendix F); or
(c) A timber species as specified in Paragraph E1, Appendix E; or
(d) A combination of any of items (a), (b) or (c) above

5.7.4 Balustrades, handrails or other barriers

This standard does not provide construction requirements for balustrades, handrails and other barriers

5.7.5 Veranda posts

Veranda posts -

(a) Shall be timber mounted on galvanised mounted shoes or stirrups with a clearance of not less than 75mm above the adjacent finished ground level; or

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(b) Less than 400mm (measured vertically) from the surface of the deck or ground shall be made from -

(i) Non-combustible material; or

(ii) Bushfire-resisting timber (see Appendix F); or

(iii) A timber species as specified in Paragraph E1, Appendix E; or

(iv) A combination of any items (a) or (b)

5.8 WATER AND GAS SUPPLY PIPES

Above-ground, exposed water supply pipes shall be metal

External gas pipes and fittings above ground shall be of steel or copper construction having a minimum wall thickness in accordance with gas regulations or 0.9mm whichever is the greater. The metal pipe shall extend a minimum of 400mm within the building and 100mm below ground

(c) Bushfire-resisting timber (see Appendix F); or

(d) A combination of any of items (a), (b) or (c) above

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SECTION 6 BAL - 19

6.1 GENERAL

A building assessed in section 2 as being BAL-19 shall conform with section 3 and clauses 6.2 to 6.8

Any element of construction or system that satisfies the test criteria of AS 1530.8.1 may be used in lieu of the applicable requirements contained in clauses 6.2 to 6.8 (see clause 3.8)

6.2 SUB-FLOOR SUPPORTS

This standard does not provide construction requirements for subfloor supports where the subfloor space is enclosed with -

(a) A wall that conforms with clause 6.4; or

(b) A mesh or perforated sheet with a maximum aperture of 2mm, made of corrosion-resistant steel, bronze or aluminium; or

(c) A combination of items (a) and (b)

6.3 FLOORS

6.3.1 General

This standard does not provide construction requirements for concrete slabs on the ground

6.3.2 Elevated floors

6.3.2.1 *Enclosed subfloor space*

This standard does not provide construction requirements for elevated floors, including bearers, joists and flooring, where the subfloor space is enclosed with -

(a) A wall that conforms with clause 6.4; or

(b) A mesh or perforated sheet with a maximum aperture of 2mm, made of corrosion-resistant steel, bronze or aluminium; or

(c) A combination of items (a) and (b)

6.3.2.2 *Unenclosed subfloor space*

Where the subfloor space is unenclosed, the bearers, joists and flooring, less than 400mm above finished ground level, shall be one of the following:

(a) Materials that conform with the following:

- (i) Bearers and joists shall be -
  - (A) Non-combustible; or
  - (B) Bushfire-resisting timber (see Appendix F); or
  - (C) A combinations of items (A) and (B)
- (ii) Flooring shall be -
  - (A) Non-combustible; or
  - (B) Bushfire-resisting timber (see Appendix F); or
  - (C) Timber (other than bushfire-resisting timber), particleboard or plywood flooring where the underside is lined with sarking-type material or mineral wool insulation; or
  - (D) A combination of any of items (A), (B) or (C); or

(b) A system conforming with AS 1530.8.1

This standard does not provide construction requirements for elements of elevated floors, including bearers, joists and

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flooring, if the underside of the element is 400mm or more above finished ground level

6.4 WALLS

6.4.1 General

The exposed components of an external wall that are less than 400mm from the ground or less than 400mm above decks, carport roofs, awnings and similar elements or fittings having an angle of less than 18 degrees to the horizontal and extending more than 110mm in width from the wall shall be as follows:

(a) Non-combustible material including the following provided with minimum thickness is 90mm:
  (i) Full masonry or masonry veneer walls with an outer leaf of clay, concrete, calcium silicate or natural stone
  (ii) Precast or in situ walls of concrete or aerated concrete
  (iii) Earth wall including mud brick; or

(b) Timber logs of a species with a density of 680kg/m^3 or greater at a 12% moisture content; of a minimum nominal overall thickness of 90mm and a minimum thickness of 70mm (see clause 3.11); and gauge planed; or

(c) Cladding that is fixed externally to a timber-framed or a steel-framed wall and is -
  (i) Non-combustible material; or
  (ii) Fibre-cement a minimum of 6mm in thickness; or
  (iii) Bushfire-resisting timber (see Appendix F); or
  (iv) A timber species as specified in Paragraph E1, Appendix E; or
  (v) A combination of any of items (i), (ii), (iii) or (iv); or

(d) A combination of any of items (a), (b) or (c) above

This standard does not provide construction requirements for the exposed components of an external wall that are 400mm or more from the ground or 400mm or more above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110mm in width from the wall

6.4.2 Joints

All joints in the external surface material of walls shall be covered, sealed, overlapped, backed or butt-jointed

6.4.3 Vents and weepholes

Except for exclusions provided in clause 3.6, vents and weepholes in external walls shall be screened with a mesh made of corrosion-resistant steel, bronze or aluminium

6.5 EXTERNAL GLAZED ELEMENTS, ASSEMBLIES AND DOORS

6.5.1 Bushfire shutters

Where fitted, bushfire shutters shall conform with clause 3.7 and be made from -

(a) Non-combustible material; or

(b) A timber species as specified in Paragraph E1, Appendix E; or

(c) Bushfire-resisting timber (see Appendix F); or

(d) A combination of any of items (a), (b) or (c)

6.5.2 Screens for windows and doors

Where fitted, screens for windows and doors shall have a mesh or perforated sheet made of corrosion-resistant steel, bronze or aluminium

The frame supporting the mesh or perforated sheet shall be made from -

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(a) Metal; or
(b) Bushfire-resisting timber (see Appendix F); or
(c) A timber species as specified in Paragraph E2, Appendix E

6.5.3 Windows and sidelights

Windows assemblies shall:

(a) Be completely protected by a bushfire shutter conforming with clause 3.7 and clause 6.5.1; or
(b) Be completely protected externally by screens conforming with clause 3.6 and clause 6.5.2; or
(c) Conform with the following:
  (i) *Frame material* For window assemblies less than 400mm from the ground or less than 400mm above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110mm in width from the window frame, window frame and window joinery shall be made from one of the following:
    (A) Bushfire-resisting timber (see Appendix F); or
    (B) A timber species as specified in Paragraph E2, Appendix E; or
    (C) Metal; or
    (D) Metal-reinforced uPVC. The reinforcing members shall be made from aluminium, stainless steel, or corrosion-resistant steel

    There are no specific restrictions on frame material for all other windows
  (ii) *Hardware* There are no specific restrictions on hardware for windows
  (iii) *Glazing* Where glazing is less than 400mm from the ground or less than 400mm above decks, carport roofs, awnings and similar elements or fittings having an angle less than 18 degrees to the horizontal and extending more than 110mm in width from the window frame, this glazing shall be toughened glass a minimum of 5mm in thickness, or glass blocks with no restriction on glazing methods
  (iv) *Seals and weather strips* There are no specific requirements for seals and weather strips at this BAL level
  (v) *Screens* The openable portions of window shall be screened internally or externally with screens that conform with clause 3.6 and clause 6.5.2

  Where annealed glass is used, both the fixed and openable portions of the window shall be screened externally with screens that conform with clause 6.5.2

6.5.4 Doors – Side-hung external doors (including french doors, panel fold and bi-fold doors)

Side-hung external doors, including french doors, panel fold and bi-fold doors, shall -

(a) Be completely protected by bushfire shutters that conform with clause 3.7 and clause 6.5.1; or
(b) Be completely protected externally by screens that conform with clause 3.6 and clause 6.5.2; or
(c) Conform with the following:
  (i) *Door panel material* Materials shall be -
    (A) Non-combustible; or
    (B) A solid timber, laminated timber or reconstituted timber door, having a minimum thickness of 35mm for the first 400mm above the threshold; or
    (C) Hollow core, solid timber, laminated timber or reconstituted timber with a non-combustible kickplate on the outside for the first 400mm above the threshold; or
    (D) For fully framed glazed door panels, the framing shall be made from metal or bushfire resisting timber (see Appendix F) or a timber species as specified in Paragraph E2, Appendix E or uPVC

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(ii) *Door frame material* Door frame materials shall be -

(A) Bushfire-resisting timber (see Appendix F); or

(B) A timber species as specified in Paragraph E2, Appendix E; or

(C) Metal; or

(D) Metal-reinforced uPVC. The reinforcing members shall be made from aluminium, stainless steel, or corrosion-resistant steel

(iii) *Hardware* There are no specific requirements for hardware at this BAL level

(iv) *Glazing* Where doors incorporate glazing, the glazing shall be toughened glass a minimum of 5mm in thickness

(v) *Seals and weather strips* Weather strips, draft excluders or draft seals shall be installed

(vi) *Screens* There are no requirement to screen the openable part of the door at this BAL level

(vii) Doors shall be tight-fitting to the door frame and to an abutting door, if applicable

6.5.5 Doors - Sliding doors

Sliding doors shall -

(a) Be completely protected by a bushfire shutter that conforms with clause 3.7 and clause 6.5.1; or

(b) Be completely protected externally by screens that conform with clause 3.6 and clause 6.5.2; or

(c) Conform with the following:

(i) *Frame material* The material for door frames, including fully framed glazed doors shall be -

(A) Bushfire-resisting timber (see Appendix F); or

(B) A timber species as specified in Paragraph E2, Appendix E; or

(C) Metal; or

(D) Metal-reinforced uPVC. The reinforcing members shall be made from aluminium, stainless steel, or corrosion-resistant steel

(ii) *Hardware* There are no specific requirements for hardware at this BAL level

(iii) *Glazing* Where doors incorporate glazing, the glazing shall be toughened glass a minimum of 5mm in thickness

(iv) *Seals and weather strips* There are no specific requirements for seals and weather strips at this BAL level

(v) *Screens* There is no requirement to screen the openable part of the sliding door at this BAL level

(vi) *Sliding panels* Sliding panels shall be tight-fitting in the frames

6.5.6 Doors – Vehicle access doors (garage doors)

The following applies to vehicle access doors:

(a) The lower portion of a vehicle access door that is within 400mm of the ground when the door is closed (see Figure D4, Appendix D) shall be made from -

(i) Non-combustible material; or

(ii) Bushfire-resisting timber (see Appendix F); or

(iii) Fibre-cement sheet a minimum of 6mm in thickness; or

(iv) A timber species as specified in Paragraph E1, Appendix E; or

(v) A combination of any of items (i), (ii), (iii) or (iv)

(b) All vehicle access doors shall be protected with suitable weather strips, draught excluders, draught seals or brushes. Door assemblies fitted with guide tracks do not need edge gap protection

(c) Weather strips, draught excluders, draught seals or brushes to protect edge gaps or thresholds shall be manufactured from materials having a flammability index not exceeding five

(d) Vehicle access doors with ventilation slots shall be protected in accordance with clause 3.6

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6.6 ROOFS (INCLUDING PENETRATIONS, EAVES, FASCIAS AND GABLES, AND GUTTERS AND DOWNPIPES)

6.6.1 General

The following applies to all types of roofs and roofing systems:

(a) Roof tiles, roof sheets and roof-covering accessories shall be non-combustible

(b) The roof/wall and roof/roof junction shall be sealed or otherwise protected in accordance with clause 3.6

(c) Roof ventilation openings, such as gable and roof vents, shall be fitted with ember guards made of non-combustible material or a mesh or perforated sheet conforming with clause 3.6 and made of corrosion-resistant steel, bronze or aluminium

(d) Only evaporative coolers manufactured in accordance with AS/NZS 60335.2.98 shall be used. Evaporative coolers with an internal damper to prevent the entry of embers into the roof space need not be screened externally

6.6.2 Tiled roofs

Tiled roofs shall be fully sarked. The sarking shall -

(a) Be located on top of the roof framing, except that the roof battens may be fixed above the sarking;

(b) Cover the entire roof area, including ridges and hips; and

(c) Extend into gutters and valleys

6.6.3 Sheet roofs

Sheet roofs shall -

(a) Be fully sarked in accordance with clause 6.6.2, except that foil-backed insulation blankets may be installed over the battens; or

(b) Have any gaps sealed at the fascia or wall line, hips and ridges by -

  (i) A mesh or perforated sheet that conforms with clause 3.6 and that is made of corrosion-resistant steel, bronze or aluminium; or

  (ii) Mineral wool; or

  (iii) Other non-combustible material; or

  (iv) A combination of any items (i), (ii) or (iii)

6.6.4 Veranda, carport and awning roof

The following applies to veranda, carport and awning roofs:

(a) A veranda, carport or awning roof forming part of the main roof space shall meet all the requirements for the main roof, as specified in clauses 6.6.1 to 6.6.6

(b) A veranda, carport or awning roof separated from the main roof space by an external wall conforming with clause 6.4 shall have a non-combustible roof covering, except where the roof covering is a translucent or transparent material

6.6.5 Roof penetrations

The following applies to roof penetrations:

(a) Roof penetrations, including roof lights, roof ventilators, roof-mounted evaporative cooling units, aerials, vent pipes and supports for solar collectors or the like, shall be sealed. The material used to seal the penetration shall be non-combustible

(b) Openings in vented roof lights, roof ventilators or vent pipes shall conform with clause 3.6 and be made of corrosion-resistant steel, bronze or aluminium

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This requirement does not apply to a room sealed gas appliance

In the case of gas appliance flues, ember guards shall not be fitted

(c) All overhead glazing shall be Grade A safety glass complying with AS 1288

(d) Glazed elements in roof lights and skylights may be of polymer, provided a Grade A safety glass diffuser, complying with AS 1288, is installed under the glazing. Where glazing is an insulating glazing unit (IGU), Grade A toughened safety glass of minimum 4mm thickness shall be used in outer pane of the IGU

(e) Flashing elements of tubular skylights may be of fire-retardant material, provided the roof integrity is maintained by an under-flashing of a material having a flammability index not exceeding five

(f) Evaporative cooling units shall be fitted with non-combustible butterfly closers as close as practicable to the roof level, or the unit shall be fitted with non-combustible covers with a mesh or perforated sheet with a maximum aperture of 2mm, made of corrosion-resistant steel, bronze or aluminium

(g) Eaves lighting shall be adequately sealed and not compromise the performance of the element

6.6.6 Eaves, linings, fascias and gables

The following apply to eaves lining, fascias and gables:

(a) Gables shall comply with clause 6.4

(b) Eaves penetrations shall be protected the same as for roof penetrations, as specified in clause 6.6.5

(c) Eaves ventilation openings shall be fitted with ember guards in accordance with clause 3.6 and made of corrosion-resistant steel, bronze or aluminium

Joints in eaves linings, fascias and gables may be sealed with plastic joining strips or timber storm moulds

This standard does not provide construction requirements for fascias, bargeboards and eaves linings

6.6.7 Gutters and downpipes

This standard does not provide material requirements for -

(a) Gutters, with the exception of box gutters; and

(b) Downpipes

If installed, gutter and valley leaf guards shall be non-combustible

Box gutters shall be non-combustible and flashed at the junction with the roof with non-combustible material

6.7 VERANDAS, DECKS, STEPS AND LANDINGS

6.7.1 General

Decking may be spaced

There is no requirement to enclose the subfloor spaces of verandas, decks, steps, ramps or landings

6.7.2 Enclosed subfloor spaces of verandas, decks, steps, ramps and landings

6.7.2.1 *Materials to enclose a subfloor space*

This standard does not provide construction requirements for the materials used to enclose a subfloor space except where those materials are less than 400mm from the ground

Where the materials used to enclose a subfloor space are less than 400mm from the ground, they shall conform with clause 6.4

6.7.2.2 *Supports*

This standard does not provide construction requirements for support posts, columns, stumps, stringers, piers and poles

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6.7.2.3 *Framing*

This standard does not provide construction requirements for the framing of verandas, pergolas, decks, ramps or landings (i.e. bearers and joists)

6.7.2.4 *Decking, stair treads and the trafficable surfaces of ramps and landings*

This standard does not provide construction requirements for decking, stair treads and the trafficable surfaces of ramps and landings that are more than 300mm from a glazed element

Decking, stair treads and the trafficable surfaces of ramps and landings less than 300mm (measured horizontally at deck level) from glazed elements that are less than 400mm (measured vertically) from the surface of the deck shall be made from -

(a) Non-combustible material; or
(b) Bushfire-resisting timber (see Appendix F); or
(c) A timber species as specified in Paragraph E1, Appendix E; or
(d) A combination of any of items (a), (b) or (c)

6.7.3 Unenclosed subfloor spaces of verandas, decks, steps, ramps and landings

6.7.3.1 *Supports*

This standard does not provide construction requirements for support posts, columns, stumps, stringers, piers and poles

6.7.3.2 *Framing*

This standard does not provide construction requirements for the framing of verandas, decks, ramps or landings (i.e. bearers and joists)

6.7.3.3 *Decking, stair treads and trafficable surfaces of ramps and landings*

This standard does not provide construction requirements for decking, stair treads and the trafficable surfaces of ramps and landings that are more than 300mm from a glazed element

Decking, stair treads and the trafficable surfaces of ramps and landings less than 300mm (measured horizontally at deck level) from glazed elements that are less than 400mm (measured vertically) from the surface of the deck shall be made from -

(a) Non-combustible material; or
(b) Bushfire-resisting timber (see Appendix F); or
(c) A timber species as specified in Paragraph E1, Appendix E; or
(d) A combination of any of items (a), (b) or (c) above

6.7.4 Balustrades, handrails or other barriers

This standard does not provide construction requirements for balustrades, handrails and other barriers

6.7.5 Veranda posts

Veranda posts -

(a) Shall be timber mounted on galvanised mounted shoes or stirrups with a clearance of not less than 75mm above the adjacent finished ground level; or
(b) Less than 400mm (measured vertically) from the surface of the deck or ground shall be made from -
    (i) Non-combustible material; or
    (ii) Bushfire-resisting timber (see Appendix F); or

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(iii) A timber species as specified in Paragraph E1, Appendix E; or

(iv) A combination of any items (a) or (b)

6.8 WATER AND GAS SUPPLY PIPES

Above-ground, exposed water supply pipes shall be metal

External gas pipes and fittings above ground shall be of steel or copper construction having a minimum wall thickness in accordance with gas regulations or 0.9mm whichever is the greater. The metal pipe shall extend a minimum of 400mm within the building and 100mm below ground

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SECTION 8 BAL - 40

8.1 GENERAL

A building assessed in section 2 as being BAL-40 shall conform with section 3 and clauses 8.2 to 8.8

Any element of construction or system that satisfies the test criteria of AS 1530.8.1 may be used in lieu of the applicable requirements contained in clauses 8.2 to 8.8 (see clause 3.8)

8.2 SUB-FLOOR SUPPORTS

This standard does not provide construction requirements for subfloor supports where the subfloor space is enclosed with a wall that conforms with clause 8.4, except that sarking is not required where specified in clause 8.4.1(b) -

Where the subfloor space is unenclosed, the support posts, columns, stumps, piers and poles shall be -

(a) Of non-combustible material; or

(b) A system conforming with AS 1530.8.1; or

(c) A combination of items (a) and (b)

8.3 FLOORS

8.3.1 General

This standard does not provide construction requirements for concrete slabs on the ground

8.3.2 Elevated floors

8.3.2.1 *Enclosed subfloor space*

This standard does not provide construction requirements for elevated floors, including bearers, joists and flooring, where the subfloor space is enclosed with a wall that conforms with clause 8.4, except that sarking is not required where specified in clause 8.4.1(b)

8.3.2.2 *Unenclosed subfloor space*

Where the subfloor space is unenclosed, the bearers, joists and flooring, shall -

(a) Be non-combustible; or

(b) Have the underside of the combustible elements of the floor system protected with a non-combustible material (e.g. fibre-cement sheet or metal sheet); or

(c) Be a system conforming with AS 1530.8.1; or

(d) Be a combination of any items (a), (b) or (c)

8.4 WALLS

8.4.1 General

The exposed components of external walls shall be as follows:

(a) Non-combustible material including the following provided with minimum thickness is 90mm:

  (i) Full masonry or masonry veneer walls with an outer leaf of clay, concrete, calcium silicate or natural stone

  (ii) Precast or in situ walls of concrete or aerated concrete

  (iii) Earth wall including mud brick; or

(b) Cladding that is fixed externally to a timber-framed or a steel-framed wall that is sarked on the outside of the frame, and is -

  (i) Fibre-cement a minimum of 9mm in thickness; or

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(ii) Steel sheet; or

(iii) A combination of any of items (i) and (ii)

(c) A system conforming with AS 1530.8.1; or

(d) A combination of any of items (a), (b) or (c)

8.4.2 Joints

All joints in the external surface material of walls shall be covered, sealed, overlapped, backed or butt-jointed

8.4.3 Vents and weepholes

Except for exclusions provided in clause 3.6, vents and weepholes in external walls shall be screened with a mesh made of corrosion-resistant steel, bronze or aluminium

8.5 EXTERNAL GLAZED ELEMENTS, ASSEMBLIES AND DOORS

8.5.1 Bushfire shutters

Where fitted, bushfire shutters shall conform with clause 3.7 and be made from non-combustible material

8.5.2 Screens for windows and doors

Where fitted, screens for windows and doors shall have a mesh or perforated sheet made of corrosion-resistant steel or bronze

The frame supporting the mesh or perforated sheet shall be metal

Screen assemblies shall be attached using metal fixings

8.5.3 Windows and sidelights

Windows assemblies shall:

(a) Be completely protected by a bushfire shutter conforming with clause 3.7 and clause 8.5.1; or

(b) Conform with the following:

(i) *Frame material* Window frames and window joinery shall be metal

(ii) *Hardware* Externally fitted hardware that supports the sash in its functions of opening and closing shall be metal

Trims or other components may use material other than metal

(iii) *Glazing* Glazing shall be toughened glass a minimum of 6mm thick or glass blocks with no restriction on glazing methods

(iv) Where used, seals and weather strips to stiles, head and sills or thresholds shall be manufactured from materials having a flammability index not exceeding 5 or from silicone

(v) *Screens* Both the openable and fixed portions of the window shall be screened externally with screens that conform with clause 3.6 and clause 8.5.2

8.5.4 Doors – Side-hung external doors (including french doors, panel fold and bi-fold doors)

Side-hung external doors, including french doors, panel fold and bi-fold doors, shall -

(a) Be completely protected by bushfire shutters that conform with clause 3.7 and clause 8.5.1; or

(b) Conform with the following:

(i) *Door panel material* Materials shall be -

(A) Non-combustible; or

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(B) Solid timber having a minimum thickness of 35mm for the first 400mm above the threshold and protected on the outside by a metal-framed screen door with a mesh or perforated sheet conforming with clause 3.6 and made of corrosion-resistant steel or bronze; or

(C) For fully framed glazed door panels the framing shall be metal

(ii) *Door frame material* The door frame material shall be metal

(iii) *Hardware* Externally fitted hardware that supports the panel in its functions of opening and closing shall be metal

Trims or other components may use materials other than metal

(iv) *Glazing* Where doors incorporate glazing, the glazing shall be toughened glass a minimum of 6mm in thickness

(v) *Seals and weather strips* Weather strips, draught excluders or draught seals shall be installed

Seals to stiles, head and sills or thresholds shall be manufactured from materials having a flammability index not exceeding 5

(vi) *Screens* There is no requirement to screen the openable part of the door at this BAL level

Where glazing is incorporated in the door, it shall be screened externally with screens that conform with clause 8.5.2

(vii) Doors shall be tight-fitting to the door frame and to an abutting door, if applicable

8.5.5 Doors - Sliding doors

Sliding doors shall -

(a) Be completely protected by a bushfire shutter that conforms with clause 3.7 and clause 8.5.1; or

(b) Conform with the following:

(i) *Frame material* The material for door frames, including fully framed glazed doors, shall be made from metal

(ii) *Hardware* Externally fitted hardware that supports the panel in its functions of opening and closing shall be metal

Trims or other components may use materials other than metal

(iii) *Glazing* Where doors incorporate glazing, the glazing shall be toughened glass a minimum of 6mm in thickness

(iv) *Seals and weather strips* Seals to stiles, head and sills or thresholds shall be manufactured from materials with a flammability index not exceeding 5

(v) *Screens* Both the fixed and openable portions of doors shall be screened externally with screens that conform with clause 3.6 and clause 8.5.2

(vi) Sliding doors shall be tight-fitting in the frames

8.5.6 Doors – Vehicle access doors (garage doors)

The following applies to vehicle access doors:

(a) Vehicle access doors shall be non-combustible

(b) All vehicle access doors shall be protected with suitable weather strips, draught excluders, draught seals or brushes. Door assemblies fitted with guide tracks do not need edge gap protection

(c) Weather strips, draught excluders, draught seals or brushes to protect edge gaps or thresholds shall be manufactured from materials having a flammability index not exceeding five

(d) Vehicle access doors shall not include ventilation slots

8.6 ROOFS (INCLUDING PENETRATIONS, EAVES, FASCIAS AND GABLES, AND GUTTERS AND DOWNPIPES)

8.6.1 General

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The following applies to all types of roofs and roofing systems:

(a) Roof tiles, roof sheets and roof-covering accessories shall be non-combustible

(b) The roof/wall and roof/roof junction shall be sealed either by the use of fascia and eaves linings or by sealing between the top of the wall and the underside of the roof and between the rafters at the line of the wall. They shall also be protected in accordance with clause 3.6

(c) Roof ventilation openings, such as gable and roof vents, shall be fitted with ember guards made of non-combustible material or a mesh or perforated sheet conforming with clause 3.6 and made of corrosion-resistant steel or bronze

(d) Roof-mounted evaporative coolers are not permitted in BAL-40

8.6.2 Tiled roofs

Tiled roofs shall be fully sarked. The sarking shall -

(a) Be located on top of the roof framing, except that the roof battens may be fixed above the sarking;

(b) Cover the entire roof area, including ridges and hips; and

(c) Extend into gutters and valleys

8.6.3 Sheet roofs

Sheet roofs shall -

(a) Be fully sarked in accordance with clause 8.6.2, except that foil-backed insulation blankets may be installed over the battens; or

(b) Have any gaps sealed at the fascia or wall line, hips and ridges by -

  (i) A mesh or perforated sheet that conforms with clause 3.6 and that is made of corrosion-resistant steel or bronze; or

  (ii) Mineral wool; or

  (iii) Other non-combustible material; or

  (iv) A combination of any items (i), (ii) or (iii)

8.6.4 Veranda, carport and awning roof

The following applies to veranda, carport and awning roofs:

(a) A veranda, carport or awning roof forming part of the main roof space shall meet all the requirements for the main roof, as specified in clauses 8.6.1 to 8.6.6

(b) A veranda, carport or awning roof separated from the main roof space by an external wall conforming with clause 8.4 shall have a non-combustible roof covering and the complete support structure shall be -

  (i) Of non-combustible material; or

  (ii) Timber rafters lined on the underside with fibre-cement sheeting a minimum of 6mm in thickness, or with material conforming with AS 1530.8.1; or

  (iii) A system conforming with AS 1530.8.1; or

  (iv) A combination of any of items (i), (ii) or (iii)

8.6.5 Roof penetrations

The following applies to roof penetrations:

(a) Roof penetrations, including roof lights, roof ventilators, aerials, vent pipes and supports for solar collectors or the like, shall be sealed. The material used to seal the penetration shall be non-combustible

(b) Glazed assemblies for roof lights and skylights have an FRL of -/30/-

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(c) External single pane glazed elements of roof lights and skylights, where the pitch of the glazed element is 18 degrees or less to the horizontal, shall conform with clause 3.6 and be made of corrosion-resistant steel or bronze

(d) A pipe or conduit that penetrates the roof covering shall be non-combustible

8.6.6 Eaves, linings, fascias and gables

The following apply to eaves lining, fascias and gables:

(a) Gables shall comply with clause 8.4

(b) Fascias and bargeboards shall conform with AS 1530.8.1

(c) Eaves linings shall be -

  (i) Fibre-cement sheet, a minimum of 6mm in thickness; or

  (ii) Calcium silicate sheet, a minimum of 6mm in thickness; or

  (iii) A combination of items (i) and (ii) above

(d) Eave penetrations shall be protected the same as for roof penetrations as specified in clause 8.6.5

(e) Eaves ventilation openings shall be fitted with ember guards in accordance with clause 3.6 and made of corrosion-resistant steel or bronze

(f) Joints in eaves linings, fascias and gables may be sealed with plastic joining strips or timber storm moulds

8.6.7 Gutters and downpipes

This standard does not provide requirements for downpipes

If installed, gutter and valley leaf guards shall be non-combustible

Gutters shall be non-combustible

Box gutters shall be non-combustible and flashed at the junction with the roof with non-combustible materials

8.7 VERANDAS, DECKS, STEPS AND LANDINGS

8.7.1 General

Decking shall not be spaced

There is no requirement to enclose the subfloor spaces of verandas, decks, steps, ramps or landings

8.7.2 Enclosed subfloor spaces of verandas, decks, steps, ramps and landings

8.7.2.1 *Materials to enclose a subfloor space*

The subfloor spaces of verandas, decks, steps, ramps and landings are deemed to be 'enclosed' when -

(a) The material used to enclose the subfloor space conforms with clause 8.4, except that sarking is not required where specified in clause 8.4.1(b); and

(b) All openings are protected in accordance with clause 3.6 and made of corrosion-resistant steel or bronze

8.7.2.2 *Supports*

This standard does not provide construction requirements for support posts, columns, stumps, stringers, piers and poles

8.7.2.3 *Framing*

This standard does not provide construction requirements for the framing of verandas, pergolas, decks, ramps or landings (i.e. bearers and joists)

8.7.2.4 *Decking, stair treads and the trafficable surfaces of ramps and landings*

Decking, stair treads and the trafficable surfaces of ramps and landing shall be -

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(a) Non-combustible material; or
(b) A system conforming with AS 1530.8.1; or
(c) A combination of items (a) and (b)

8.7.3 Unenclosed subfloor spaces of verandas, decks, steps, ramps and landings

8.7.3.1 *Supports*

Support posts, columns, stumps, stringers, piers and poles shall be -

(a) Of non-combustible material; or
(b) A system conforming with AS 1530.8.1; or
(c) A combination of items (a) and (b)

8.7.3.2 *Framing*

Framing of verandas, decks, ramps or landings (i.e. bearers and joists) shall be -

(a) Of non-combustible material; or
(b) A system conforming with AS 1530.8.1; or
(c) A combination of items (a) and (b)

8.7.3.3 *Decking, stair treads and trafficable surfaces of ramps and landings*

Decking, stair treads and the trafficable surfaces of ramps and landings shall be -

(a) Of non-combustible material; or
(b) A system conforming with AS 1530.8.1; or
(c) A combination of items (a) and (b)

8.7.4 Balustrades, handrails or other barriers

Those parts of the handrails and balustrades less than 125mm from any glazing or any combustible wall shall be of non-combustible material

Those parts of the handrails and balustrades that are 125mm or more from the building have no requirements

8.7.5 Veranda posts

Veranda posts shall be made from non-combustible material

8.8 WATER AND GAS SUPPLY PIPES

Above-ground, exposed water supply pipes shall be metal

External gas pipes and fittings above ground shall be of steel or copper construction having a minimum wall thickness in accordance with gas regulations or 0.9mm whichever is the greater. The metal pipe shall extend a minimum of 400mm within the building and 100mm below ground

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SECTION 3 GENERAL

3.1 GENERAL

This section specifies general requirements for the construction of buildings for all Bushfire Attack Levels (BALs)

3.2 CONSTRUCTION REQUIREMENTS FOR SPECIFIC STRUCTURES

3.2.1 Attached structures and structures sharing a common roof space

Where any part of a garage, carport, veranda, cabana, studio, storage area or similar roofed structure is attached to, or shares a common roof space with, a building required to conform with this standard, the entire garage, carport, veranda or similar roofed structure shall conform with the construction requirements of this standard, as applicable to the subject building

Alternatively, the structure shall be separated from the subject building by a wall that extends to the underside of a non-combustible roof covering, and that conforms with one of the following:

(a) The wall shall have an FRL of not less than 60/60/60 for loadbearing walls and -/60/60 for non-loadbearing walls when tested from the attached structure side and shall have openings protected as follows:

- (i) *Doorways* - By self-closing fire doors with an FRL of -/60/30, conforming with AS 1905.1 and tested in accordance with AS 1530.4
- (ii) *Windows* - By fire windows with an FRL of -/60/- when tested in accordance with AS 1530.4 and permanently fixed in the closed position
- (iii) *Other openings* - By construction with an FRL of not less than -/60/- when tested in accordance with AS 1530.4; or

(b) The wall shall be of masonry, earth or masonry-veneer construction with the masonry leaf of not less than 90mm in thickness and shall have openings protected as follows:

- (i) *Doorways* - By self-closing fire doors with an FRL of -/60/30, conforming with AS 1905.1 and tested in accordance with AS 1530.4
- (ii) *Windows* - By fire windows with an FRL of -/60/- when tested in accordance with AS 1530.4 and permanently fixed in the closed position
- (iii) *Other openings* - By construction with an FRL of not less than -/60/- when tested in accordance with AS 1530.4

3.2.2 Garages and carports beneath the subject building

Where a garage or carport is beneath a building required to comply with this standard, it shall conform with the construction requirements of this standard, as applicable to the subject building

Alternatively, any construction separating the garage or carport (including walls and flooring systems) from the remainder of the building shall conform with one of the following:

(a) The separating construction shall have an FRL of not less than 60/60/60 for loadbearing construction and -/60/60 for non-loadbearing construction when tested from the garage or carport side and shall have openings protected in accordance with the following:

- (i) *Doorways* - By self-closing fire doors with an FRL of -/60/30, conforming with AS 1905.1 and tested in accordance with AS 1530.4
- (ii) *Windows* - By fire windows with an FRL of -/60/- when tested in accordance with AS 1530.4 and permanently fixed in the closed position
- (iii) *Other openings* - By construction with an FRL of not less than -/60/- when tested in accordance with AS 1530.4*; or*

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(b) Where part of all of the separating construction is a wall, the wall need not conform with item (a) above, provided the wall is of masonry, earth or masonry-veneer construction with the masonry leaf of not less than 90mm in thickness and the wall has openings protected in accordance with the following:

(i) *Doorways* - By self-closing fire doors with an FRL of -/60/30, conforming with AS 1905.1 and tested in accordance with AS 1530.4

(ii) *Windows* - By fire windows with an FRL of -/60/- when tested in accordance with AS 1530.4 and permanently fixed in the closed position

(iii) *Other openings* - By construction with an FRL of not less than -/60/- when tested in accordance with AS 1530.4

3.2.3 Adjacent structures on the subject allotment

Where any garage, carport, or similar roofed structure on the subject allotment is not attached to a building required to conform with this standard, that structure shall conform with the construction requirements of this standard

Alternatively, the adjacent structure shall be separated from the subject building by one of the following:

(a) A distance of not less than 6m from the building required to conform with this standard. This distance is measured as any of the horizontal straight lines from the adjacent structure to the subject building; or

(b) A wall of the building required to conform that extends to the underside of a non-combustible roof covering and has an FRL of not less than 60/60/60 for loadbearing walls and -/60/60 for non-loadbearing walls when tested from the outside. Any openings in the wall shall be protected in accordance with the following:

(i) *Doorways* - By self-closing fire doors with an FRL of -/60/30, conforming with AS 1905.1 and tested in accordance with AS 1530.4

(ii) *Windows* - By fire windows with an FRL of -/60/- when tested in accordance with AS 1530.4 and permanently fixed in the closed position

(iii) *Other openings* - By construction with an FRL of not less than -/60/- when tested in accordance with AS 1530.4*; or*

(c) A wall of the building required to conform that extends to the underside of a non-combustible roof covering and is of masonry, earth or masonry-veneer construction with the masonry leaf of not less than 90mm in thickness. Any openings in the wall shall be protected in accordance with the following:

(i) *Doorways* - By self-closing fire doors with an FRL of -/60/30, conforming with AS 1905.1 and tested in accordance with AS 1530.4

(ii) *Windows* - By fire windows with an FRL of -/60/- when tested in accordance with AS 1530.4 and permanently fixed in the closed position

(iii) *Other openings* - By construction with an FRL of not less than -/60/- when tested in accordance with AS 1530.4*; or*

3.3 EXTERNAL MOULDINGS

Unless otherwise required in clause 3.6.1 and sections 5 to 9, combustible external mouldings, jointing strips, trims and sealants may be used for decorative purposes or to cover joints between sheeting material

3.4 HIGHER LEVELS OF CONSTRUCTION

The construction requirements specified for a particular BAL shall be acceptable for a lower level

3.5 REDUCTION IN CONSTRUCTION REQUIREMENTS DUE TO SHIELDING

Where an elevation is not exposed to the source of bushfire attack, then the construction requirements for that elevation

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can reduce to the next lower BAL. However it shall not reduce to below BAL-12.5

An elevation is deemed to be not exposed to the source of bushfire attack if all of the straight lines between that elevation and the source of bushfire attack are obstructed by another part of the same building. However it shall not reduce to below BAL 12.5

The shielding of an elevation shall apply to all the elements of the wall, including openings, but shall not apply to subfloors or roofs

3.6 VENTS, WEEPHOLES, GAPS AND SCREENING MATERIALS

3.6.1 Vents, weepholes, joints and the like

All gaps including vents, weepholes and the like shall be screened, except for weepholes to the sills of windows and doors

All joints shall be suitably backed with a breathable sarking or mesh, except as permitted by Clause 3.3.

The maximum allowable aperture size of any mesh or perforated material used as a screen shall be 2mm.

3.6.2 Gaps to door and window openings

Where screens are fitted to door openings for ember protection, they shall have a maximum aperture of 2.0mm and be tight fitting to the frame in the closed position.

Gaps between doors including jambs, heads or sills (thresholds) shall be protected using draught seals and excluders of the like.

Windows conformant with AS 2047 will satisfy the requirements for gap protection. Screens fitted to window openings shall have a maximum aperture of 2.0mm and these shall be tight fitting to the frames.

3.7 BUSHFIRE SHUTTERS

Bushfire shutters shall -

(a) Protect the entire window assembly including framing, glazing, sash and sill;

(b) Protect the entire door assembly including framing, glazing, sill and hardware;

(c) Consist of materials specified in Clauses 5.5.1, 6.5.1, 7.5.1, 8.5.1 and 9.5.1 for the relevant BAL;

(d) Be fixed to the building and be non-removable;

(e) Be capable of being closed manually from either inside or outside or motorised shutter systems, where they are not reliant on mains power to close;

(f) When in the closed position, have no gap greater than 2mm between the shutter and the wall, frame or sill; and

(g) Where perforated, have uniformly distributed perforations with a maximum aperture of 2mm and a perforated area no greater than 20% of the shutter.

If bushfire shutters are fitted to all external doors then at least one of those shutters shall be operable from inside to facilitate safe egress from the building.

3.8 TESTING OF MATERIALS, ELEMENTS OF CONSTRUCTION AND SYSTEMS TO THE AS 1530.8 SERIES

Unless otherwise specified, elements of construction and systems satisfy this Standard when tested in accordance with the AS 1530.8 series for the relevant BAL level and Crib Class in Table 3.2.

Elements of construction or systems tested in accordance with AS 1530.8.1-2007 with Crib Class A prior to the issue of this Standard are acceptable.

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TABLE 3.2

TESTING OF MATERIALS, ELEMENTS OF CONSTRUCTION AND SYSTEMS

Acceptable test criteria	Relevant allowable BAL level	Crib class
AS 1530.8.1	BAL-12.5 to BAL-40	AA
AS 1530.8.2	BAL-FZ	Not applicable

Where any element of construction or system satisfies the test criteria in the AS 1530.8 series without screening for ember protection, the requirements of this Standard for screening of openable parts of windows shall still apply.

Where a window protected with a shutter satisfies the test criteria of the AS 1530.8 series, the additional requirements of this Standard for screening of openable parts of windows do not apply.

3.9 GLAZING

Glazing requirements shall be in accordance with Sections 5 to 9 of this Standard.

3.10 SARKING

Where sarking is required in Sections 5 to 9, the flammability index shall not exceed five when tested to AS 1530.2.

3.11 TIMBER LOG WALLS

Where the thickness of a timber log wall is specified in Sections 5, 6 and 7, two criteria are nominated as follows:

(a) The nominal overall thickness is the overall thickness of the wall.

(b) The minimum thickness is the thickness of the wall at the interface of two logs in the wall.

For most log profiles, the thickness of the log at the interface with an adjacent log is less than the overall thickness of the wall.

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APPENDIX 4

Rene Hutter
Xero Fire & Risk
PO Box 340
Quinns Rock
WA 6030

Matthew Sobelik
Building Certification Services

26 February 2024

Re: 73-75 Maritime Drive, Jindalee – Fire Engineering Report

Dear Matthew

The Class 1a buildings located on the subject site are deemed to be located in a bushfire prone area. The prescribed Bushfire Attack Level is deemed to range from BAL-40 to BAL-12.5, depending on the setback to the relevant plots (vegetation), as assessed in the Bushfire Attack Level Assessment report[1].

The Class 1a buildings will be constructed to meet the bushfire construction requirements of AS 3959, except where a Performance Solution is provided to review a setback of 8.4 m to townhouse 1 to 13 and will be subject to a radiant heat flux level of less than 29 kW/m^2 based on a Method 2 assessment.

All other setbacks to townhouses 14 to 16, the GP clinic and apartments 1 to 11 are deemed to be applicable and in accordance with Bushfire Attack Level Assessment report and therefore, the applicable BAL rating applies.

Scope & Appointment

Xero Fire & Risk has been instructed by Dale Alcock to provide an assessment to review the building setbacks of 8.4 m to townhouse 1 to 13 to provide a bushfire attack level of BAL-29.

The objective of the Fire Engineering Process is to recognise variations from the Building Code of Australia (BCA) Deemed-to-Satisfy (DtS) Provisions Volume 2 and to provide a Performance Solution to demonstrate compliance with the relevant BCA Performance Requirements.

Intent of the BCA

In accordance with BCA Vol 2, Clause 3.10.5 states that Performance Requirement P2.7.5 is satisfied when Class 1a buildings are constructed to comply with AS 3959.

Performance Requirement

BCA Performance Requirement P2.7.5 requires that a Class 1 building that is constructed in a designated bushfire prone area must, to the degree necessary, be designated and constructed to

[1] BAL Assessment Report by Building Certification Services dated 22 February 2024 version 2.

reduce the ignition from a bushfire, appropriate to the potential for ignition caused by burning embers, radiant heat or flame generated by a bushfire, and intensity of the bushfire attack on the building.

Hazard Identification

There is an increased risk to townhouse 1 to 13 in the event of bushfire, where the bushfire construction requirements are not able to withstand exposure to bushfire, as determined by the Method 1 assessment.

However, the Method 2 assessment modelling outputs will demonstrate that the proposed setback of 8.4 m to townhouse 1 to 13 will be subject to a radiant heat flux level of BAL-29

Acceptance Criteria

The acceptance criterion for this Solution is that the risk in terms of radiant heat exposure to townhouse 1 to 13 is considered to be acceptable based on the Method 2 assessment.

Assessment

The bushfire threat adjacent to townhouse 1 to 13 comprises of Class C shrubland and is noted as Plot A within the Bushfire Attack Level Assessment report.

The shrubland is located perpendicular to the subject site and extends along the ocean front. The vegetation is deemed to present a perceived risk of bushfire threat in terms of radiant heat impact to the proposed townhouses.

As the vegetation is deemed to extend along the ocean front, the shrubland is limited in width and extent and therefore is considered to present a less chance of a fully developed bushfire impacting on the site.

A calculated fire width is used as an input to AS 3959 Method 2 calculations to determine the radiant heat impacts on the proposed townhouses. This is based on the site specific inputs and bushfire modelling calculations to show that a radiant heat flux level of BAL-29 is deemed to be acceptable

All other setbacks to townhouses 14 to 16, the GP clinic and apartments 1 to 11 are deemed to be applicable and in accordance with Bushfire Attack Level Assessment report and therefore, the applicable BAL rating applies.

Equations Used in Modelling

The following equations have been used to model the radiant heat impacts on the proposed townhouses:

- Transmissivity: Fuss and Hammins, 2002.
- Rate of Fire Spread: Table B1 AS3959 (McArthur, 1973 & Noble et al., 1980).
- Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005.
- Fire Intensity: Byram 1959.

Assumptions and Limitations

The following assumptions have been made in the assessment:

- Wind direction and speed is constant and in the direction of fire spread.
- Fuel load is distributed equally and is continuous for the entire length of the fire run.
- The shape of the fire is based on a uniform shape.
- The fire develops from a single ignition point and does not consider time of ignition or fire growth.
- Flaming is restricted to surface, near surface and elevated fuels.
- The fire does not become a crown fire.
- Fire run is measured perpendicular to contours.

The short fire run modelling has the following limitations:

- Suitable for fire runs up to 150 m in length.
- Suitable for slope no greater than 20 degrees.

Fire Scenrio

One fire scenario was modelled for the assessment based on Plot A which is located perpendicular to the subject townhouses, and adopts a reduced fire width based on a fire run of 55 metres.

The fire run was determined based on the average length of vegetation in Plot A to the pathway that divides Plot A.

Fire Width Calculations

The head fire width for the assessment has been calculated using the DFES 'short fire run' calculator, as shown below.

Inputs				Outputs	
Fire Run Meters	**FDI**	**Surface Fuel Load**	**slope**	**Total Fire length**	**Head Fire Width**
55	80	15	5	56.84	20.13

Modelling Inputs

The following inputs were used in the calculation to determine the radiant heat flux impact on the townhouses.

Modelling Inputs		
Parameter	**Source**	**Input**
Vegetation Information		
Vegetation Classification	Site Data	Class C shrubland
Slope Under Vegetation (degrees)	Site Data	Downslope 0-5°
Surface Fuel Load (t/Ha)	AS 3959	15
Overall Fuel Load (t/Ha)	AS 3959	15
Site Information		
Slope Between Townhouse and Vegetation (degrees)	Site Data	Downslope 0-5°
Elevation of Receiver (m)	AS 3959	AS 3959 algorithms
Separation Distance (m)	Site Data	8.4 m
Fire Run (m)	Site Data	55 m
Fire Inputs		
Flame Width (m)	Flame width calculator	20.13
Flame Temperature (K)	AS 3959	1090
Flame Angle (degrees)	NSW FRS SFR Guide[2]	90
Constants		
Flame Emissivity	NSW FRS SFR Guide	0.95
Heat of Combustion (kj/kg)	AS 3959	18600
Relative Humidity (%)	AS 3959	25
Ambient Temperature (K)	AS 3959	308
FDI	AS 3959	80
Wind Speed (kph)	NSW FRS SFR Guide	30

[2] Short Fire Run – Methodology for assessing bushfire risk for low risk vegetation, NSW Rural Fire Service

Modelling Outputs

The following outputs were provided based on the calculation to determine the radiant heat flux impact on the townhouses.

Rate of Spread (km/h) = 2.48 Fire intensity (kW/m) = 19220 Flame Length (m) = 7.24 m				
Distance to vegetation (m)	**View factor (degrees)**	**Transmissivity**	**Radiant heat** (kW/m^2)	**Bushfire Attack Level (BAL)**
8.4	0.43	0.87	28.44	BAL-29

Compliance

The modelling outputs demonstrate that the proposed setback of 8.4 m to townhouse 1 to 13 will be subject to a radiant heat flux level of BAL-29. The assessment therefore meets the acceptance criteria the Performance Requirement.

Sincerely yours,

René Hutter | BSc (Fire) | MIEAust | NER | CPEng | BPAD |
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Appendix A References[3]

Australian Legislation

[BCA] National Construction Code Series Volume 2, Class 1 and 10 buildings – Building Code of Australia 2019 Amendment 1.

Australian Standards

[AS 3959] AS 3959, Construction of buildings in bushfire-prone areas.

[3] Abbreviation in square brackets is how item is referred to throughout this report.

Appendix B Reference Drawing

DISCLAIMER & LIMITATION

This assessment has been carried out in accordance with AS 3959-2018 for the purpose of calculating the potential Bushfire Attack Level (BAL).

A fire event is unpredictable and can be influenced by many factors such as, but not limited to, temperature, wind speed, wind direction, humidity, the slope of the land, vegetation fuel load, growth, planting or removal, level of implementation and maintenance of fire prevention measures and the construction of additional structures upon the property that are not included as part of this assessment. If you are concerned or notice that factors have changed a new Bushfire Attack Level should be undertaken.

As permitted by the law and to its greatest extent, BCSWA Pty Ltd and its associated employees excludes all liability whatsoever for: Damage, loss, injury, death or claim to any property and/or person caused by a fire regardless of how that fire was caused and Errors and/or omissions in this report with the client expressly acknowledging that such exclusion of liability is reasonable in all circumstances.

This assessment is not a Bushfire Management Plan and does not in any way certify that the proposed structure has been built in accordance with the assessed BAL rating. In providing this report as part of a development application or building licence the client and landowner acknowledges that they understand, approve and will comply with all requirements to maintain the separation distances detailed in this report. Furthermore, the client/landowner acknowledges and accepts all responsibility in maintaining the required building protection zone defined in AS 3959-2018.

This report is valid for 12 months only from the date of issue.

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