ISSUE TWO 2020

FIRE AUSTRALIA

The real cost of building for bushfires

How much does a Bushfire Attack Level house cost to build?

To burn or not to burn?

International experience on Australian firegrounds

Caution needed on oxygen reduction systems

HOW MUCH DOES IT REALLY COST TO BUILD HOMES THAT WILL SURVIVE BUSHFIRE?

A new West Australian study, Project BAL Build, has sought to address the misinformation and confusion about the cost of building bushfire-resistant houses.

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In regional Western Australia, questions continually arise about the cost of building to Australian Standard AS 3959 *Construction of buildings in bushfire-prone areas* and the Bushfire Attack Levels (BAL) it prescribes. Project BAL Build was a study developed by this article's authors to provide information on the cost of building to AS 3959 in regional WA. The study examined costs using a building design that is common in the region (rather than hypothetical house plans), as well as examining the cost of constructing the seven levels of BAL and comparing these ratings with a base design.

Background to AS 3959

The practice of building to AS 3959 is not new in Australia. AS 3959 was originally released in 1991, with the current fourth edition published in 2018. Construction to AS 3959 was legislated in December 2015 by the WA Government, making the practice relatively new in the WA building industry.

Poor information availability

There is little public information about how much building to BAL requirements adds to the cost of a house. What information is available puts broad ranges on that cost. It was reported in the *Daily Telegraph* in 2018 that a leading insurance company estimated the cost of meeting BAL 12.5 to BAL 40 was between $16,000 and $56,000, and between $65,000 and $277,000 for meeting BAL Flame Zone (FZ) requirements.

WA landowners described additional charges of $50,000 to $120,000 for construction to BAL FZ and $45,000 to $65,000 for construction to BAL 40, demonstrating that there are clearly financial impacts attributed to BAL compliance—but the nature and extent of these costs is extremely variable.

Regulatory Impact Statement

In 2009 the Australian Building Codes Board (ABCB) published a Regulatory Impact Statement (RIS) that assessed the cost benefits of the revised AS 3959. The RIS assessed three house types as the basis for comparison and calculated the generic cost impacts for compliance across the six different BAL ratings. The three house types were:

- a base house: a single-storey, three-bedroom house, timber weatherboard construction, slab on ground
- a large two-storey, four-bedroom house, brick veneer construction, slab on ground
- an elevated lightweight construction (ELC), single-storey, four-bedroom house, timber weatherboard construction, elevated subfloor.

The cost implications the ABCB found are presented in Figure 2.

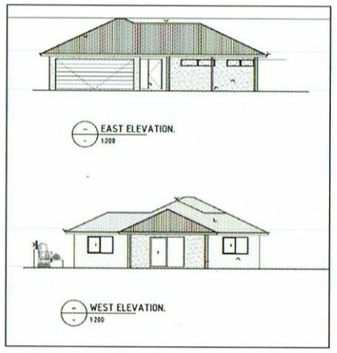
Some key findings of the RIS:

- It accepts that some individuals will pay more for their house to comply with AS 3959, offering them some benefits (inherent in the higher construction standard, such as reduced damage costs, wellbeing, etc.) but primarily offering a cost benefit to the broader community, particularly by reducing the economic impacts of property loss from bushfires.
- Costs can be seen to favour different building types (i.e. brick veneer), potentially reducing consumer choice and design innovation for alternative construction types.
- The RIS tends to minimise the broad scale impacts of these cost implications. When used out of context, this could lead to ill-considered or restricted choices regarding site selection, building type, materials and construction methodology. The reality is that some home owners may not be able to afford to build in a bushfire-prone area.
- Consumers may be misled about the real cost of bushfire compliance, with generic figures being applied by 'shonky builders' under the guise of variations.
- It is difficult to calculate the cost of applying a higher standard of construction to an industry standard that has much higher tolerances for error (e.g. maximum gaps of 2mm).

PHOTO: LEE GRIFFITH

Australian Standard AS 3959 divides bushfire prone areas into six Bushfire Attack Levels (BALs), based on their potential exposure to ember attack, radiant heat and direct flame contact.
BAL-LOW—very low risk
BAL-12.5—low risk
BAL-19—moderate risk
BAL-29—high risk
BAL-40—very high risk
BAL-FZ—extreme risk (Flame Zone)

Building a BAL-rated house, like this BAL-19 home, is not as expensive as often thought.



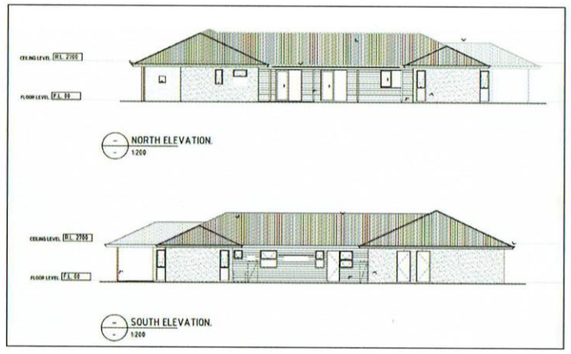


FIGURE 1. The reference house.

SOURCE: K. KINNEAR, J. DE JONG

FIGURE 2. Costs of constructing houses to various BAL ratings.

Category of bushfire attack	Base house	Large two-storey	ELC house
Current standard			
LOW	$0	$0	$0
MEDIUM	$9,196	$12,586	$19,174
HIGH	$24,469	$36,529	$42,573
EXTREME	$29,483	$43,810	$53,489
Proposed standard			
BAL–LOW	$0	$0	$0
BAL–12.5	$11,535	$14,981	$21,428
BAL–19	$11,535	$14,981	$21,428
BAL–29	$15,471	$17,095	$35,024
BAL–40	$17,107	$19,751	$62,357
BAL–FZ	$20,885	$28,905	$76,679

SOURCE: ABCB 2009

Are all these costs attributable to bushfire compliance?

We must recognise that bushfire compliance needs to be considered in conjunction with other construction standards that already require higher levels of performance, including Section J of the National Construction Code (NCC) on energy efficiency. In particular, many bushfire-prone areas are cold in winter and hot in summer, already requiring a passive-solar design response, thermally efficient glazing and thermal mass.

Site-responsive design should already take into consideration all aspects of the site including topography, sunlight and solar orientation, prevailing winds, shading and sun protection, thermal insulation and thermal mass, retention of environmental features, functioning of local ecosystems and habitats, site access and egress, proximity to neighbours, provision of site services, etc. Good design and construction should already consider the suitability of materials and their performance in a range of environmental conditions, including summer heat, winter storms, seasonal flooding, insect and vermin infestations and bushfire events.

Good design and construction

From an architect's perspective, one positive outcome of the construction standards and BAL planning principles of AS 3959 is the importance placed on site-responsive design. It also reinforces higher standards of construction in residential building—an industry that doesn't necessarily prioritise the importance of 'building to last', and where we are constantly seeing more consumers being convinced to upgrade their kitchen benchtops instead of their insulation levels.

Some key building requirements in AS 3959 are just good practice in building a durable house.

- **Durable products:** Use of durable and resilient cladding/construction materials will increase the life of the building and reduce maintenance costs long-term.
- **Minimal gaps, seals and weather strips:** Minimal gaps in buildings means better weather-proofing, improved insect and vermin control, and better thermal insulation properties of the internal conditioned spaces.
- **Glazing:** Higher-spec glazing improves thermal performance and energy efficiency of buildings.
- **Cladding:** Eaves and subfloors reduce maintenance and allow concealment of structure and services.
- **Metal screens:** Mesh screens made of corrosion-resistant steel, bronze or aluminium have superior performance and improve security.
- **Sarking:** Sarking improves the thermal performance of all roofs and assists with controlling condensation in buildings, which is a significant issue resulting from the higher insulation requirements of Section J.
- **Setbacks between buildings:** The NCC already requires consideration of setbacks and separation distances between buildings and boundaries that are considered 'fire-source features' to prevent the spread of fire and property damage, and the BAL standards reinforce this approach.

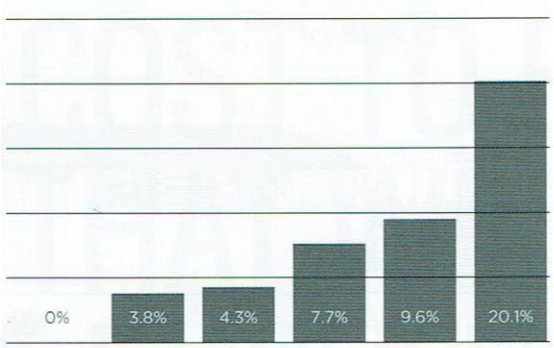
Project BAL Build: a case study

In developing the cost comparison, the Project BAL Build authors wanted to be sure an actual design used in regional WA was the reference house. The design had to reflect the current building market's expectations and had to take into account materials that can be sourced in regional WA (noting some materials, especially timber species for

PHOTO: J DE JONG

BAL construction can struggle with industry tolerance of lower standards, such as this BAL 12.5 build with gaps greater than 3mm.

FIGURE 3. Project BAL Build increase in construction costs to reference house.



SOURCE: K. KINNEAR, J. DE JONG

BAL 40, often cannot be sourced in WA).

The reference building used was a house built in Tambellup, WA, approximately 200 kilometres from Perth. The reference house was a single-storey, four-bedroom house, brick veneer and with weatherboard cladding and a Colorbond roof (see Figure 1). The reference house had no special construction requirements, aligned to the NCC, and was a typical size and type of construction seen throughout regional WA .

The study found that it was feasible to build to all BAL levels, and major cost impacts are likely to be experienced only for BAL-40 and BAL-FZ. A summary of the findings for the building construction requirements and the cost increase through the seven levels of AS 3959/ BAL construction is shown in Figure 2.

Full details of the construction requirements of the reference house from BAL-Low to BAL FZ can found at www.biodiversesolutions.com.au and www.hharchitects.com.au.

Findings of study

The biggest cost impacts revolved around the gap and join sealing (applicable to all levels), upgrading glazing (but starting from a very low standard in the reference house), screens (applicable to all levels), bushfire shutters or BAL 40/BAL FZ-rated window systems, and lining the eaves, verandas and subfloors.

It is in the interest of the consumer to minimise their BAL, both to limit their upfront construction costs as well as long-term maintenance costs (for the building and the site, to manage the Asset Protection Zones). Some building types are more readily compliant to the AS 3959 bushfire standard, and this is already the dominant type of housing construction in WA (i.e. masonry or fibre-cement weatherboard with slab-on-ground and profiled steel roof). It was noted that many of the upgrades required to comply with AS 3959 are already required in order to comply with Section J–Energy Efficiency provisions of the NCC and good practice generally.

Recommendations and conclusions from this study include:

- ◆ Consumers should request quotes from their builder that clearly demonstrate the extra-over provisions related to AS 3959 compliance, which aren't already required for their six-star energy rating.
- ◆ Builders should clearly articulate in plans the BAL provisions addressing compliance with AS 3959. Many building surveyors require this to be submitted as a separate drawing at the time of building permit application.
- ◆ Bushfire consultants should not give advice about construction cost implications unless they are a construction cost consultant.
- ◆ Designers and builders should consider bushfire compliance as part of their consideration of all site conditions that affect the building and its site planning, and mitigate impacts where possible.
- ◆ Building to BAL-12.5 to BAL-29 is not as significant a cost as previously thought.
- ◆ The cost of building to BAL-40, surprisingly, added less than 10% cost to the reference house.
- ◆ Significant cost increases occur in the BAL-FZ building standard.
- ◆ Building to AS 3959 and BAL is good building practice; it prioritises resilience, durability, building performance and site-responsive design. ■

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