PGH BRICKS & PAVERS™

COMMERCIAL CLAY COMMONS & TECHNICAL DATA

NEW SOUTH WALES

CSR

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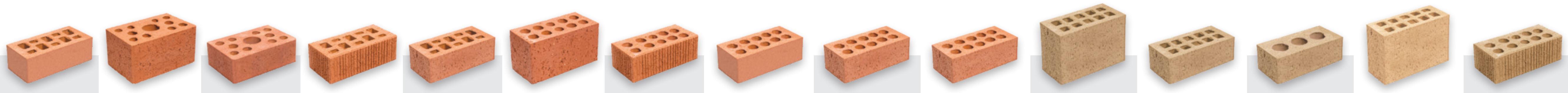
Face Brick: Blue Steel Flash

CLAY COMMONS PRODUCT SUMMARY

Images are only indicative



Product Name	Paint Grade Common	Party Wall 119	Party Wall 76	Scratch Coat Common EXP & GP	Wirecut Common EXP & GP	Schooner Common EXP & GP	Scratch Coat Common	Smooth Face Common	Universal Common EXP & GP	Wire Cut Common	Double Height Common	Universal Common	Uni Common 3 core	Presto Common (90mm)	Scratch Coat Common
Texture List	Smooth	Wirecut	Wirecut	Chiseled	Wirecut	Wirecut	Wirecut	Smooth	(EXP) Rolled (GP) Smooth & Wirecut	Wirecut	Wirecut	Smooth, Wirecut	Smooth, Wirecut	Wirecut	Chiseled
SAP Material Code	137596	137611	137610	(EXP) 137600 (GP) 167718	(EXP) 137588 (GP) 167717	(EXP) 132753 (EXP) 132754 (GP) 112184 (GP) 112183	87109	87110	(EXP) 119728 (GP) 38196	19421	19641	118263	20042	191525	193182
Plant of Manufacture	Bringelly	Bringelly	Bringelly	Bringelly	Bringelly	Cecil Park	Cecil Park	Cecil Park	Cecil Park	Cecil Park	Oxley*	Oxley*	Oxley*	Oxley*	Oxley*
Weight Per Brick (kg)	3.0	6.0	4.0	2.9	3.0	4.3	2.7	2.7	2.7	2.7	5.5	2.7	2.7	3.7	2.7
Working Size (mm) Length x Depth x Height	230x110 x76	230x150 x119	230x150 x76	230x110 x76	230x110 x76	230x110 x119	230x110 x76	230x110 x76	230x110 x76	230x110 x76	230x110 x162	230x110 x76	230x110 x76	230x90 x162	230x110 x76
Bricks Per SQM	48.5	32.3	48.5	48.5	48.5	32.3	48.5	48.5	48.5	48.5	24.25	48.5	48.5	24.25	48.5
Pack Type	Strapped	Strapped	Strapped	Strapped	Strapped	Palletised	Palletised	Palletised	Palletised	Palletised	Strapped	Strapped	Strapped	Strapped	Strapped
Bricks Per Pallet/Pack	400	200	280	400	400	(EXP) 196 & 224 (GP) 196 & 224	336	336	336	336	225	460	460	280	460
"Characteristic Unconfined Compressive Strength MPa ƒ'uc"	>22	>22	>22	>22	>22	>15	>15	>15	>15	>15	>15	>15	>15	>10	>15
Void Volume	<30%	<30%	<30%	<30%	<30%	<30%	<30%	<30%	<30%	<30%	<30%	<30%	<30%	37%	<30%
Salt Attack Resistance. EXP = Exposure Grade GP = General Purpose	EXP	EXP	EXP	EXP & GP	EXP & GP	EXP & GP	GP	GP	EXP & GP	GP	EXP	EXP	EXP	EXP	EXP
Fire Rating - Insulation (Unrendered)	-/-/90	-/-/120	-/-/120	-/-/90	-/-/90	-/-/90	-/-/90	-/-/90	-/-/90	-/-/90	-/-/90	-/-/90	-/-/90	Refer to Data Sheet	-/-/90

FRLs shown in the table are test results where the structural adequacy is specific to a 3 metre high wall restrained on all 4 sides. The design of fire rated walls should be checked by a qualified structural engineer. All specifications are nominal.
Sound Transmission for all bricks, refer to Technical Manual.

PGH Bricks & Pavers™ reserve the right to change specifications without notice. Check our website for the most up-to-date result. Product testing is carried out in our PGH NATA accredited laboratory (accredited to AS/NZS 4455 & AS/NZS 4456) and by the CSIRO and other independent NATA accredited laboratories.

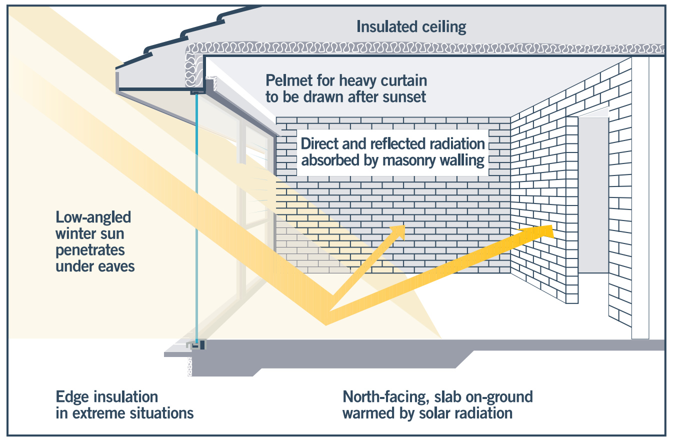
* Interstate Product

Bricks are an essential part of energy efficient building design. The key reason for this, is that bricks provide thermal mass when used in a building. This thermal mass is a key part of passive design, a proven method of maintaining your home at a comfortable temperature all year round and reducing the need for heating and cooling devices, which in turn decreases electricity loads, providing cost savings.

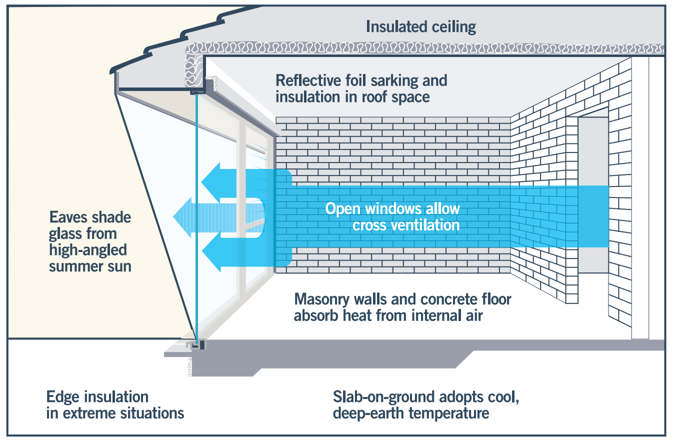
According to the Department of Climate Change and Energy Efficiency, "Thermal mass acts as a thermal battery. During summer, it absorbs heat, keeping the house comfortable. In winter, the same thermal mass can store the heat from the sun or heaters to release it at night, helping the home stay warm.[1]

PRINCIPLES OF PASSIVE SOLAR DESIGN

WINTER Image 01



SUMMER Image 02



Brickwork can be very energy efficient. When designing a house to be cool in summer and warm in winter, the wall material as well as other factors need to be taken into account. There are five key passive design features:

Orientation:	Placement of the house in relation to the sun.
Insulation:	A wall's ability to isolate temperature.
Climate:	The maximum day-time and minimum night-time temperatures (diurnal range). Thermal mass is most appropriate in climates with a large diurnal temperature range.
Thermal Mass:	Heavy-weight wall materials slow the passage of heat through a wall, a process called 'thermal lag'. And, the easiest way to get this heavy mass into walls is by using brickwork. The heavier the brick, the higher its thermal value.
Ventilation:	Air flow through the house.

Tailoring these passive design features to each climate is important. Think Brick Australia has put together a Climate Design Wizard that provides sustainable design strategies for designing ecologically sustainable buildings for the unique climatic conditions within Australia.

With many new building products entering the market, it's important to consider what will be best for the long term sustainability of building designs and the environment and what will minimise energy usage after installation.

SUSTAINABLE LIVING BUILD BETTER WITH BRICK

CLAY BRICKS OUTPERFORM THEIR LIGHTWEIGHT COUNTERPARTS

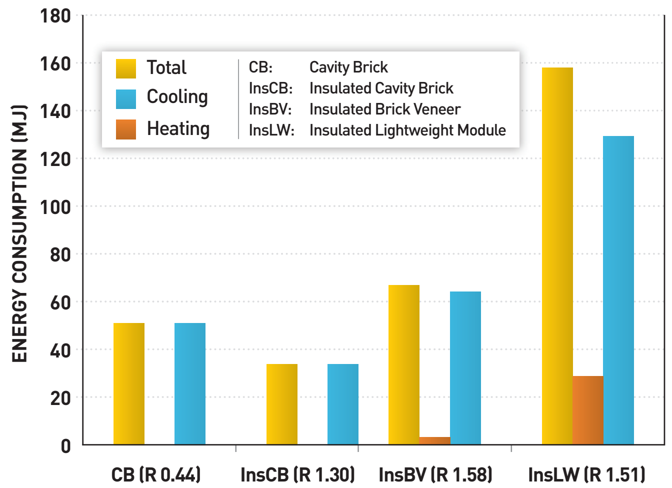
In Australia, a significant proportion of the end energy usage in residential buildings is used for space heating and cooling.[2] Research findings from an eight year thermal research program on masonry housing, conducted by Think Brick Australia in conjunction with the Faculty of Engineering and the Built Environment at the University of Newcastle, found that clay bricks outperformed their lightweight counterparts in relation to thermal performance, providing superior, energy efficient environments for people to live, work and play in.[3]

The thermal research findings concluded that the lightweight building was the worst performing in all seasons, brick veneer performed better than lightweight materials and insulated cavity brick performed the best. It also showed that the R-value is not the sole predictor of thermal performance and that there is no correlation between the R-value of a wall and energy usage. (R-value: is a measure of thermal resistance used in the building and construction industry.)

Image 03 shows that the insulated lightweight module (R 1.51), with over three times the R-value of cavity brick (R 0.44), used over three times the energy to maintain the temperature in the comfort zone. This data shows a clear difference between clay bricks and lightweight products with insulated cavity brick performing the best in relation to energy efficiency in a temperate climate.

TOTAL ENERGY CONSUMPTION, OCTOBER 2007[3]

Image 03



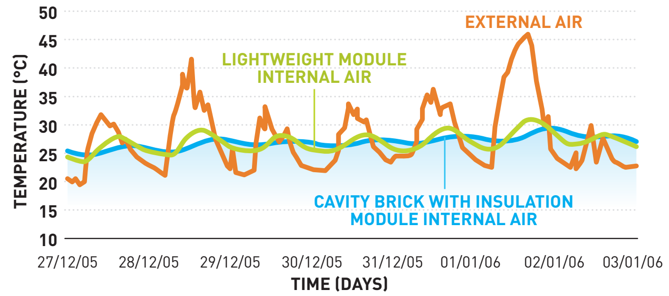
CLAY BRICKS PROVIDE SUPERIOR THERMAL CONTROL

The same research findings through Think Brick Australia and the University of Newcastle also found that insulated lightweight buildings exhibit greater variations in internal temperature and minimal thermal lag, resulting in daily temperature swings of more than twice that of insulated cavity brick dwellings during hot conditions.[3]

Image 04 shows that the lightweight module responds directly to the external environment with a rapid increase and reduction in temperature due to its low thermal mass, unlike insulated cavity brick. The lightweight module exhibited no properties with the potential to assist in maintaining adequate thermal comfort. Clay bricks have always been known for their thermal comfort properties and this research confirms this.

EXTERNAL AND INTERNAL AIR TEMPERATURES FOR LIGHTWEIGHTAND INSULATED CAVITY BRICK MODULES, JANUARY 2006.[3]

Image 04



REFERENCES:

1. www.yourhome.gov.au/technical/pdf/TechManual_4th_edition2011.pdf (pg.114)
2. Australian Residential Building Sector Greenhouse Gas Emissions 1990–2010, Australian Greenhouse Office, 1999.
3. 'Energy Efficiency and the Environment – The Case for Clay Brick – Edition 4', Research conducted by Think Brick Australia in conjunction with the Faculty of Engineering and the Built Environment at the University of Newcastle, 2009. A Study of the Thermal Performance of Australian Housing is the full report. www.thinkbrick.com.au/energy-efficiency-using-brick-and-the-environment

STRENGTH

BRICK STRENGTH IS DEFINED AS RESISTANCE TO LOAD PER UNIT AREA AND IS EXPRESSED IN MEGAPASCALS (MPA). PGH™ OFFERS A RANGE OF BRICKS THAT COMPLY WITH STRENGTH REQUIREMENTS TO OPTIMISE PROJECT, STRUCTURAL AND COST PERFORMANCE.

COMPRESSIVE STRENGTH

It is measured according to AS4456.4 – Determining Compressive Strength of Masonry Units. Individually crushing 10 bricks gives the compressive strength of each brick and the mean compressive strength of the lot. Whilst these figures are not used in masonry design, they are used to calculate Unconfined Compressive Strength.

UNCONFINED COMPRESSIVE STRENGTH

Unconfined compressive strength is a calculated number based on the compressive strength. The test method involves subjecting the individual unit to increasing load by compressing it between two metal platens, which is then multiplied by a factor depending on the height of the brick. The resulting number is called the unconfined compressive strength and reflects the performance of the brick in a wall. Whilst this figure is not used in masonry design, it is used to calculate Characteristic Unconfined Compressive Strength.

CHARACTERISTIC UNCONFINED COMPRESSIVE STRENGTH (F'UC)

A batch of bricks has a range of strengths that would usually follow a normal distribution and which contribute to the strength of the entire wall. Importantly, the weakest brick does not determine the strength of the wall. To ensure the safe strength of the wall, engineers use characteristic unconfined compressive strength in masonry design calculations. This is the strength 95% of the bricks will exceed and is typically 0.86 times the lowest unconfined compressive strength found when measuring the compressive strengths of the individual 10 units.

PGH Bricks & Pavers™ provides Characteristic Unconfined Compressive Strength details for Technical Specifications (see www.pghbricks.com.au).

The design characteristic compressive strength of masonry (f'm as denoted by AS3700) in a wall is generally a function of the height of the structure and the spacing of the load-bearing elements (the walls). Everything else being equal, the taller the structure and the larger the spacing between walls, the greater the compressive strength required.

The compressive strength requirements also vary for different levels within the same structure. Whilst the walls on the ground floor must bear the load of all the floors above plus the roof, the walls on the top floor must only carry the load of the roof itself.

FIRE RESISTANCE

FIRE RESISTANCE LEVELS (FRLs) ARE SPECIFIED IN THE NATIONAL CONSTRUCTION CODE (NCC). THIS SYSTEM PROVIDES AN ACCURATE METHOD OF PREDICTING THE ABILITY OF A WALL TO MAINTAIN ITS STRENGTH IN A FIRE AND TO RESIST THE SPREAD OF THE FIRE. THE FRL SPECIFIES THE FIRE RESISTANCE PERIODS (FRP) FOR STRUCTURAL ADEQUACY, INTEGRITY AND INSULATION.

There are three components to fire resistance levels which are expressed in minutes.

1. **STRUCTURAL ADEQUACY:**
   The ability of a wall to continue to perform its structural function for the fire resistance period (FRP).
2. **INTEGRITY:**
   The ability of a wall to maintain its continuity and prevent the passage of flames and hot gases through cracks in the wall during the FRP.
3. **INSULATION:**
   The ability of the wall to provide sufficient insulation such that the side of the wall away from the fire does not exceed a pre–defined temperature during the rated period. At this temperature (a rise of 140°C over the ambient temperature or a maximum of 180°C) surface finishes and furnishings in contact with or near the wall may combust.

A fire resistance level is therefore expressed as a triple rating, for example 90/90/90, for each of the structural adequacy, integrity and insulation components respectively.

FRLs can be determined from AS 3700 (Masonry Structures) or by testing in accordance with AS 1530.4.

The FRL of a wall depends not only on the thickness of the wall, but also on its height, length and boundary conditions (ie how it is connected to other building elements).

For further information on Fire Resistance Levels for clay brick walls in accordance with AS 3700, refer to Manual 5 published by the CBPI (www.thinkbrick.com.au).

SOUND TRANSMISSION

WITH GROWING NUMBERS OF APARTMENTS IN MANY CITIES, THE NEED TO MAINTAIN PRIVACY BETWEEN DWELLINGS HAS NEVER BEEN MORE IMPORTANT. THE ACOUSTIC PERFORMANCE OF PRODUCTS IS BEING CONSIDERED MORE OFTEN THAN EVER BEFORE.

In response to the market, the National Construction Code (NCC) sound provisions were amended on the 1st May 2004. Amendments to the NCC apply to New South Wales, the ACT, Tasmania and South Australia. The NCC sound provisions apply to attached Class 1 buildings plus Class 2, 3 and 9c buildings.

CLASS 1 BUILDINGS:
Buildings include single dwellings that do not have another dwelling above or below it, such as a stand-alone house or a row of townhouses.

CLASS 2 BUILDINGS:
Buildings include buildings that contain two or more sole-occupancy units, such as an apartment unit.

CLASS 3 BUILDINGS:
Buildings include residential buildings that contain a number of unrelated persons, such as a guest house or the residential part of a school, hotel, etc.

CLASS 9C BUILDINGS:
A building of a public nature, specifically an Aged Care building.

MEASUREMENT OF ACOUSTIC PERFORMANCE

Sound or acoustic performance is measured by the weighted sound reduction index (Rw). Rw is a single number rating of the sound reduction through a wall or other building element. Since the sound reduction may be different at different frequencies, test measurements are subjected to a standard procedure that yields a single number that is about equal to the average sound reduction in the middle of the human hearing range.

Since the human ear does not discern all frequencies in the spectrum, measurement standards have been altered to incorporate correction factors. Correction factors are also used to take into account common noise sources.

There are two types of correction factors:

CTR = weighted towards low frequency sounds such as traffic, trains, hi-fi systems with subwoofers. These noise sources are much more distinct and irritating.

C = weighted towards general domestic sounds such as speech, vacuum cleaners, normal television and radio.

The reference spectrum for this is fairly flat and is commonly referred to as "pink noise".
The NCC often specifies in terms of Rw + Ctr, where Ctr is a correction factor for low to medium frequency noise. Therefore, the correction factor is used to show how effective a particular wall construction is against those types of noise. The correction factors are negative numbers, so the smaller the number the better. A small number (eg -1) shows that the construction does not have a large performance drop in that sound frequency range.

EVALUATING ACOUSTIC PERFORMANCE

When evaluating the loudness of a sound resulting on the other side (receiver side) of a partition the following process is used:

1. Begin with a reference spectrum (sound source) loudness measured in dBA.
2. Apply (subtract) the transmission loss of the partition.
3. Determine the new dBA value on the resultant (receiver) side. The difference between the reference and the resultant values is equivalent to the Rw + Ctr (when the Ctr spectrum is applied as the sound source).

The frequencies considered in the Ctr spectrum have greater levels of energy and are much more difficult to attenuate. Consequently, the NCC has adopted this term when specifying the minimum sound insulation requirements involving habitable areas.

INTERPRETING A SOUND RESULT?

An acoustic performance result is expressed in terms of Rw and the correction factors.
For example, a wall might have Rw(C,Ctr) of 55(-1,-5), which means that Rw is 55, C is -1 and Ctr is -5. The NCC often specifies the Rw + Ctr. For this wall the Rw + Ctr will be 55 + (-5) or 55 - 5. So the Rw + Ctr is 50.

THE DIFFERENCE BETWEEN RW AND STC?

Sound transmission class (STC) was a former reference to sound performance requirements which were based on different criteria to that of Rw ratings, and it did not include any correction factors. STC is no longer relevant to sound performance and cannot be used.

HOW TO ACHIEVE THE REQUIRED ACOUSTIC PERFORMANCE

The sound performance requirements of the NCC can be satisfied by:

- Building a deemed-to-satisfy wall as specified in the NCC.
- Demonstrating compliance by lab testing of an exact construction, or
- Demonstrating compliance by field testing.

The deemed-to-satisfy walls are the lowest bound results. Walls built of specific clay bricks may have better performance, as indicated by the manufacturer from individual tests.

PGH Bricks conducts extensive testing of different wall constructions and a large number of acoustic solutions are available to suit your construction. It is important to recognize that bricks from different manufacturers and manufactured in different plants give different results.

The National Construction Code (NCC) requires that walls separating sole-occupancy units in Class 1, 2 and 3 buildings are required to have an Rw + Ctr of not less than 50.

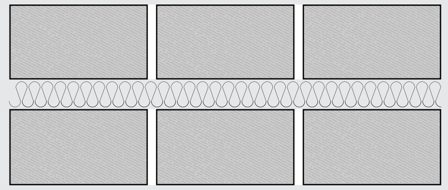
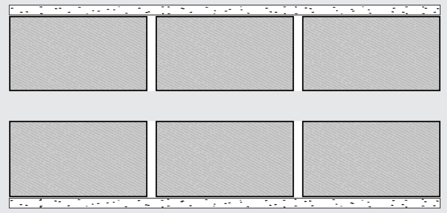
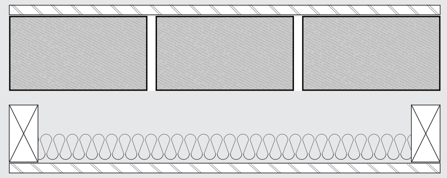
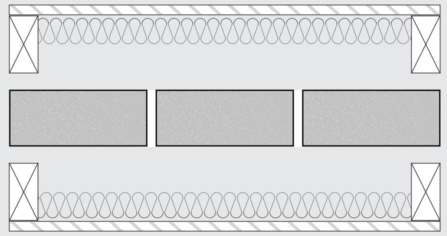
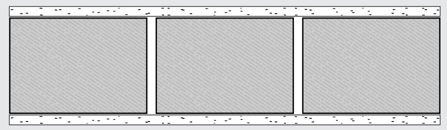
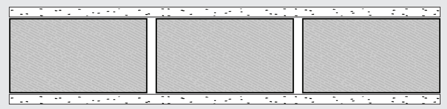
In addition, the construction must be discontinuous, if the wall separates a habitable room (living room, dining room, bedroom study and the like) from a wet room (kitchen, bathroom, sanitary compartment or laundry).

Walls in Class 2 or 3 buildings that separate a sole occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like must have an Rw of not less than 50.
If this wall separates a sole-occupancy unit from a plant room or a lift shaft, the construction must be discontinuous.

Discontinuous construction requires a minimum 20mm cavity between two separate leaves. If wall ties are to be used, they must be resilient wall ties.

Face Brick: Black & Tan

ACCEPTABLE FORMS OF CONSTRUCTION FOR WALLS

Description Wall construction type: Masonry	$R_w + C_{tr}$ (not less than)	R_w (not less than)	Construction
Two leaves of 110 mm clay brick masonry with: (a) cavity not less than 50 mm between leaves; and (b) 50 mm thick glass wool insulation with a density of 11 kg/m3 or 50 mm thick polyester insulation with a density of 20 kg/m3 in the cavity.	50	50	
Two leaves of 110 mm clay brick masonry with: (a) cavity not less than 50 mm between leaves and; (b) 13 mm cement render on each outside face.	50	50	
Single leaf of 110 mm clay brick masonry with: (a) a row of 70 mm × 35 mm timber studs or 64 mm steel studs at 600 mm centres, spaced 20 mm from the masonry wall; and (b) 50 mm thick glass or mineral wool insulation with a density of 11 kg/m3 positioned between studs; and (c) one layer of 13 mm plasterboard fixed to outside face of studs and outside face of masonry.	50	50	
Single leaf of 90 mm clay brick masonry with: (a) a row of 70 mm × 35 mm timber studs or 64 mm steel studs at 600 mm centres, spaced 20 mm from each face of the masonry wall; and (b) 50 mm thick glass or mineral wool insulation with a density of 11 kg/m3 positioned between studs in each row; and (c) one layer of 13 mm plasterboard fixed to studs on each outside face.	50	50	
Single leaf of 150 mm brick masonry with: 13 mm cement render on each face.	-	50	
110 mm thick brick masonry with: 13 mm cement render on each face.	-	45	
110 mm thick concrete brickwork.	-	45	-

PGH BRICKS & PAVERS™

DISCLAIMER

PGH™ cannot and does not warrant the strength of any structure comprising its bricks and other components. PGH™ strongly advises users to consult a qualified structural engineer before selecting any masonry products and structural systems. The field performance advice provided in this document is based on typical field de-rating applied to laboratory measured performance data. Independent specialist advice and confirmation should be sought for the specific project with regard to the presence of flanking paths or any other acoustic effects that may affect field performance. Information contained in this document may change without notice.

WARNING INFORMATION

Dust from clay products contains crystalline silica. Repeated inhalation of this dust may cause lung scarring (silicosis) and lung cancer. Do not breathe dust. Wear an approved mask (respirator) if dusty. For further information and a Material Safety Data Sheet, visit www.pghbricks.com.au. PGH™ is unable to accept any liability for costs incurred as a result of failure or delay in delivering the product. Further test certificates are available on request. No product is guaranteed to match.

We offer more than just our Commons. PGH Bricks & Pavers have a wide range of face bricks and pavers to choose from. Visit a PGH Selection Centre.

For sales or technical assistance:

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