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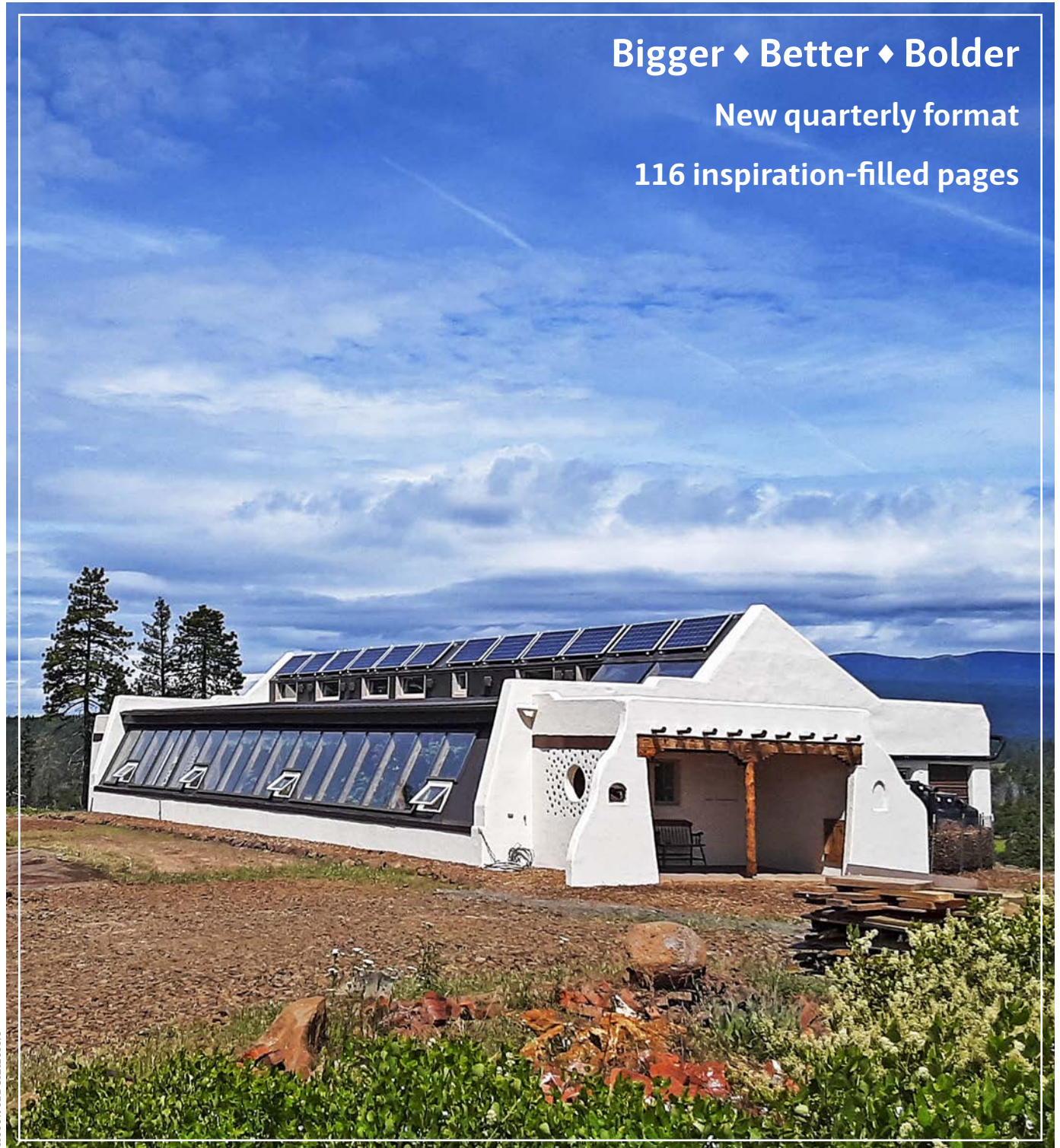


PHOTO: JOEL CHALLUPNY

**EARTHSHIP ♦ FERROCEMENT ♦ URBAN INFILL ♦ GRANNY FLAT ♦ STRAW BALE**

# Straw bale building update...

*The Australasian Straw Bale Building Association (Ausbale) is a network of building industry professionals, researchers, owner builders, and interested people who share their knowledge and experiences, summed up in the organisation's mantra of 'Promoting the art and science of straw bale building'.*

*In its pursuit of promoting natural building, and specifically straw bale building, Ausbale has had a number of projects that it has been working on over several years, the main purpose being to bring these forms of building to the 'mainstream'. Two of these projects have now reached fruition.*

## Strawbale Building Construction Guide

Over the past six years Lance Kairl, on behalf of Ausbale, has travelled the road of developing a construction guide for Australian conditions. The catalyst for him pursuing the guide was after hearing comments at conferences from owner builders and interested people that all the technical stuff is great but they just wanted a 'safe place to start' in their straw bale construction journey. From there, the guide was formed, referencing Appendix S in the International Residential Construction Code as well as the New Zealand Straw Bale Construction Guidelines.

This guide provides prescriptive and performance-based information for the use of baled straw as a building material. Buildings using straw bale walls need to comply with the National Construction Code. This guideline is not intended to be limited to residential buildings and can be used as a guide to gaining approval as a Deemed to Comply material.

Because of the importance or technical nature of some of the methods specified in this guide it is highly recommended that an experienced straw bale practitioner should be consulted.

The guide provides a starting point for everyone to use, covering infill and hybrid systems, foundations, lintels, electrical, inspections, bales specifications and finishes, as well as fire resistance. It has an extensive glossary of terms to try and explain straw bale terminology in lay-person's terms.



*Redwood Valley residence – trees, outbuildings and two neighbouring homes burned. (Photo: Edward Doody/Arkin Tilt Architects)*

The guide will be ever evolving, as some of our corporate members share information on their systems, as there are many different methods and systems in straw bale construction throughout the country. The Australian Strawbale Building Construction Guide is available to members online.

See extract on pages 30-31.

## Fire Test Reports

The Fire Test Reports provide a pathway to construction in all Bushfire Attack Level (BAL) areas, with straw bale walls constructed in accordance with the Straw Bale Building Construction Guide deemed to be rated to FRL 90/90/90.

Meeting bushfire requirements has perhaps been one of Ausbale's biggest agendas since formation. The original tests were performed back in 2002; changing standards and more of a focus on flame resistance has required us to maintain the focus on the viability of straw bale construction. Practitioners and enthusiasts have all known of the fire resistance of rendered straw bale buildings but we needed evidence for the authorities to recognise this. Previously, to meet the requirements, 90mm of render had to be applied or magnesium board had to be used behind the render so as to have buildings pass the bushfire requirements. This is both a time consuming and expensive process. These reports provide the evidence that it can be achieved within the normal parameters of straw bale construction, outlined in the guide.

Two reports are available for members to purchase. One is a test that uses a 30mm loam render, which a lime render could be Deemed-to-Satisfy as a superior finish. The second report is using a proprietary lime render. In both reports they achieve a BAL-45 and FRL of 90/90/90. ♦

### ♦ AUSBALE

Australasian Straw Bale Building Association is a group of building industry professionals, researchers, owner builders, and interested people who share knowledge and experiences.

[www.ausbale.org](http://www.ausbale.org), Facebook @ausbale

### ♦ CASBA

The California Straw Building Association is an all-volunteer non-profit organization committed to straw bale building.

[www.strawbuilding.org](http://www.strawbuilding.org)





Redwood Valley residence – columns salvaged from a prior fire frame the conflagration, they charred but did not ignite. (Photos: Edward Doody/Arkin Tilt Architects. Courtesy of CASBA – The California Straw Building Association)



Clockwise from top left:  
Norrbon Road straw bale home (Photo: Edward Caldwell/Arkin Tilt Architects). Fires burned to the footings but not up the walls. The mineral oxides in natural hydraulic lime turn pink when heated, showing where the fire reached. (Photos: Michel Courveaux/TransMineral).  
Straw bale home on Lovall Valley Loop Road withstood fire against its walls.  
Photos courtesy of CASBA – The California Straw Building Association.



Photo: David Arkin/Arkin Tilt Architects

## 7. Fire Resistance

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While it is widely recognized that render is not flammable, straw generally is flammable. Fire protection and mitigation strategies should be undertaken during bale wall construction and rendering. On completion no exposed straw should be accessible, this includes tops of bale walls, gable infill and walls extending above ceiling height, straw behind rainscreen cladding and appropriate protection of straw in truth windows. Fire Resistance Level (FRL) as defined in the Building Code of Australia (BCA) is the grading period in minutes for three criteria: structural adequacy, integrity and insulation.

### 7.1 Fire Resistance Level

Shall be considered to be non-rated, except for walls constructed in accordance with recognized International or Australian testing results. There is no Deemed to Comply option for fire resistance levels.

#### 7.1.1 – 1.5 HOUR RATED EARTH PLASTERED WALL

1.5 hour fire resistance rated earth plastered strawbale walls shall comply with the following:

1. Bales shall be laid flat or on-edge in a running bond.
2. Bales shall maintain thickness of not less than 450mm on flat and 350mm on edge.
3. Gaps shall be stuffed with straw or straw-clay.
4. Earth plaster on each side of the wall shall be not less than 35mm thick, shall be crack-free, and comprised of a mixture of 3 parts clay, 2 parts chopped straw, and 6 parts sand, or an alternative suitable earth plaster.
5. Plaster application shall be in accordance with section 4 of this guide and should be reinforced and be crack free.
6. Be structurally compliant with the approved tested sample.

#### 7.1.2 – 1.5 HOUR RATED LIME PLASTERED WALL

1.5 hour fire resistance rated lime plastered strawbale walls shall comply with the following:

1. Bales shall be laid flat or on-edge in a running bond.
2. Bales shall maintain a thickness of not less than 350mm on edge or 450mm on flat.
3. Gaps shall be stuffed with straw or straw-clay.
4. 50mm by 1.15mm dia. galvanized woven wire mesh shall be attached to wood members with 38mm staples at 150mm centres. 3mm dia. U-pins with minimum 200mm legs shall be installed at 450mm centres to fasten the mesh to the bales.
5. Plaster application shall be in accordance with section 4 of this guide and should be reinforced and be crack free.
6. Be structurally compliant with the approved tested sample.

### 7.2 Openings in Walls

Openings and penetrations in bale walls shall be required to have a fire-resistance rating that satisfies the same requirements for openings and penetrations as prescribed in the National construction code for the desired FRL.



# The Australian Strawbale Building Construction Guide

Excerpted from **The Australian Strawbale Building Construction Guide**  
By Australasian Straw Bale Building Association (Ausbale)  
Published by Ausbale (2019). [www.ausbale.org](http://www.ausbale.org)

## 7.3 Control Joints

Control joints or expansion joints in fire rated rendered strawbale walls shall meet the same level of FRL as the required wall rating, and shall be formed, cut or have a proprietary control joint strip installed to the manufacturers specifications.

## 7.4 Bushfire Construction

Strawbale buildings shall comply with the Bushfire Attack Level assessment criteria of AS 3959, constructors should undertake and adhere to the risk mitigation strategies contained within AS 3959. Construction of strawbale walls in bushfire zones shall be in accordance with the criteria of the tested wall samples for the required BAL level or in accordance with the construction criteria of a FRL of -/30/30 tested sample. A sample tested to and achieving a FRL of 90/90/90 complies with the -/30/30 requirement, and as such is suitable for all (12.5 to FZ) BAL zones.

### 7.4.1 – BAL 12.5

It is generally accepted that the surface of a plastered wall is noncombustible. 2018 test accreditation classifies rendered strawbale walls as suitable for this level of bushfire attack.

### 7.4.2 – BAL 19

It is generally accepted that the surface of a plastered wall is noncombustible,

### 7.4.3 – BAL 29

It is generally accepted that the surface of a plastered wall is noncombustible.

### 7.4.4 – BAL 40

It is generally accepted that the surface of a plastered wall is noncombustible.

## 7.4.5 – BAL FZ (FLAME ZONE)

It is generally accepted that the surface of a plastered wall is noncombustible.

The addition of 90mm of Masonry leaf (or 90mm of render) to the exterior of the bale wall does comply with the Flame Zone requirements.

## 7.5 Openings in Bushfire Rated Walls

Openings and penetrations in bale walls are required to have a fire-resistance rating shall satisfy the same requirements for openings and penetrations as prescribed in the National Construction Code for the desired BAL.

## 7.6 Control Joints in Bushfire Rated Walls

Control joints and or/expansion joints in bushfire rated rendered strawbale walls shall meet the same level as required for the wall rating system, and shall be formed, cut or a proprietary control joint strip installed to the manufacturers specifications.

## 7.7 Fireplaces and Chimney Flues

Strawbale surfaces adjacent to fireplaces or chimney flues shall be finished with a minimum 35mm thick plaster of any type permitted by this guide and shall be crack free. Clearance from the face of such plaster to fireplaces and chimney flues shall be maintained as required from fireplaces and chimney flues to combustibles in AS/NZS 2918 or as required by the combustion heater manufacturer's installation instructions, whichever is more restrictive. ♦

*NOTE: An FRL rated wall is only rated for that number of minutes, combustion heaters may operate well beyond the time tested for FRL compliance.*

## BAL and FRL

A **Bushfire Attack Level (BAL)** is a way of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact. There are six Bushfire Attack Levels that form part of the Australian Standard AS 3959: *Construction of buildings in bushfire-prone areas*: BAL-LOW, BAL-12.5, BAL-19, BAL-29, BAL-40, BAL-FZ (Flame Zone).

**Fire Resistance Level (FRL)** as defined in the Building Code of Australia (BCA) is the grading period in minutes for three criteria: structural adequacy, integrity and insulation.

- Structural adequacy means the ability of a structure to maintain its stability and loadbearing capacity.
- Integrity means the ability of a structure to resist the passage of flames and hot gases.
- Insulation means the ability of a structure to maintain a temperature below specified limits on the surface not exposed to fire.

Hence, a FRL requirement for a wall of 90/60/30 means that the wall must maintain structural adequacy for 90 minutes, integrity for 60 minutes and insulation for 30 minutes, as tested to AS 1530.4-1990: *Methods for fire tests on building materials, components and structures – Fire-resistance tests of elements of building construction*.