

Mudbrick House Design Guidelines

Achieving a 6 star energy rating
for your Mudbrick home



Eltham and District
Community Bank® Branch

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Contents



Nillumbik Mudbrick Association Inc.

The Nillumbik Mudbrick Association Inc. (NMA) was formed in June 2004, principally in response to the introduction of the FirstRate 5-star energy rating program for buildings.

The principal aims are:

- To protect and promote the Mudbrick building industry
- To strengthen Nillumbik's standing as Australia's most important Mudbrick region

The NMA Inc. welcomes members both from within and outside the Nillumbik Shire, who share their passion and commitment for the future of the earth building industry.

**Become a member today at:
www.mudbrick.org.au**

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The Mudbrick House



There are enormous advantages to building your home using traditional Mudbricks. The environmental benefits begin with utilising the dirt from your own house excavations, mixing it with water and straw, and drying the moulded brick in the sun. This provides a low-embodied energy wall material, and presents a warm, inviting look to your home.

A plethora of environmentally sustainable opportunities arise when contemplating your future home: these include the use of recycled timbers for framework and linings, second-hand clay bricks for paving, as well as new technologies such as solar power. The thermal mass of Mudbrick walls provide a more constant temperature throughout the year than the usual industry alternatives and, with good design, you can develop a truly beautiful home.

Mudbrick homes date back ten thousand years around the world, and have been with us here in Australia for well over a century. Although initially developed as a low-cost housing alternative for those with some time on their hands (and a whole lot of initiative), they have more recently become the choice for people on all manner of budgets seeking a more sustainable and sound lifestyle, or simply something a little bit different.

About the Star Rating

The FirstRate 5 House Energy Rating (HER) software is a method for assigning a star rating to domestic building designs. The star rating is based on the energy required to heat and cool your home to a certain temperature throughout the year. In May 2011, a 6-star minimum requirement for obtaining a building permit became mandatory in Victoria.

There are a number of ways in which to increase your star rating, including double glazing, caulking external windows and doors, and using dampers and self-sealing devices on exhaust fans, flues, chimneys and ducts.

Timber window and door frames are typical of Mudbrick homes, offering superior insulating properties to many mass-produced alternatives. A concrete slab or paved brick floor laid at ground level may further enhance the rating when provided with good solar access during colder months.

While typically providing great thermal mass, Mudbricks possess a relatively low R-value, with limited capacity for improvement due to the lack of cavity within the brick.

In general terms, the rating tool is weighted towards having a high R-value of insulation which can be designed into walls, roof and floor cavities. The R-value represents the capacity of an insulating material to resist heat flow. The higher the R-value, the greater the insulating power.

An R-value of R2.0 in walls provides significant advantages; however, the addition of as little as R1.0 extra can further improve the star rating. Expanded polystyrene (EPS) is a versatile insulation option, and 50mm thickness equates to approximately R1.2. Extruded polystyrene (XPS) is slightly more expensive, but provides somewhat higher R-values for the same thickness (approximately R1.75 for 50mm): it is more resistant to degradation caused by moisture, making it ideal for under-slab applications. Polyester and glass wool batts are relatively inexpensive and commonly available in R1.5 to R2.5 in 90mm thickness for wall applications, and R2.0 to R4.0 in 120mm to 210mm thickness for ceilings.



Optimising Your Mudbrick Star Rating

One of the key considerations for Mudbrick designers is the location of opportunities for increasing the R-value in external walls. Typically, one would expect more windows to be built towards northern rather than eastern orientations. There may well be opportunities to define some walls to the west and south as 'dead walls', or walls that are less important aesthetically. Externally, these may be walls confronting paling fences, walls facing onto carports or garages, or walls forming part of a utility area compromised by hot water services, piping, or other appliances. In high-pitched rooves and dormer windows, the apex may be insulated and panelled with rough-sawn timber. Internally, it is advantageous to locate opportunities such as walk-in robes, substantial shelving, pantries, kitchen/bathroom/laundry tiled and cupboard areas, to which an added R-value can be applied.

The following will provide some guidelines in how to achieve a higher R-value and star rating within a typical Mudbrick house design. The aim of this guide is for designers to achieve the mandatory star rating without compromising that which is truly valued and integral to a Mudbrick home.





Features & Treatments

> Ceilings

Feature: Exposed beams, rafters and cathedral ceilings

Treatment options:

- Install polystyrene insulation board over timber ceiling lining and fix roof battens and sisalation directly above (an R-value of 2.5 is possible using approximately 100mm of expanded polystyrene or 75mm of extruded polystyrene)
- Install foilboard insulation board (cathedral 25mm) in between rafters and roof battens, and use beading to fix timber ceiling lining between rafters, creating a still airspace on either side of foilboard (combined with double-sided foil sisalation this will provide around R2.7, depending on size of airspaces)
- Create a 150-200mm cavity for bulk insulation by using beading to fix timber ceiling lining between rafters
- Fit timber ceiling lining to underside of rafters to create a 200-250mm cavity for insulation (bulk insulation batts of 200-210mm thickness can provide an R-value of R3.5-4.0 and are a very cost effective solution)

Feature: Exposed timber ceiling beams/floor joists between floors

Treatment options:

- This treatment is only effective in improving the star rating in certain situations whereby a notable difference in the heating and cooling loads between the ground and first floors exist. This may occur where one floor is primarily a living zone and the other is a night time/bedroom zone, or if one floor is compromised more than the other by adverse heat loss or gain (due to orientation, glazing, shading, etc.)
- Install timber ceiling lining half way down beams/joists to create a 100mm cavity for R2.0 bulk insulation or similar
 - Cover beams entirely by installing timber ceiling lining to bottom face, thus creating a 150-200mm cavity for bulk insulation



Features & Treatments

> Walls Internal

Feature: Internal character and look of Mudbrick walls, in particular, living and high-use areas of house

Treatment options:

Locate potential 'dead walls'. If there are any interior walls not readily seen or not significant aesthetically, such as walk-in robes and wardrobes, pantries, kitchen/bathroom/laundry tiled areas, shelving and cupboard areas, the following treatments may be applied:

- Expanded or extruded polystyrene fitted behind cabinets or shelving
- Timber stud cavity wall with insulation batts (may be finished in timber cladding, corrugated metal, gypsum board and render, if required)

- Expanded or extruded polystyrene with render or gypsum board finish, if required
- A second skin of reduced thickness Mudbricks, providing a cavity for insulation

> Walls External

Feature: External character and look of Mudbrick walls, in particular, front of home and elevations which are readily visible

Treatment options:

Locate potential 'dead walls'. If there are any exterior walls not readily seen or not significant aesthetically, such as walls confronting paling fences, walls facing onto carports or garages, or walls forming part of a utility area already compromised by hot water services, piping, or other appliances, the following treatments may be applied:

- Corrugated iron, colorbond, weatherboard or rendered finish attached to timber frame, providing a cavity for insulation

- Rigid expanded or extruded polystyrene with render finish
- Double skin Mudbrick, providing a cavity for insulation (Mudbrick thickness in this scenario approximately 150mm rather than usual 250mm)



Features & Treatments

> Floors

Feature: Brick paving and solid finishes to concrete slab on ground

Treatment options:

- Install extruded or expanded polystyrene board beneath concrete raft slab as per manufacturer's recommendations
- Waffle slab construction incorporating R2.0 pods
- Install extruded or expanded polystyrene board around the perimeter of the brick floor (not recognised in FirstRate 5)

Feature: Brick paving - no slab

Treatment options:

- A cost effective way of producing a finished product with limited processes is to lay clay bricks on solid or compacted ground subject to soil test and engineer's requirements
- Install extruded (XPS) or expanded (EPS) polystyrene board over a layer of sand and vapour barrier/membrane, or as per manufacturers recommendations (this treatment is made more important in the event of 'in-floor' heating)
 - Install extruded or expanded polystyrene board around perimeter of the brick floor



> Windows

Feature: Timber window and door frames, typically rough-sawn, handmade and chunky

Treatment options:

- Timber window and door frames generally possess lower conductance, and are therefore more thermally efficient than mass-produced alternatives such as aluminium (without thermal breaks)
- Fit flexible rubber or foam weather seals around all external doors and windows
 - Fit draught seals to the bottom of all external doors
 - Ensure all gaps and cracks in timber frames are plugged or sealed



Features & Treatments

> Verandas

Feature: Wide verandas with exposed timber rafters, beams and facias

Treatment options:

- Design verandas to the south orientation and, to a lesser extent, west
- Pergolas designed to allow sun onto glazing during winter, and to shield glazing from sun in summer should be used on the north orientation and, to a lesser extent, east and west



> Building Sealing

Feature: Open fireplace, wood boiler or gas heater

Treatment options:

- Fit all chimneys, flues and exhaust fans with dampers and/or self closing mechanical louvres

Features & Treatments

> Construction Types

Post and Beam Frame

Feature: Exposed over-sized timber posts and beams to external of home

Treatment options:

Timber provides a reasonable R-value, so this is unlikely to prove a problem.

- See 'Walls'

Load Bearing Mudbrick

Feature: Solid and timeless look of external Mudbrick walls, particularly at corners

Treatment options:

- See 'Walls'



Above: an example of load bearing

Other Considerations to improve Star Rating

- Maximise glazing to north orientation
- Minimise glazing to south and west orientations
- Use glazing with low U-value and high solar heat gain coefficient (SHGC). Clear double glazing with a large air (preferably argon) gap provides good performance in Melbourne's climate zone. Low-E or tinted finishes can be added for windows impacted by summer sun
- Use sealed downlights with covers, allowing insulation to be fitted close around fixture housing inside ceiling
- Design eaves to protect glazing in summer and provide solar access in winter
- Locate living areas to north and east of house, with bedrooms to south
- Use adjustable external shading devices, particularly over windows impacted by direct summer sun
- Maximise winter solar access to brick, tiled and concrete floors
- Maximise winter solar access to internal brick, stone and Mudbrick walls



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