TIMBER QUEENSLAND

Technical Data Sheet
Energy Efficient Timber Framed Construction 26

Recommended Practice / May 2009

Issued by: Timber Queensland Limited

Introduction

The Energy Efficiency variations that applied to Queensland in BCA 2008 and earlier, have been removed from BCA 2009. The provisions given in BCA 2009, which apply statewide, with some variations depending on climate zones, come into force on 1st May 2009

This data sheet provides a brief outline of the energy efficiency requirements of the BCA with respect to Queensland and explains how timber framed wall and roof systems can be used to achieve the thermal insulation ('R' value) requirements. There are no insulation requirements for floors for the climatic zones applicable in Queensland.

BCA Energy Efficiency Requirements

The energy requirements for Queensland apply to four Climate Zones (Zones 1, 2, 3 and 5) which are separated by local government boundaries. See Table 1.
Other Zones (4, 6, 7 and 8) are not applicable in Queensland.

Compliance with the energy efficiency provisions can be achieved either by a 'deemed to comply' solution or by thermal simulation. Thermal simulation requires use of computer software such as 'AccuRate' or 'BERS' and is beyond the scope of this data sheet.

The provisions of the BCA relating to energy efficiency include minimum requirements for insulation of the building fabric (roofs, walls, and floors), shading of external glazing, sealing of the building and air movement.

This datasheet is primarily concerned with acceptable 'deemed to comply' solutions relating to insulation of the building fabric. For all other requirements refer to the BCA.

Insulation

The **total** thermal resistance ('R') value of a roof or wall system required by the BCA is given in Table 2. The 'R' values given are directional, depending upon the need to either keep in heat, or exclude heat from the building.

Table 1 Climate Zones (For a detailed map of these zones refer to www.abcb.gov.au)

Climate Zone	Local Government Areas included in Zone
Zone 1	Aurukun, Burdekin, Burke, Cairns, Carpentaria, Cassowary Coast, Cook, Croydon, Etheridge, Hinchinbrook, Northern Peninsular Area, Torres, Torres Strait Island, Townsville, Whitsunday and other Cape York Aboriginal and Torres Strait Islander Local Government Bodies
Zone 2	Brisbane, Bundaberg, Fraser Coast, Gladstone, Gold Coast, Gympie, Ipswich, Isaac, Lockyer Valley, Logan, Mackay, Moreton Bay, Redland, Rockhampton, Scenic Rim, Somerset, Sunshine Coast
Zone 3	Balonne, Banana, Barcaldine, Barcoo, Blackall-Tambo, Boulia, Bulloo, Central Highlands, Charters Towers, Cloncurry, Dalby, Diamantina, Flinders, Goondiwindi, Longreach, McKinlay, Mount Isa, Murweh, North Burnett, Paroo, Quilpie, Richmond, Roma, Winton
Zone 4	South Burnett, Southern Downs, Toowoomba

Table 2 Insulation

Element	Climate Zone				
	1 (Hot wet tropics)	2 (Sub-tropical)		3 (Hot dry inland)	5 (Temperate)
		Less than 300m AHD(1)	Equal or > 300m AHD (1)		
Timber framed roof/ceiling system	R 2.7 downward R.22 downward where upper surface has solar absorptance value not .0.55 or roof space ventilated	R 2.7 downward R.22 downward where upper surface has solar absorptance value not >0.55 or roof space ventilated	R3.0 downward R 2.5 downward where upper surface has solare absorptance value not > 0.55 or roof space ventilated	R2.7 downward & upward or R 2.2 downward & upward where upper surface has solar absorptance value no .0.55 or roof space is ventilated	R 3.2 upward
Timber framed external wall system	R 1.9 or R 1.4 if slab onground for lightweight clad or masonry veneer be slab on ground plus RMN no >0.05 inwards and have wall sheded by roof etc at min. projection angle of 15 deg.	R 1.9 or R 1.4 if slab on ground	R 1.9	R 1.9 or R 1.4 if slab on ground	R 1.9
Floors	NR	NR	NR	NR	NR

Notes:

1. 'R' values given above are total 'R' values required for the roof or wall system .
2. AHD is Australian Height Datum. Height above AHD is measured from mean sea level.
3. NR = No requirement.
4. RBM = Reflective building membrane.
5. Specific requirements apply to skylights.
6. Solar absorptance value relates to the colour of the roofing. Pale colours have lower values.

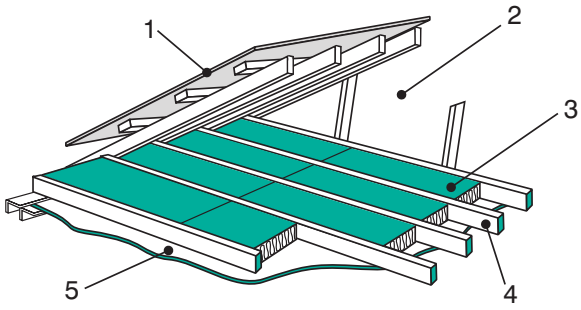
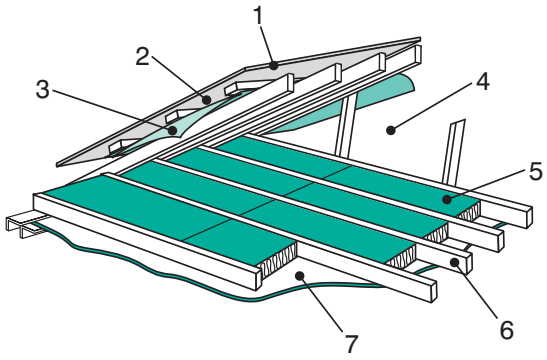
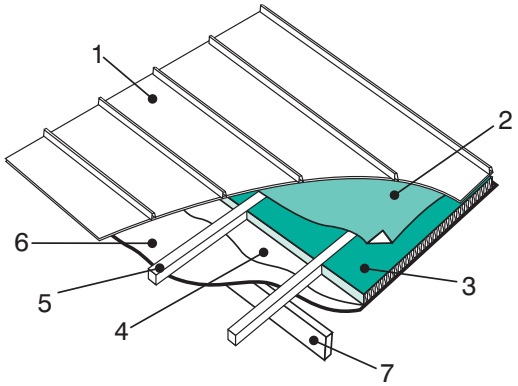
'R' Rated Timber Systems

Tables 3 and 4 give a summary of some 'R" ratings for typical timber framed roof and wall systems.

The **'R' rating** is a measure of the thermal resistance (m^2.K/W) of the total system, that is, the summation of the 'R' values of all the components of the system including any insulation and reflective air spaces that may be present.

Comprehensive 'R' ratings for a wider range of timber framed roof, wall and floor systems are available at www.timber.org.au under the 'ENERGY' page. The numbering system used in this data sheet for roofs and walls, corresponds to that in the details at the above web address.

Table 3 'R' Ratings for timber framed roof assemblies

Description	Item	Total 'R' Value	
		Inward	Outward
R1 Pitched/truss roof, flat ceiling, bulk insulation between joists			
 1. Roof cladding 2. Attic space (non-reflective) 3. Bulk insulation 4. Timber ceiling joists 5. Plasterboard	R 1.5 bulk insulation		
	Tiles	2.3	1.9
	Sheet	2.1	1.9
	R 2.0 bulk insulation		
	Tiles	2.7	2.3
	Sheet	2.5	2.3
	R 2.5 bulk insulation		
	Tiles	3.0	2.8
	Sheet	2.8	2.8
	R 3.0 bulk insulation		
	Tiles	3.4	3.2
	Sheet	3.2	3.2
R2 Pitched/truss roof, flat ceiling, reflective foil with/without bulk insulation between joists			
 1. Roof cladding 2. Airspace (non-reflective) 3. RFL 4. Attic space (reflective) 5. Bulk insulation 6. Timber ceiling joists 7. Plasterboard	No bulk insulation		
	Tiles	1.4	0.6
	Sheet	1.4	0.6
	R 1.5 bulk insulation		
	Tiles	2.9	2.1
	Sheet	2.9	2.1
	R 2.0 bulk insulation		
	Tiles	3.3	2.5
	Sheet	3.3	2.5
	R 2.5 bulk insulation		
	Tiles	3.6	3.0
	Sheet	3.6	3.0
R6 Metal roof, exposed rafters, bulk insulation and RFL			
 1. Metal decking 2. Sarking 3. Bulk insulation 4. Vapour barrier 5. Timber batten 6. Ceiling lining 7. Exposed rafter slope: 15° to 35°	R 2.5 bulk insulation	2.3	2.6
	R 3.0 bulk insulation	2.7	3.1

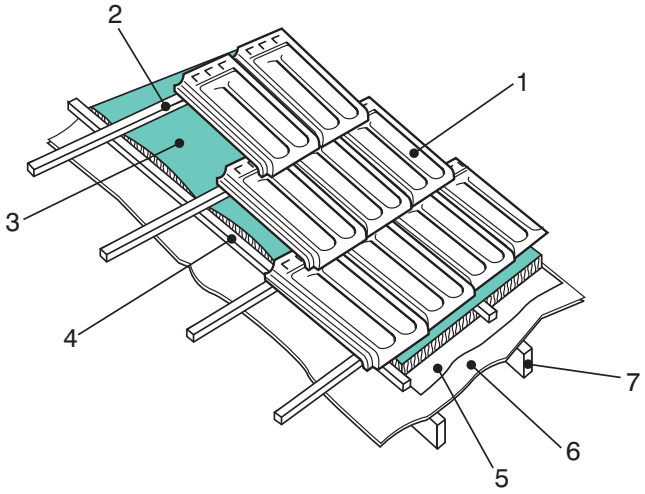
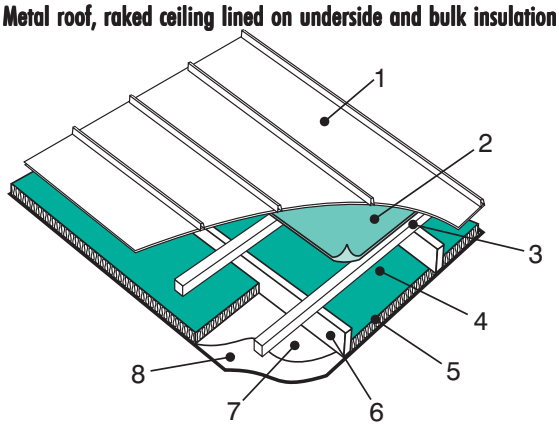
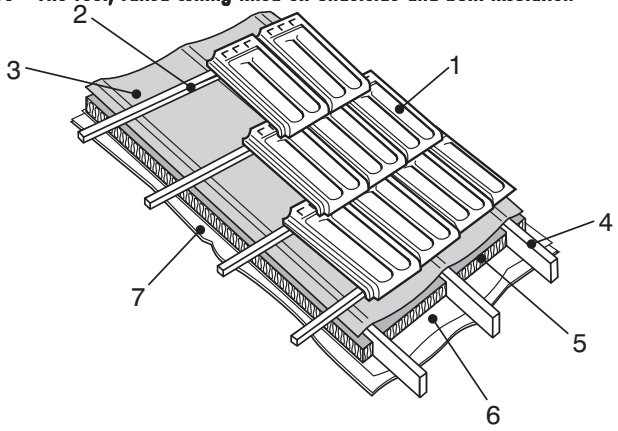
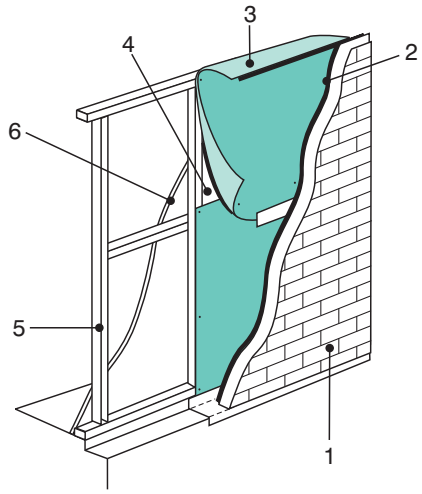
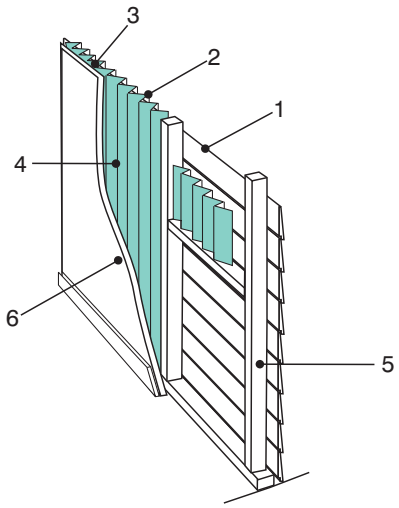
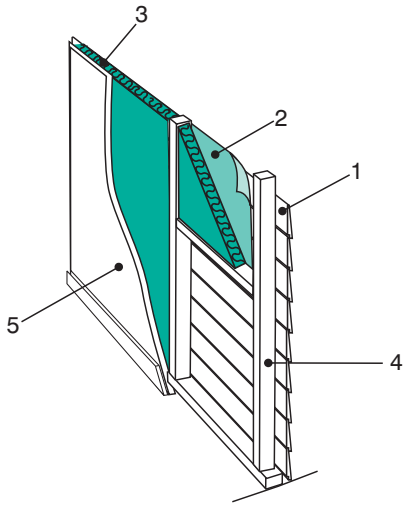
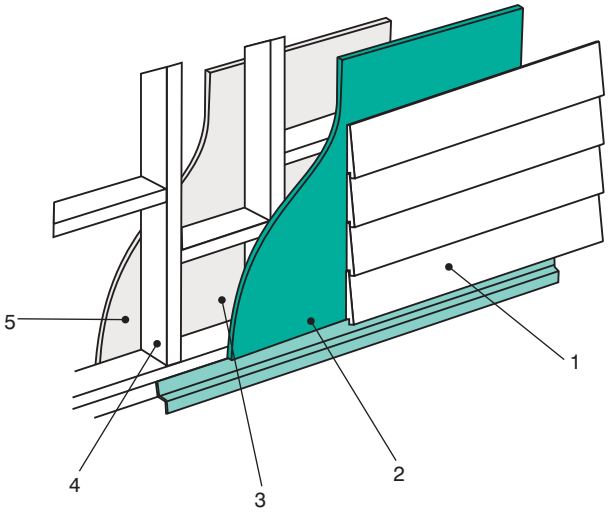
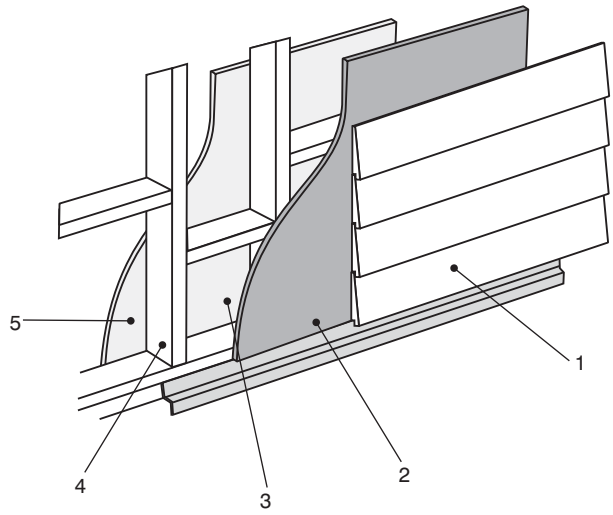
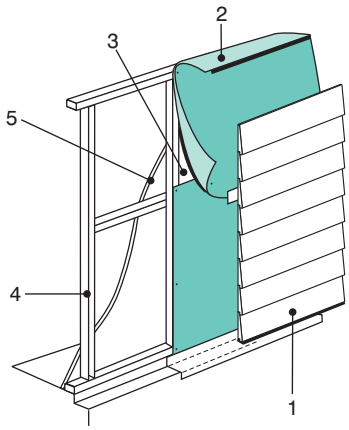
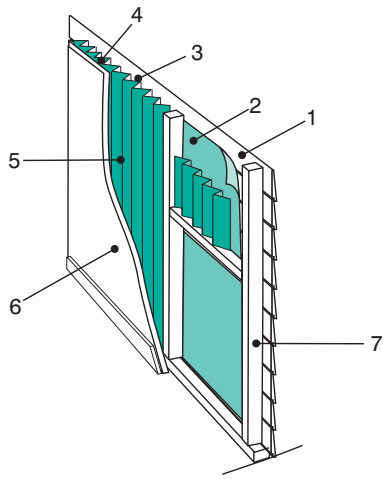
Description		Item	Total 'R' Value	
			Inward	Outward
R7 Tile roof, exposed rafters and bulk insulation Inward Outward  	1. Tiles 2. Timber tile batten 3. Bulk insulation 4. Counter battens 5. Vapour barrier 6. Plasterboard 7. Exposed rafter slope: 15° to 35°	R 2.5 bulk insulation R 3.0 bulk insulation	2.5 2.8	2.7 3.1
R9 Metal roof, raked ceiling lined on underside and bulk insulation  	1. Metal roofing 2. Sarking RFL 3. Timber roofing batten 4. Airspace (reflective) 5. Bulk insulation 6. Timber rafter 7. Vapour barrier 8. Plasterbaord slope: 15° to 35°	R 2.0 bulk insulation R 2.5 bulk insulation R 3.0 bulk insulation	2.6 3.0 3.4	2.7 3.2 3.6
R10 Tile roof, raked ceiling lined on underside and bulk insulation  	1. Tiles 2. Timber tile batten 3. Sarking RFL 4. Timber rafter 5. Bulk insulation 6. Vapour barrier 7. Plasterboard slope: 15° to 35°	R 2.0 bulk insulation R 2.5 bulk insulation R 3.0 bulk insulation	2.7 3.0 3.4	2.8 3.2 3.6

Table 4 'R' Ratings for timber framed wall assemblies

Description	Item	Total 'R' Value	
		Inward	Outward
W1 Timber framed wall, brick veneer, reflective foil laminate (RFL)			
	Clay Brick 110mm		
1. External cladding 2. Airspace (anti-glare) 3. RFL 4. Airspace (reflective) 5. Timber studs 6. Plasterboard 10 mm	70mm frame	1.4	1.3
	90mm frame	1.5	1.3
	Concrete brick 90mm		
	70mm frame	1.4	1.3
	90mm frame	1.4	1.3
W2 Timber framed wall, weatherboard or sheet cladding, concertina RFL between studs			
	Weatherboard	1.8	1.5
1. External cladding 2. Airspace (reflective) 3. Concertina RFL 4. Airspace (reflective) 5. Timber studs 6. Plasterboard 10 mm Note: Noggings omitted for clarity	Plywood cladding	1.7	1.4
	Fibre cement cladding	1.7	1.4
W5 Timber framed wall, weatherboard or sheet cladding, R 1.5 bulk insulation and RFL			
	Weatherboard	1.6	1.5
1. External cladding 2. Vapour permeable RFL Airspace (reflective) 3. R 1.5 bulk insulation 4. Timber studs 5. Plasterboard 10 mm	Plywood cladding	1.6	1.5
	Fibre cement cladding	1.5	1.4
Note: Noggings omitted for clarity			

Description	Item	Total 'R' Value	
		Inward	Outward
W9 Timber framed wall, weatherboard or sheet cladding, 10 mm foil-backed insulation board			
 1. External cladding 2. Insulation board 10 mm 3. Airspace (reflective) 4. Timber studs 5. Plasterboard 10 mm	Weatherboard	1.2	1.2
	Plywood cladding	1.2	1.1
	Fibre cement cladding	1.1	1.1
W10 Timber framed wall, weatherboard or sheet cladding, 15 mm foil-backed insulation board			
 1. External cladding 2. Insulation board 15 mm 3. Airspace (reflective) 4. Timber studs 5. Plasterboard 10 mm	Weatherboard	1.4	1.4
	Plywood cladding	1.3	1.3
	Fibre cement cladding	1.3	1.3
W11 Timber framed wall, weatherboard or sheet cladding, RFL			
 1. External cladding Airspace (anti-glare) 2. Vapour permeable RFL 3. Airspace (reflective) 4. Timber studs 5. Plasterboard 10 mm	Weatherboard	1.2	1.1
	Plywood cladding	1.1	1.0
	Fibre cement cladding	1.1	1.0

Description	Item	Total 'R' Value	
W14 Timber framed wall, weatherboard or sheet cladding, concertina RFL between studs		Inward	Outward
 1. External cladding 2. Vapour permeable RFL 3. Airspace (reflective) 4. Concertins RFL 5. Airspace (reflective) 6. Plasterboard 7. Timber studs	Weatherboard	1.9	1.8
	Plywood cladding	1.9	1.7
	Fibre cement cladding	1.8	1.7

Other Considerations

Substitution of lining/sheeting materials

It can be noted from Tables 3 and 4, that the total 'R' rating for the various assemblies is not very sensitive to the type of lining or sheeting materials used. Table 5 provides 'R' ratings for individual lining/sheeting materials and this can be used to determine if one product can be substituted for another in any of the assemblies given in Tables 3 and 4.

Table 5 'R' Ratings for some common lining/ sheeting materials

Material	Thickness (mm)	'R' Rating (m^2K/W)
Softwood	12	0.09
	19	0.14
Hardwood	12	0.06
	19	0.10
Plywood	6	0.05
	12	0.09
	15	0.11
Hardboard	4.5	0.02
	6	0.03
Particleboard	19	0.17
	22	0.20
Medium Density Fibreboard	9	0.07
	12	0.09
	18	0.14
Fibre cement	6	0.02
Plasterboard	10	0.06
	13	0.08
Brick	90	0.06
	110	0.07

Standard plasterboard thickness used for wall and ceiling lining in Tables 3 and 4

Fixed shading for windows and doors (Screens, awnings etc)

The code requires control of solar radiation through external glazing. This can be achieved by either using roof overhangs or fixed screens that have blades, slats or battens covering a minimum of 75% of the area of the screen.

Note: Overhang requirements vary with orientation of glazing and height from overhang to bottom of glazing.

Timber used for the construction of screens should be of an appropriate quality and durability to achieve the performance required. Information on durability and preservative treatment for timber used in these applications can be obtained from Technical Data Sheet No 25 'Outdoor Timber Performance'

Thermal Bridging

The thermal conductivity of building elements plays an important role in the overall thermal efficiency of building assemblies. Timber, which has a relatively low coefficient of thermal conductivity is ideal for framing systems and window and door joinery as it does not result in any significant thermal bridging between the inside and outside of the building envelope.

The BCA has specific requirements for situations where thermal bridging is an issue.

References

1. Building Code of Australia – 2009.
2. R-Values for Timber Framed Building Elements. Forest and Wood Products Research and Development Corporation. April 2002.
3. Building Insulation Design Guide. CSR Bradford Insulation. Dec 1992.

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