NASH
NATIONAL ASSOCIATION OF STEEL-FRAMED HOUSING INC.

NASH NEWS

MARCH / APRIL 2006

MAJOR CHANGES TO THE BUILDING CODE OF AUSTRALIA (BCA) 2006

BCA2006 has introduced significant changes that impact on steel framing:

1. NASH Standard – Residential and Low-rise Steel Framing Part 1: Design Criteria 2005 is referenced in Volume 2 Part 3.4.2 alongside AS3623 Domestic Metal Framing. It is anticipated that the reference to AS3623 will be withdrawn in 2007. (See article on the new NASH Standard for more detailed information.)
2. Five star energy efficiency ratings have been introduced into BCA2006. However it will only apply in Victoria, Australian Capital Territory, Western Australia and South Australia. Tasmania and Queensland will continue with BCA2005. New South Wales will operate under its BASIX requirements.
3. Energy efficiency requirements for commercial and other types of non-housing buildings have also been introduced into BCA2006.
4. Due to the move to higher levels of thermal efficiency in points 2 and 3 above, thermal breaks have been introduced as a requirement for steel frames with light weight claddings in New South Wales, Victoria, South Australia and Western Australia. Thermal breaks are not required with brick veneer or similar construction. The thermal break will typically consist of a 12mm thick strip of Class M Expanded Polystyrene (EPS) attached to the outer face of the stud. (See article on thermal bridging for a more detailed explanation and the benefits of thermal breaks.)

The changes come into force for new building applications submitted after the new Code is enacted in each of the states. It does not apply for buildings where the Building Application has already been approved. Commencement date varies between states but in some states BCA2006 will come into force in May.

NEW NASH STANDARD REFERENCED IN BCA 2006

The new NASH Standard – Residential and Low-rise Steel Framing Part 1: Design Criteria is now published and referenced in the Housing Provisions (Volume 2) of BCA2006.

NASH followed the Australian Building Codes Board (ABCB) Protocol for the development of BCA Referenced Documents in their development of the Design Criteria. This approach combined with the enthusiasm of a very active committee, allowed rapid development of the new NASH standard. The Public Review Draft was distributed to all NASH members and to the broader building industry for comment.

Some of the major features included in the NASH Standard are:

- scope includes both residential and commercial low-rise buildings using traditional framing techniques.
- limit state code in line with the latest AS/NZS 1170 series.
- serviceability criteria.
- assessment of the design criteria may be undertaken by calculation, testing or a combination of both. Prototype testing of full size members and sub-assemblies can be very beneficial and is frequently used in the development of new systems.
- tolerances for manufacture and installation. These reflect the ability of steel framing to provide a high quality structure eg. straight and flat walls.
- guide for self weights.

The Standard and the BCA 2006 reference the latest updates of AS4055-2006 Wind Load for Housing and AS/NZS4600:2005 Cold-formed Steel Structures. These new Standards were reviewed in the last edition of NASH News (January/February 2006). In addition to the changes discussed in the article, Professor Greg Hancock advises there are new rules for webs with holes to allow for holes in webs in shear (Clause 3.3.4.2) and bearing (Clause 3.3.6.3). Also covered are channel section webs with holes and with stress gradient (Clause 2.2.4). This is very significant for the steel framing industry where holes are frequently put into webs for services. It is based on research at University of Missouri Rolla for the residential framing industry.

The NASH Standard – Residential and Low-rise Steel Framing Part 1: Design Criteria is referenced in the 2006 edition of the Building Code of Australia. It is available for purchase through the Australian Building Codes Board website www.abcb.gov.au at a cost of:

- $90.00 for hardcopy (including postage, handling and GST)
- $60.00 for pdf (including GST)

NASH would like to thank the committee members and their member companies for their contribution and support in the development of the Standard.

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THERMAL BRIDGING

What is it?

Thermal bridging is a term given to heat leakage through a conductive path that generally bridges insulation.

The extent of thermal bridging in an external wall depends upon the insulation details. If the framing does not bridge the insulation, as with insulation board attached to the external flange, then no bridging occurs. With bulk insulation placed between framing members in conventional clad construction, thermal bridging does occur, see Figure 1 (a). The framing members are more conductive than the insulation providing a thermal bridge through the insulation. Thermal bridging occurs for both steel and timber framing; however steel framing is more conductive and leads to greater bridging than timber framing. As the R-Value of the bulk insulation increases, the impact on thermal bridging also increases.

What problems can it cause?

Thermal bridging leads to two main problems, see Figure 1 (a):

- A downgrade in the thermal resistance of the wall.
- – For example, steel frame weatherboard construction with
  - ♦ R1.5 bulk insulation the wall achieves a total R-Value of R1.2.
  - ♦ R2.5 bulk insulation the wall achieves a total R-Value of R1.5.
- Potential moisture problems on the frame and internal lining.
- – The framing becomes cooler than the surrounds making it prone to condensation, potentially leading to corrosion.
- – The internal lining adjacent to the frame can become much cooler than the lining adjacent to the insulation. Depending upon the air temperature and humidity, these cooler areas can form condensation and possible mould growth. Dust settling on the moisture may lead to patterned staining of the lining.

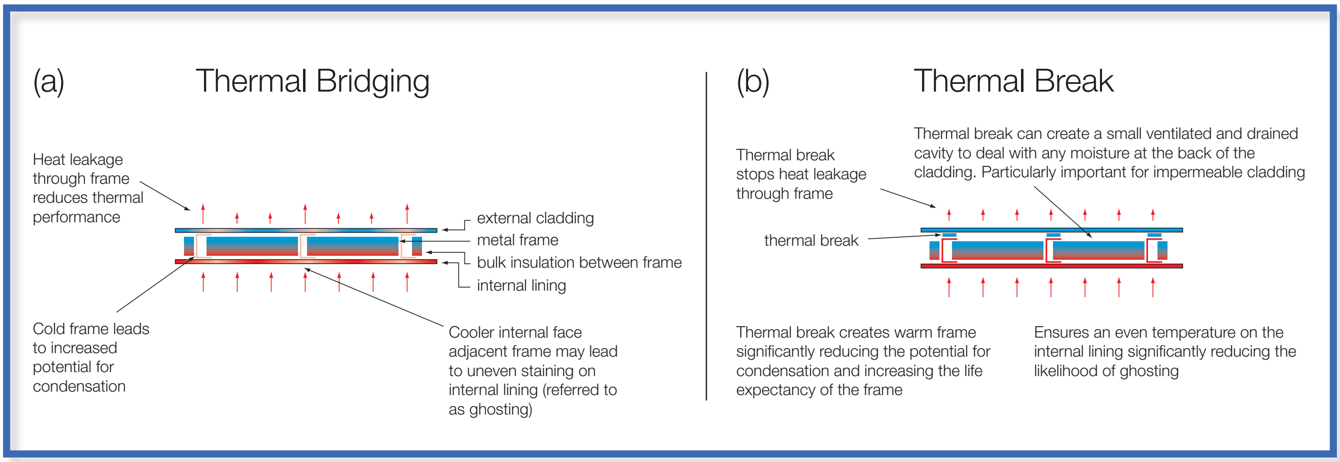

Figure 1

Evolution of the need for a thermal break in Australian steel clad construction:

- Historically the lack of a thermal break has not caused significant issues in construction as Australian homes have traditionally had low levels of insulation and the building envelope has been relatively leaky.
- A small number of cases with steel frame clad construction have been reported where thermal bridging has been a problem. Predominantly these cases involved high levels of insulation and moisture. The thermal bridging problem was made evident through patterned staining of the internal lining.
- Energy efficiency requirements in Australia are becoming increasingly more stringent. Under BCA2006 all new homes will be required to meet 5 stars. This is leading to construction that is better sealed and has higher insulation levels.
- These factors mean that the consequence of not addressing excessive thermal bridging will become much more apparent.
- – The total R-Value of the wall will be considerably compromised. It will be less than half its ideal value.
- – The frame and lining will be much cooler than surrounds, increasing condensation risk leading to potential corrosion of the frame and patterned staining on the internal lining.

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The Australian Building Codes Board (ABCB) commissioned a study into the impact of steel framing on building thermal performance. The findings show that conventional steel frame lightweight clad construction would result in unacceptable reductions in wall R-Values unless a suitable thermal break was installed. The ABCB study also considered roofs and determined that exposed rafters with metal roofs attached to metal purlins or battens and a ceiling directly beneath the metal purlins or battens also requires a thermal break. The issue of condensation was not considered.

Requirement for Thermal Break

The ABCB study shows that the inclusion of a thermal break of minimum R-Value 0.2 makes steel-framed clad constructions perform similarly to timber-framed clad constructions.

Steel-framed brick veneer construction was deemed not to require an additional thermal break as the air space between the frame and brick was deemed sufficient.

BCA2006 will require all steel frames clad with weatherboards, cement sheeting or cladding of similar thickness and R-Value, to install a thermal break of at least R0.2, see Figure 2.

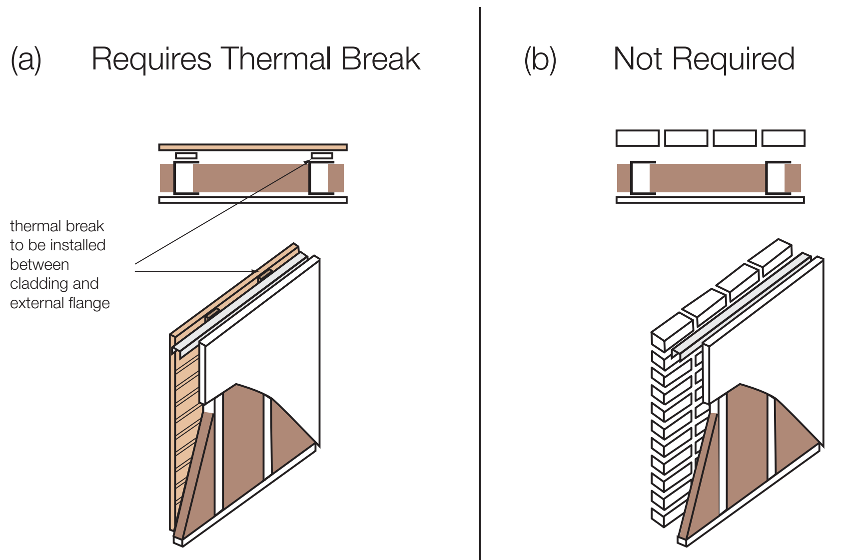

Figure 2

BCA 2006 extract

References: Part 1 Clause J1.5 (e) and Part 2 Clause 3.12.1.4 (d)

A metal framed wall that is required to achieve a minimum Total R-Value and has an external cladding of weatherboards, cement sheeting or similar light weight material attached directly to the metal frame must have a thermal break:

(i) installed between the metal frame and the external cladding; and

(ii) with a minimum R-Value of at least 0.2.

Explanatory information:

1. *The thermal performance of metal and timber framed walls is affected by conductive bridging by the framing members and convective thermal bridging at gaps between the framing and any added bulk insulation. Metal framed walls are more prone to conductive bridging than timber walls.*
2. *Because of the high thermal conductance of metal, a thermal break is needed when a metal framed wall is clad with weatherboards, cement sheeting or the like. The purpose of the thermal break is to ensure that the thermal performance of the metal framed wall is comparable to that of a similarly clad timber framed wall.*

   A thermal break may be provided by materials such as timber battens, plastic strips or polystyrene insulation sheeting. The material used as a thermal break must separate the metal frame from the cladding and achieve the specified R-Value. For the purpose of clause 3.12.1.4(d)(ii), expanded polystyrene strips of not less than 12 mm thickness and timber of not less than 20 mm are deemed to achieve a R-Value of not less than 0.2.

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The regulation requires the thermal break to be placed on the outside flange of the stud. This will result in a better quality construction. The steel frame is protected from cold outdoor conditions and thus is warmer and less prone to condensation than if the thermal break was placed on the inside flange.

Insulating board, plastic strips, battening out the weatherboard, cement sheeting or similar lightweight material can be used to provide the thermal break. Cladding that has inherent insulation, such as EPS cladding, does not require a thermal break. A thermal break eg. EPS strip is not required to be placed on the top and bottom plates or nogging, as the air gap provides the necessary performance.

A similar requirement is in place for the rare case of exposed rafters that have a metal roof attached to a metal purlin or batten and a ceiling attached directly beneath; see Figure 3. In this case the purlins or battens will need to be significantly deeper than conventional to ensure that the insulation is not compressed.

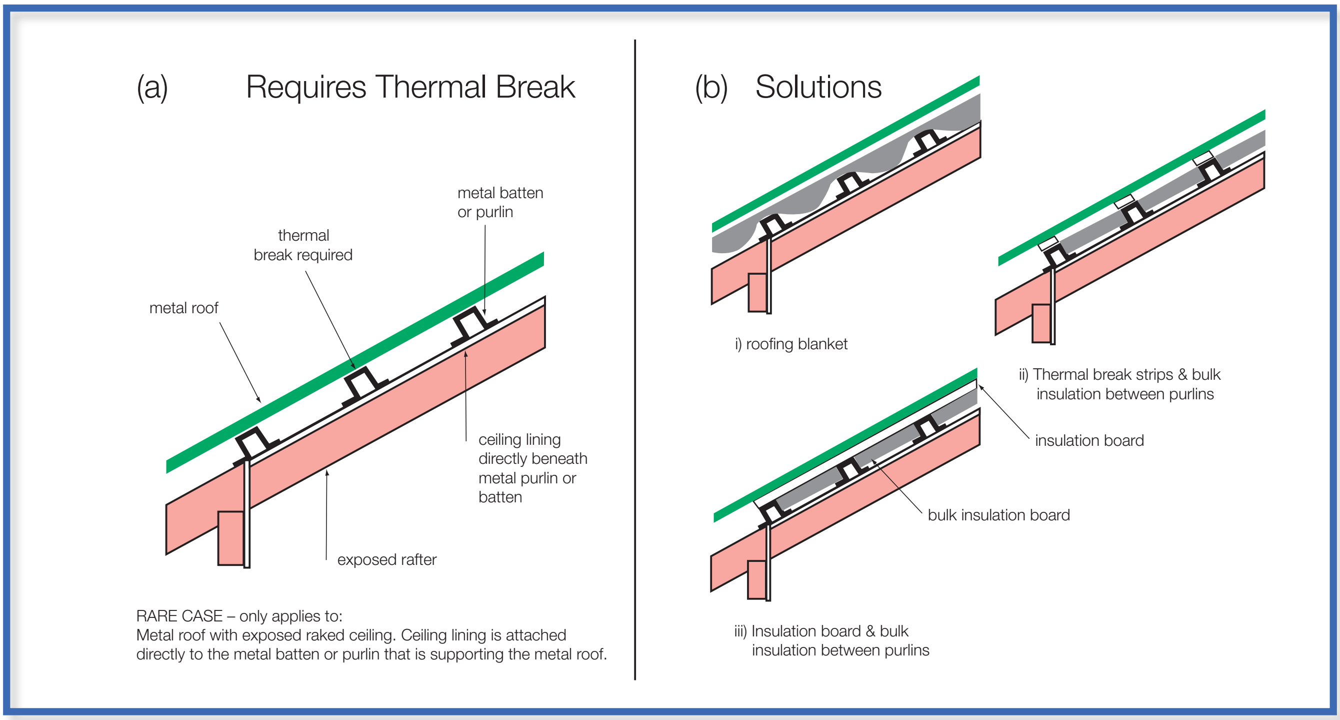


Figure 3:

Supply and Installation

Thermal break strips can be sourced through EPS suppliers such as RMAX.

The cladding fixer would typically install the thermal break strips. The strips would be installed by either, temporarily gluing the strips to the external flange and fixing the cladding over the top of the strips, or by holding the strips in place as the cladding is installed. The cladding fastening system will keep the thermal break strips permanently in place.

Summary

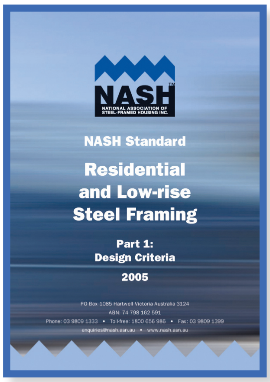
Thermal breaks are only required on steel frame clad construction with weatherboard, cement sheeting or lightweight cladding with a similar low R-Value. Brick veneer construction does not require a thermal break; see Figure 2.

For housing (Class 1 buildings) thermal breaks for lightweight cladding will be required in the following states / territories: (See article Major Changes to the Building Code of Australia.)

- New South Wales
- Victoria
- South Australia
- Western Australia
- Australian Capital Territory

It is not currently required in any other states / territories.

For other classes of buildings (Class 2-9) deemed to be conditioned in accordance with the BCA, thermal breaks for lightweight cladding will be required in all states except the Northern Territory.



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