SafeBridge®

High Performance Roof Insulation System

Version 4, October 2011
Presentation Objectives

- Understand the BCA Section J Energy Efficiency requirements and the impact upon building design
- Overview of the benefits of insulation
- Introduction to the SafeBridge® roof system
The following sections in the BCA/NCC cover the insulation aspects of commercial buildings:

- **SECTION C – FIRE RESISTANCE**
  - Part C1 – Fire Resistance and Stability
  - Part C2 – Compartmentalisation and Separation
  - Part C3 – Protection of Openings

- **SECTION F – HEALTH AND AMENITY**
  - Part F5 – Sound Transmission and Insulation

- **SECTION G – ANCILLARY PROVISIONS**
  - Part G5 – Construction in Bush Fire Prone Areas
    (Excl. Hotel, High Rise, Medium Density and schools)

- **SECTION J - ENERGY EFFICIENCY**
  - Part J1 – Building Fabric
  - Part J5 – Air-conditioning and Ventilation Systems

This presentation will focus upon Section J1 Building Fabric.
Section J1 roof insulation compliance elements

(b) Where required, bulk insulation must be installed so that:

(i) it maintains its position and thickness, other than where it is compressed between cladding and supporting members, water pipes, electrical cabling or the like;

and

The Deemed-to-Satisfy Provisions of this Part apply to building elements forming the envelope of a Class 2 to 9 building other than –

(a) A Class 7, 8 or 9b building that does not have a conditioned space; or

(b) An atrium or solarium that is not a conditioned space and is separated from the remainder of the building by an envelope.

Class 7a – car park
Class 7b – for the storage, or display of goods or produce for sale by wholesale
Class 8 – laboratory or a building in which a handicraft or process for the production, assembling, altering, repairing, packing, finishing, or cleaning of goods or produce is carried on for trade, sale or gain.
Class 9b – (a building of public nature) an assembly building, including a trade workshop, laboratory or the like in a primary or secondary school, but excluding any other parts of the building that are of another Class.
Summary of Section J compliance elements

- Energy efficiency standards for commercial buildings are mandatory in the Building Code of Australia (BCA) and National Construction Code (NCC) as it is known from 2011.

- Where required, insulation must comply with AS/NZS 4859.1 and be installed so that it:
  1. abuts or overlaps adjoining insulation other than at supporting members such as studs, noggings, joists, furring channels and the like where the insulation must be against the member; and
  2. forms a continuous barrier with ceilings, walls, bulkheads, floors or the like that inherently contribute to the thermal barrier; and
  3. does not affect the safe or effective operation of a service or fitting.

- Where required, bulk insulation must be installed so that:
  1. It maintains *position and thickness* other than where it is compressed between cladding and supporting members, water pipes, electrical cabling or the like; and
Determining the minimum compliant R Value

To quickly identify what the minimum thermal performance of a roof is, a designer needs to know the following information:

1. **Building class** (1, 2, 3, 4, 5, 6, 7, 8, 9a, 9b, 9c)
2. **Climate zone** (1, 2, 3, 4, 5, 6, 7, 8)
3. Is the building occupied space to be **conditioned or non conditioned?**
The importance of roof colour

- Roof colour plays a large role in the amount of heat absorbed by the surface of a roof.
- Dark roofs can absorb up to twice as much heat as a light coloured roof which will have implications for both hot and cold climates.

- The solar absorbance factors can be found on the roof sheet manufacturers web site, e.g. BlueScope

- The principle is based upon the lighter the colour the more reflective and the less energy goes into the building, hence a reduction to the overall thermal performance of the roof is allowed.

<table>
<thead>
<tr>
<th>Colour</th>
<th>Solar Absorpance</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classic Cream™</td>
<td>0.31</td>
<td>VL</td>
</tr>
<tr>
<td>Surfmist®</td>
<td>0.318</td>
<td>VL</td>
</tr>
<tr>
<td>Poporbark®</td>
<td>0.421</td>
<td>L</td>
</tr>
<tr>
<td>Evening Haze®</td>
<td>0.427</td>
<td>L</td>
</tr>
<tr>
<td>Slate Grey™</td>
<td>0.433</td>
<td>L</td>
</tr>
<tr>
<td>Sandbank®</td>
<td>0.455</td>
<td>L</td>
</tr>
<tr>
<td>Dune®</td>
<td>0.466</td>
<td>L</td>
</tr>
<tr>
<td>Windspray®</td>
<td>0.564</td>
<td>D</td>
</tr>
<tr>
<td>Palo Eucalypt®</td>
<td>0.597</td>
<td>D</td>
</tr>
<tr>
<td>Bushland®</td>
<td>0.619</td>
<td>D</td>
</tr>
<tr>
<td>Headland®</td>
<td>0.632</td>
<td>D</td>
</tr>
<tr>
<td>Wilderness®</td>
<td>0.651</td>
<td>D</td>
</tr>
<tr>
<td>Jasper®</td>
<td>0.662</td>
<td>D</td>
</tr>
<tr>
<td>Manor Red®</td>
<td>0.688</td>
<td>D</td>
</tr>
<tr>
<td>Woodland Grey®</td>
<td>0.706</td>
<td>D</td>
</tr>
<tr>
<td>Loft®</td>
<td>0.711</td>
<td>D</td>
</tr>
<tr>
<td>Monument®</td>
<td>0.732</td>
<td>D</td>
</tr>
<tr>
<td>Ironstone®</td>
<td>0.743</td>
<td>D</td>
</tr>
<tr>
<td>Cottage Green®</td>
<td>0.746</td>
<td>D</td>
</tr>
<tr>
<td>Deep Ocean®</td>
<td>0.749</td>
<td>D</td>
</tr>
</tbody>
</table>
Reference documentation to assist in designing

- System design is complex and is dependent on;
  - Type of roof and components used
  - Location of insulation in roof
  - Ventilated or, unventilated type roofs
  - Type of foil facing

- System design has been made simple by the publication of a Insulation Handbook by the Insulation Council of Australia & New Zealand (ICANZ).

This Handbook provides:
- Detail on most roof systems
- Thermal values of roof systems
- Simply compare the system
- Recommendations for roof systems that can be compared against the BCA minimum
Reference design guide by roof type - ICANZ

Industry standard insulation system calculations that can be used to assist in developing BCA compliant designs
Why do you need insulation under metal roofing?

- Insulation acts as a barrier to slow down the movement of heat, this reduces energy consumption. An un-insulated metal roof will allow 14 times more heat to escape than with a roof insulated with Bradford Anticon 145.

### Flat metal roof with no ceiling (Warehouse)

<table>
<thead>
<tr>
<th>Anticon</th>
<th>Thickness</th>
<th>R-value (Winter)</th>
<th>Relative Heat Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>0mm</td>
<td>0.267</td>
<td>14 times</td>
</tr>
<tr>
<td>Anticon 55</td>
<td>60mm</td>
<td>1.37</td>
<td>2.8 times</td>
</tr>
<tr>
<td>Anticon 145</td>
<td>145mm</td>
<td>3.79</td>
<td>1.0 times</td>
</tr>
</tbody>
</table>
The BCA is the minimum compliant standard

- The BCA/NCC stipulates the minimum deemed to satisfy standard but insulating under metal roofing is good practice even if the space below is not air conditioned or heated (conditioned space)

The benefits of insulation:
- Acoustic dampening of rain noise
- Condensation control – Anticon is specifically designed to control
- Increase lighting efficiency
- Future lessees to air condition the space if desired
- Decreased thermal stress on roof structure
Anticon controls condensation

- In cold weather roofs become several degrees cooler than the ambient temperature.
- Air moves to the roof, cools and water vapour condenses on the surface.

Bradford Anticon stops condensation forming under the roof by preventing air coming in contact with the cold roof.
Maintaining insulation thickness is key to complying

- Bulk insulation must:
  1. maintain its position and thickness, other than where it crosses roof battens, water pipes, electrical cabling or the like;

- Meeting this requirement in a safe and cost effective manner can be achieved in two ways:
  - Roof Spacer Systems which elevate the roof sheet above the purlins
  - **SafeBridge®** which utilises the purlins depth to allow the insulation to recover to design thickness

- Consideration of these methods must occur at the design phase to ensure roof design integrity and compliance to regulatory height regulations
SafeBridge®
High Performance Roof Insulation System
Safebridge®

- A unique, patented system that combines roof safety with BCA Section J compliance without the use of roof spacers
- SafeBridge® utilises the depth of the purlin and the position of the purlin bridge bar to create exactly the right amount of space to comply with the BCA/NCC requirement that insulation must “maintain its position and thickness” (BCA/NCC)
- The system has been jointly developed by Metroll, Bradford Insulation, ITW Buildex, Australian Mesh & SafeBridge® and is only available when using these system components
Safebridge®

- The space created between the Safebridge bridge bar and the underside of the roof sheet is **exactly** the right depth to suit the insulation and to ensure control of condensation on the underside of the roof sheet and purlins.
- Unique to this system is that this is achieved **without adding to the roof height**.
Safebridge® System Benefits

- Achieves BCA Section J compliance for **all climate zones**
- Able to achieve high total R values **beyond** BCA compliance (depending upon purlin depth up to $R_T 5.5$)
- Does not alter the structural integrity of the roof construction
- Suitable for most metal roof designs, regardless of roof pitch
- No roof height increase so no need to alter the roof gutter, fascia or flashing details
- Does not add any additional components to the roof construction and offers faster construction times
Safebridge® Bridge Bar Assembly

Simple Bridge Bar Assembly

1. Purlins are delivered to site with the pre-punched Safebridge® keyway
2. Telescopic bridge bars fit all purlin spacing
3. The punched SB keyway accepts bridge bars from each side
4. Bridge bar fixing uses a standard Metal-Tek screw through both bars
5. Final screw in centre of bridge bar secures the system
Safebridge® Structural System Assembly

**Safebridge® Purlin & Bridge Bar**
Designed specifically for the Safebridge® system.

**Safebridge® Purlin Spacing**: 610/910/1210/1360mm  
**Safebridge® Bar Spacing**: Maximum 1500mm

**Bridge Bar Stabiliser**
Prevents purlin twist prior to roof sheet assembly

Custom purlin and bridge bar design available upon request – contact Bradford Insulation or Metroll
Safebridge® Insulation System Assembly

High quality internal finish on underside of roof

Finishes available include: White / Black / Foil

The center bonded foil facing on the Bradford Insulation Anticon SB ensures condensation protection for all climate zones

Safebridge® Safety Mesh
Designed specifically for the Safebridge® system.
Code compliant fall prevention system
Tested and passed AS/NZ 4389;1996

Simple Mesh & Insulation Assembly

1. Safety mesh tied to bridge with no side lap joints required
2. Anticon SB insulation fits snugly between purlins
3. Thermal break tape prevents thermal bridging
Improved safety is achieved by utilising a unique ‘trolley system’ to lay the safety mesh between the purlins – this allows workers to remain safely secured below the roof surface, rather than above it on the open roof.

Cost Saving: Removal of side lapping of the mesh results in reduced installation time as well as a reduction in the overall amount of material required as the mesh does not need to cover the purlin and overlap by 150mm.
Safebridge® Safety & Testing

Safety Achievements

- Best Solution of an OHS&E Specific Workplace Risk – 2011 National Safety Council of Australia Award
- Safety Product Solution of the Year - 2010 Queensland Work Safe Awards
- National Safety Product of the Year – Finalist 2010

Structural & Thermal Testing

- Code compliant as a fall prevention system – the system has been tested to and passed AS/NZ 4389;1996 - Independently verified testing of 200 kg dropped from a height of 4m, 32 times
- Metroll purlins have been independently verified to provide lateral stability with up to 1340mm purlin centers with 1500mm bridge bar centers
- Bradford have undertaken extensive thermal analysis testing with a certified 3rd party test laboratory using both practical and computer generated 3-dimensional thermal modeling
Safebridge® Performance Guarantee

Safebridge® has undergone hundreds of hours of development and testing to ensure it performs in accordance to its published specifications and the building code. As part of this program, the Safebridge® system has undergone experimental temperature analysis using a roof section to validate 3 dimensional theoretical modelling of heat transfer calculations.

This complex process was used to develop the new generation of Bradford Anticon SB thermal insulation used in the Safebridge® system to ensure effective management of condensation across all climate zones through the purlin and adjacent materials (roof sheet, mesh, screw, insulation and thermal break tape).

Please note that the design of high humidity applications (such as indoor swimming pools) should always be reviewed with Bradford during the design phase.
## Table 1. BCA/NCC COMPLIANT SERIES

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>Heat Direction</th>
<th>Solar Absorbance</th>
<th>Required Total R-Value $[R_t]$</th>
<th>BCA/NCC Compliant Insulation Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 1,2,3</td>
<td>Inwards</td>
<td>Very Light</td>
<td>$R3.2$</td>
<td>Anticon SB110 $R_{a,2.5}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anticon SB140 $R_{a,3.3}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anticon SB75 $R_{a,1.8}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anticon SB95 RM2.3</td>
</tr>
<tr>
<td></td>
<td>Light</td>
<td></td>
<td>$R3.7$</td>
<td>Anticon SB110 $R_{a,3.0}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anticon SB110 + SB55 $R_{a,3.8}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anticon SB75 $R_{a,1.8}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anticon SB110 $R_{a,2.5}$</td>
</tr>
<tr>
<td></td>
<td>Dark</td>
<td></td>
<td>$R4.2$</td>
<td>Anticon SB130 $R_{a,3.6}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anticon SB130 + SB55 $R_{a,4.3}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anticon SB95 $R_{a,2.3}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anticon SB130 $R_{a,3.0}$</td>
</tr>
<tr>
<td>Zone 4,5,6</td>
<td>Inwards</td>
<td>All</td>
<td>$R3.2$</td>
<td>Anticon SB110 $R_{a,2.5}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anticon SB140 $R_{a,3.3}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anticon SB75 $R_{a,1.8}$</td>
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<td></td>
<td>Anticon SB95 $R_{a,2.3}$</td>
</tr>
<tr>
<td>Zone 7</td>
<td>Outwards</td>
<td>All</td>
<td>$R3.7$</td>
<td>Anticon SB140 $R_{a,3.3}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anticon SB145 $R_{a,3.6}$</td>
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<td></td>
<td></td>
<td>Anticon SB125 $R_{a,2.8}$</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anticon SB130 $R_{a,3.0}$</td>
</tr>
<tr>
<td>Zone 8**</td>
<td>Outwards</td>
<td>All</td>
<td>$R4.8$</td>
<td>Anticon SB130 + SB55 $R_{a,4.3}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anticon SB140 + SB55 $R_{a,4.6}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anticon SB110 + SB55 $R_{a,3.8}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anticon SB110 + SB55 $R_{a,3.8}$</td>
</tr>
</tbody>
</table>

*Refer to the ICANZ handbook for detailed descriptions of roof constructions and thermal calculation parameters. Note that quoted R-Values are based on reflective Thermofoil facings and are not applicable to decorative facings unless stated – please contact Bradford for assistance when calculating R-Values for these materials.

**Excludes high humidity applications (e.g. swimming pools) – please consult Bradford.

*Refer to the relevant BCA/NCC Solar Absorbance table for the buildings roof colour.
## Safebridge® Ultimate Performance Thermal Table

<table>
<thead>
<tr>
<th>Roof Systems</th>
<th>Metal roof with no ceiling - R0900 (reflective)</th>
<th>Metal roof with no ceiling - R0900 (non-reflective)</th>
<th>Metal roof with suspended ceiling - R1000 (100-600mm cavity)</th>
<th>Metal roof with suspended ceiling - R1000 (&gt; 600mm cavity)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System Illustrations</strong></td>
<td><img src="image1.png" alt="Illustration 1" /></td>
<td><img src="image2.png" alt="Illustration 2" /></td>
<td><img src="image3.png" alt="Illustration 3" /></td>
<td><img src="image4.png" alt="Illustration 4" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Metroll Purlin Size</th>
<th>Bradford Insulation</th>
<th>Material R-Value [R&lt;sub&gt;m&lt;/sub&gt;]</th>
<th>Heat Direction</th>
<th>Maximum Total R-Value [R&lt;sub&gt;t&lt;/sub&gt;]</th>
</tr>
</thead>
<tbody>
<tr>
<td>150mm</td>
<td>Anticon SB110</td>
<td>R2.5</td>
<td>Inwards</td>
<td>R3.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Outwards</td>
<td>R2.9</td>
</tr>
<tr>
<td>200mm</td>
<td>Anticon SB145</td>
<td>R3.6</td>
<td>Inwards</td>
<td>R4.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Outwards</td>
<td>R4.1</td>
</tr>
<tr>
<td>250mm</td>
<td>Anticon SB110 + SB75</td>
<td>R4.2</td>
<td>Inwards</td>
<td>R4.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Outwards</td>
<td>R4.7</td>
</tr>
<tr>
<td>300mm</td>
<td>Anticon SB110 + SB110</td>
<td>R5.0</td>
<td>Inwards</td>
<td>R5.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Outwards</td>
<td>R5.4</td>
</tr>
</tbody>
</table>

- **Note:** Thinner blanket must be on top for dual blanket applications.

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*Refer to the ICANZ handbook for detailed descriptions of roof constructions and thermal calculation parameters. Note that quoted R-Values are based on reflective Thermofoil facings and are not applicable to decorative facings unless stated– please contact Bradford for assistance when calculating R-Values for these materials.

**Excludes high humidity applications (eg. swimming pools) - please consult Bradford.

*Refer to the relevant BCA/NCC Solar Absorbance table for the buildings roof colour.
Safebridge® Specification Process

**Architect**
- Determine building thermal performance and required R-Value

Note: R-Value determines the Bridging member depth below roof sheet

**Engineer**
- Purlin depth is calculated based on position of Bridging member
- Purlin BMT is determined by purlin depth and building design, based on Metroll SafeBridge span tables
- Purlin spacing is selected from the standard range of SafeBridge spacing options

**Architect**
- Final insulation and purlin specifications provided for inclusion on architectural drawings/specification

Technical Support by METROLL

Technical Support by BRADFORD

Review & Technical Support as required
Specifying SafeBridge®

The SafeBridge® Roofing System is a patented roofing system and is only certified to perform in accordance with published specification with the following components:

- Metroll SafeBridge® Purlins
- Metroll SafeBridge® Bridge Bars
- Bradford Insulation Anticon SB (specify thickness and R rating) faced to Bradford Insulation (specify white/foil/black facing material)
- Australian Mesh SafeBridge® mesh – via Bradford
- Bradford Insulation Thermal Break Tape 60mm

Ask your Bradford Insulation or Metroll representative to assist in specification writing to ensure you get the system specified products required for a compliant system.
Interactive Presentation Review – Discussion points

1. The BCA/NCC defines the minimum building standard - what are the two key elements specified in the BCA/NCC that need to be considered when designing roofs for conditioned spaces?

2. In addition to the thermal characteristics of insulation, what are two other benefits of insulation?

3. Condensation occurs when warm moist air contacts cooler parts of the building structure – condensation can be controlled by the use of what type of insulation?

4. What is the importance of the height of the SafeBridge keyway to the insulation thickness?

5. The SafeBridge system is unique to the market and requires early engagement by both the Architect and Structural Engineer – what are the key elements of the system that need to be specified early in the design process?
For more Information contact your
Bradford Insulation or Metroll Representative