

Timber Housing in Bushfire-prone Areas

Designing timber-framed and clad houses to meet new building standards

Sustainably produced wood can offer environmental and practical advantages in comfortable, affordable designs that meet the new Australian Standard, AS 3959-2009 Construction of buildings in bushfire-prone areas.

A range of prevention strategies has been developed, aimed at diminishing the risk of ember, radiant heat and even flame damage.

The best bushfire resistance results from a combination of design and material choices, building practices and keeping vegetation clear of the structure.

Research¹ shows that keeping hot air and embers out of a building is the important factor, whatever its construction materials.

Windows are the most vulnerable part of a house when it comes to bushfire attack,² which is why the new standard, AS 3959-2009 *Construction of buildings in bushfire-prone areas*, specifies window glass types and thicknesses and provides bushfire shutter options for higher bushfire attack level (BAL) sites.

While the updated standard modifies how a home is built to address bushfire risk, it still enables designers, builders and home owners to enjoy all the advantages of wood.

In all cases, it is still acceptable to build as we always have - with easy, economical and sustainable timber-framed construction - for brick veneer and lightweight cladding exteriors.

Using sustainably produced wood for framing, floors and cladding can reduce the embodied energy of a building in two ways. Compared to other materials, wood requires relatively little energy to produce (usually in the form of fossil fuels) and it is also a natural carbon store. Up to 50% of the weight of dry wood is carbon.

Considerations involved in designing to meet AS 3959-2009 Construction of buildings in bushfire-prone areas

Bushfire Attack Level (BAL)

Each level relates to the potential radiant heat flux for that BAL, a measure of heat intensity.

For example BAL-19 expects increasing heat flux greater than 12.5 and up to 19kW/m². Bal-FZ designates the highest risk level referred to as Flame Zone.

Suitable Timber Species³

Structural timbers

There are no additional requirements for internal framing. The usual timbers can be used including:

Pine
Structural Hardwoods

Bushfire-resisting timbers

Blackbutt
Kwila (Merbau)
Red Ironbark
River Red Gum
Silvertop Ash
Spotted Gum
Turpentine

Density 650kg/m³ or greater

Alpine Ash
Mountain Ash
Shining Gum
Slash Pine
White Cypress

Density 750kg/m³ or greater

Brownbarrel
Grey Gum
Grey Ironbark
Jarrah
Messmate
Spotted Gum
Sydney Blue Gum
Silvertop Ash
Spotted Gum
Sydney Blue Gum



The Australian Standard AS 3959-2009 Construction of buildings in bushfire-prone areas will be adopted across all States and Territories. The Standard applies to all new homes and to significant extensions and additions.

The Standard sets guidelines for assessing which of six bushfire attack levels (BAL) a site falls into (BAL: LOW, 12.5, 19, 29, 40 and FZ) and then specifies additional construction requirements for houses in the more bushfire-prone areas. The goal is to reduce the risk of fire and ember penetration.

Timber used for construction in bushfire-prone areas and directly exposed to radiant heat, should not burn readily. AS 3959-2009 identifies three distinct groups of timber and specifies which group is appropriate for which applications under each BAL rating. The three groupings are timber with seasoned density of 650 kg/m³ or greater, seasoned density of 750 kg/m³ or greater and bushfire-resisting timber.

“timber may be ‘bushfire-resisting’ by means of one or more of³:

- the inherent properties of the material itself;
- being impregnated with fire-retardant chemicals; or
- the application of fire-retardant coatings or substrates.”

AS 3959-2009 does not impose requirements on construction timber that is not directly exposed to radiant heat. Internal applications such as wall framing, roof framing walls, ceiling linings and joinery are not covered by the Standard.

Fortunately, Australia has a number of high-density timbers that provide inherent natural bushfire resistance. The seven bushfire-resisting timbers specified in the AS 3959-2009 are tough, dense hardwoods that performed well in extensive fire testing. While the Standard specifies them for some applications, they can be used more extensively for greater peace of mind.

AS 3959-2009 specifies the use of special timbers in some applications. Appendix E of the Standard provides the full lists of timber species with specified densities. A list of suitable timber species is provided.

Building off the ground - cost-effective timber subfloor systems sit lightly on the land

Timber subfloor systems are ideal for sloping blocks, where they avoid expensive and damaging 'cut and fill'.

Rather than the more expensive and environmentally damaging cut-and-fill required for a concrete slab, where there is a slope (even on high BAL sites) it is still advisable to use a timber subfloor.

AS 3959-2009 specifies that when a timber subfloor is fully enclosed, all traditional timber subfloor framing products (stumps, bearers, joists) continue to be appropriate. For higher BALs, all vents in any enclosed subfloor space need to be covered with a secure, appropriate metal mesh with maximum 2 mm aperture to reduce the risk of burning embers entering the subfloor space.

Enclosing subfloor space reduces the risk of ember penetration



External cladding - the best looks for homes are still possible

Home owners want a good-looking home that fits in with its surroundings. A wide range of options, including weatherboard and most light-weight cladding, is still possible with careful choice of materials.

While there are no special requirements for external cladding when a home is fully brick veneer, where light-weight cladding sections are used, for instance above windows and doors, the same requirements as a totally light-weight clad building apply.

For BAL-LOW, which most homes are, normal timber products and other lightweight cladding materials can be used. For BAL-12.5 and BAL-19, timber cladding needs to be

bushfire-resisting or made from timber species listed in AS 3959E1 (species with density of 750 kg/m³ or greater). Joints in the cladding need to be sealed or the framing externally sarked.

If a home site is designated as BAL-40, it is worth considering building to the higher flame zone rating, BAL-FZ, where a fire resistance level (FRL) of 30/30/30 is required. This can be achieved with a fire rated plasterboard/timber system which will actually give a higher rating (16 mm fire grade plasterboard provides a 60/60/60 FRL). Major plasterboard manufacturers can supply more information on suitable products and simple, cost-effective solutions.

Any lightweight cladding sections must comply with the BAL requirements when combining brick veneer with other cladding materials.



Checking compliance certificates for high bushfire attack level materials

For high bushfire attack levels (BAL-40 and BAL-FZ) external building components need to prove they will perform in case of attack. In some cases, this means ensuring that the material or system you select has been certified as required by the Standard.

There are even log home systems that have been tested to comply.

For BAL-40, certification to AS 1530.8.1 is required for: flooring materials (other than appropriately underlined timber flooring); and for materials (other than those defined as non-combustible), for fascias and bargeboards, unenclosed subfloor spaces, decking materials and external cladding systems.

For BAL-FZ, certification to AS 1530.8.2 is required for roofing systems, materials used in fascias, bargeboards and eaves linings, window systems, bushfire shutters, external doors and door systems and flooring systems when unenclosed, as well as decking.

FRL performance is an alternative compliance requirement for some external building materials systems. In the case of lightweight cladding systems using a wet-area, fire-grade plasterboard/timber system, manufacturers say they have found their systems actually have a higher rating, with 16 mm plasterboard used, an FRL of 60/60/60.

It is important to ask for proof of performance certification before specifying or constructing in high bushfire-prone zones.

Bushfire-resisting timber posts, such as these Red Gum posts, comply with AS 3959-2009 up to BAL-29



Design tips to reduce risk



Extensive research about how bushfires attack homes, and how houses burn, has led to the conclusion that the most significant factor is house siting and design. Points to consider include:

✓ **Design with a simple footprint**

Minimise external nooks and crannies, corners and spaces where debris (which can become fuel) or embers from a bushfire can accumulate.

✓ **Use a simple roof design**

Avoid roof valleys and skylights.

✓ **Install gutter guards**

Specify and install gutter guards to help keep the gutters clear and free of debris.

✓ **Build at the bottom of a slope**

Where the site is on a slope, the bottom of a slope is safer to build on than the top. Slopes facing east are generally safer than slopes facing north, north-west or west.

✓ **Enclose the subfloor area**

Reduce the risk of ember penetration beneath a house by ensuring it is fully enclosed below floor level and fitting vents with spark-proof metal screens.

✓ **Create a firebreak around the house**

Use thoughtful garden design and paving to leave a firebreak between vegetation and the house.

These simple details can help increase the fire resistance of a structure - no matter what material it is built from. By applying knowledge and experience, we can continue to use functional and attractive timber to build beautiful houses that comply with safe building requirements.



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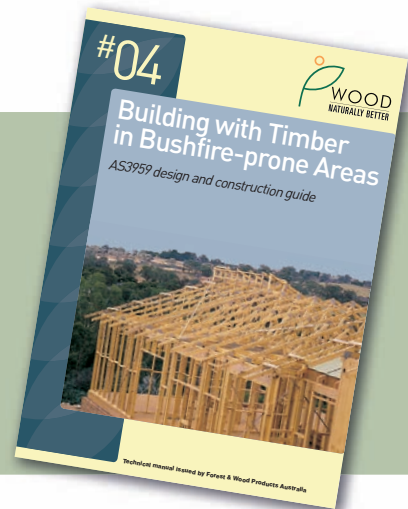
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For further information and to register for your free copy of the Technical Manual *Building with Timber in Bushfire-prone Areas*, valued at \$30, visit www.timber.org.au/bushfire



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References

¹ *A Nation Charred*: Inquiry into the recent Australian bushfires October 2003. House of Representatives Select Committee on the Recent Australian Bushfires; CoResearch No. 395, April 2003

² CSIRO, Building Innovation & Construction Technology, Number 11, February 2000.

³ Australian Standard AS 3959-2009, *Construction of buildings in bushfire-prone areas*, Standards Australia, March 2009.



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