NASH Standard – Steel Framed Construction in Bushfire Areas

• An overview of NASH and the standard
• Process of development of the standard
• What this means for building practitioners
• Recent amendments
• Future developments
Overview
- About NASH

- Industry association formed in 1982 to represent cold formed steel frame fabricators
- Members supply frames, materials, components and services as well as steel framed houses
- Develop and publish standards, handbooks, technical notes and brochures
- Participate in public policy discussion and enquiries
- Provide member support and guidance
- Direct public enquirers to reliable suppliers
Overview
- Major publications

NASH Standard – Residential and low-rise steel framing, Part 1: Design criteria
  • Published 2005, referenced in NCC 2006

NASH Standard – Residential and low-rise steel framing, Part 2: Design solutions (C & NC)
  • Published 2014, referenced in NCC 2015

NASH Standard – Steel framed construction in bushfire areas
  • Published 2014, referenced in NCC 2015
Overview
- NASH Bushfire Standard

- Instigated and developed by NASH Standards Committee, using CSIRO research and fire engineering design
- First referenced in NCC 2015 (Amdt A 2016)
- DTS solution meeting performance requirement P2.3.4
- *Construction standard* – uses existing BAL classification system
- Based on non-combustible construction
Standard development process

- Why develop it?
- Performance Requirements
- Experimental program
- Fire engineering considerations
- Standard preparation
Why develop it?

- Black Saturday 2009
  - 2100 houses, 173 lives
- Canberra 2003
  - 500 houses, 4 lives
- These events overtook their communities
- Many houses not expecting and not designed to resist bushfire
- Even if they had been, many would still have been lost

Was there another way to look at increasing the bushfire resistance of houses?
P2.3.4 Bushfire areas

A Class 1 building or a Class 10a building or deck associated with a Class 1 building that is constructed in a designated bushfire prone area must, to the degree necessary, be designed and constructed to reduce the risk of ignition from a bushfire, appropriate to the —

a) potential for ignition caused by burning embers, radiant heat or flame generated by a bushfire; and

b) intensity of the bushfire attack on the building.
Quantify the required performance

Key elements:

- *Reduce risk of ignition*
- *Potential for ignition*
- *Intensity of attack*
NASH concept

- Design for worst case and work back
- Use ‘real’ worst case bushfire heat profiles and fire engineering
- Maximise use of non-combustible materials
- Use readily available materials and familiar, accepted building practices
- Robustness – failure of one element does not lead to failure of building
Experimental program

- Define bushfire exposure conditions
- Develop novel building designs using familiar materials
- Design bushfire exposure test methods
- Conduct controlled experiments
- Document the results of the experiments
Define bushfire exposure conditions

Embers
- Responsible for > 75% of house loss
- Hard to quantify

Radiant heat
- Distance, flame body temp
- Easier to quantify

Flame contact
- Sudden thermal shock, piloting
Building design challenge

Bushfires inflict combined actions

Materials react in different ways

Building components can interact with each other

Minor damage or modification can compromise the system

Performance is as good as the system’s weakest link
Ember tolerance

Key question:

*How can building designs be made more ember tolerant without unrealistic workmanship, supervision and maintenance?*
Conventional bushfire design

- Fire-resistant cladding
- Unregulated structure
- Incremental radiant heat tolerance
NASH bushfire design

Non-combustible cladding

Non-combustible cavities

Ember-proof lining
Test methods – radiant heat exposure

- Develop exposure profile = “design action” (CSIRO 2010)
- Complete house subject to bush fire flame front exposure at NSW RFS Eurobodalla Training Centre (Mogo - 2010)
- Wall test subject to same exposure at CSIRO Radiant Panel Test Facility (Highett – 2011)
Test profile

Flame immersion for 110 seconds
Mogo test
Outcomes from full scale outdoor experiment

• Confirmed simulator performance at building scale
• Confirmed which building details performed well and by what margin
• Provided confidence in whole of system
• Identified opportunities for improvements in design details for flame zone
Outcomes from radiant panel facility experiments

- Validated a range of wall designs & their safety margins
- Provided an understanding of performance at different exposure levels
- Provided understanding of wall insulation performance
Standard preparation
Deemed-to-satisfy solution - AS 3959

Deemed-to-satisfy solution - NASH Standard (steel framing and roofing only)
3.7.4.0 Performance Requirement P2.3.4 is satisfied for —

a) a Class 1 building; or

b) a Class 10a building or deck associated with a Class 1 building,

located in a designated bushfire prone area if it is constructed in accordance with —

c) AS 3959; or

d) NASH Standard 'Steel Framed Construction in Bushfire Areas'.
In NSW, Flame Zone sites require solutions developed in consultation with RFS.

These solutions can be based on DTS reference standards.
Standard scope

- Steel roof framing with steel roof sheeting
- Steel wall framing with:
  - Steel cladding
  - Brick veneer
  - Non-combustible claddings
- Solid masonry walls
- Steel floor framing with various flooring linings
- Various subfloor enclosure systems
Standard structure

• Scope and general requirements
• Roof and ceiling system
• External wall systems
• Floor systems
• Carports, pergolas, verandahs and decks

Generally two tables per section: BAL-FZ and lower BALs

BAL alignment allows BAL-rated components such as windows, screens and doors
# Standard layout

**Roof example**

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>BAL-12.5, BAL-19, BAL-29 and BAL-40</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Roof</strong></td>
<td></td>
</tr>
<tr>
<td>Framing</td>
<td>NASH Standard Part 1 or Part 2, with maximum pitch of 45°, with horizontal or sloping ceiling</td>
</tr>
<tr>
<td>Battens</td>
<td>NASH Standard Part 1 or Part 2</td>
</tr>
<tr>
<td>Insulation</td>
<td>Clauses 1.4.3 and 1.4.4</td>
</tr>
<tr>
<td>Cladding</td>
<td>Steel roof cladding conforming to AS 1562.1 with valleys or pans turned up at ridges and hips (see Fig. 2.3)</td>
</tr>
<tr>
<td>Ridge and hip capping</td>
<td>Steel capping conforming to AS 1562.1 with minimum 150 mm sheet overlap each side (see Fig. 2.3)</td>
</tr>
<tr>
<td>Gable ends</td>
<td>Be constructed as walls in accordance with Table 3.1</td>
</tr>
<tr>
<td>Fascia and barge</td>
<td>Minimum BMT 0.42 mm steel clipped or fixed at maximum 1200 mm spacing</td>
</tr>
<tr>
<td>Eaves lining</td>
<td>Fibre cement sheet of 4.5 mm minimum thickness; or steel sheet</td>
</tr>
<tr>
<td>Penetrations</td>
<td>Flashed with metallic coated steel</td>
</tr>
<tr>
<td>Valley support</td>
<td>Flat or profiled steel sheeting (see Fig. 2.4)</td>
</tr>
<tr>
<td>Valley gutter</td>
<td>Steel flashing conforming to AS 1562.1 and AS/NZS 2179.1 with minimum 100 mm roof sheet overhang into valley (see Fig. 2.4)</td>
</tr>
<tr>
<td>Gutter and gutter guard (where installed)</td>
<td>Steel gutter conforming to AS/NZS 3500.3</td>
</tr>
<tr>
<td></td>
<td>Gutter guards must be non-combustible</td>
</tr>
<tr>
<td>Exhaust fan (where installed)</td>
<td>Externally vented and ceiling exhaust fans must conform to Clause 1.4.2 and have external components and ducting made from non-combustible materials</td>
</tr>
<tr>
<td>Roof mounted equipment and services</td>
<td>Evaporative coolers and other equipment and services must conform to AS 3959</td>
</tr>
<tr>
<td>Photovoltaic modules</td>
<td>Roof mounted modules or modules laminated to the roof cladding must be installed in accordance with AS/NZS 5033</td>
</tr>
<tr>
<td>Ventilators</td>
<td>The external components of ventilators must be made from non-combustible material</td>
</tr>
<tr>
<td>Vent pipes</td>
<td>That portion of a vent pipe passing through the roof space must be non-combustible; or be covered by a non-combustible material</td>
</tr>
</tbody>
</table>
Typical details
Roof: BAL 12.5 - 40
Typical details
Roof: BAL-FZ

- Steel roof framing
- Steel roof batten
- Steel roof sheathing
- Foil and insulation
- Steel eaves support frame
  - Gutter (Optional)
  - Steel fascia
- Eaves lining
- Steel flashing
- External wall cladding
- Ceiling insulation
- Ceiling batten (optional)
- Ceiling lining
- Cornice or square set
- Steel wall framing
Typical details
Wall: steel cladding BAL 12.5 - 40
Typical details
Walls: Brick veneer - All BALs
Typical details
Enclosed subfloor (All BALs)
Typical details
Subfloor: Unenclosed BAL 12.5 - 40
Other elements

- Doors, windows and screens to AS 3959
- Bulk Insulation is fibreglass or mineral wool
- Generally use non-combustible materials
What does it all mean?

Additional DTS solution for bushfire areas
Compatible with current BAL assessment and component rating system
Inherently robust and resilient solution
Does not require significant changes to building practices, supervision or detailing
Recent changes and impacts

Amendment A – 2015 (NCC 2016)

- Ember paths to garage spaces
- Combustible adjacent fencing
- Roof mounted equipment
- Exhaust fans

Industry feedback drives amendments and guidance
Future developments

- Windows, doors & shutters
- Tiled roofs
- Subfloors
- Sheds
- Guidance handbook
Thank you