

THE BRICKERY®

Technical and Aesthetic properties of our clay bricks and pavers

Testing refers to the standards listed:

AS/NZS 4455.1:2008

Masonry units, pavers, flags and segmental retaining wall units - Masonry units

Provides users and specifiers with the requirements for masonry units used in pavement construction.

AS/NZS 4456:2003

Masonry units, segmental pavers and flags - Methods of test

Provides a general introduction and a series of 19 test methods for masonry units and segmental pavers. The tests are for sampling, mean and standard deviation, and for determining dimensions, compressive strength, breaking load, potential to effloresce, core percentage and material thickness, moisture content and dry density, abrasion resistance, resistance to salt attack, expansion, contraction, pitting due to salt attack, expansion, contraction, pitting due to lime particles, water absorption properties, lateral modulus of rupture, permeability to water, rate of absorption and tensile strength.



Definition of First Quality

First quality product complies with the technical and aesthetic properties specified by Austral Bricks™

Technical properties

"A measure of mechanical characteristics of a material – how it will perform"

- Tested in our laboratory as per applicable Australian Standard test methods AS/NZS 4456
- The technical properties that are tested are specified on product data sheets that can be found at www.australbricks.com.au
- They include dimensional category, breaking load, compressive strength, estimated 15 years coefficient of expansion, cold water absorption, initial rate of absorption, durability class, potential to effloresce, pitting due to line, perforation volume, abrasion resistance category

Aesthetic properties

"The properties of aesthetics are the texture, shape and colour - it must appeal to the customers and must feel nice"

- Assessment is conducted by viewing a dry-stacked panel of 100 units sampled from every 15th car out of the kiln
- Compared against master reference boards for colour consistency and graded accordingly
- Includes texture, slurry application, cracking, squareness, shape, arris treatment, face markings

Assessment of Technical Properties

Dimensional category (AS/NZS 4456.3)

AS/NZS 4455 Masonry units and segmental pavers calls for bricks, blocks and pavers to be classified into dimensional categories based on their deviation from their work size, or the size specified in manufacture.

Users of pavers will often want to know how much variation there is in the size of their pavers. Consistency of dimensions is important whenever patterns or straight lines need to be maintained in a paved area, particularly when pavers are butted up against one another.

Under this standard test, 20 pavers can be either measured individually (Method B, which is more appropriate for concrete products) for length, width and thickness, or they can be placed side by side, end to end, etc and their cumulative dimensions measured (Method A, which is more appropriate for clay products).

- Measured cumulatively over 20 units and compared against the specified work size, i.e. the distance from the first to the last brick or paver

DIMENSIONAL DEVIATIONS OF MASONRY UNITS

CATEGORY	WORK SIZE DIMENSIONS (mm)		
	UNDER 150	150 to 250	OVER 250
DW0	Not Required		
DW1 (see note 1)	±50	±90	±100
DW2 (see note 1)	±40	±60	±70
DW3	Values declared by the supplier or by agreement between the supplier and purchaser		
DW4	Standard deviation of not more than 2mm and a difference between the mean and the work size of not more than 3mm		

NOTES:

1. For DW1 and DW2 refer to the AS/NZS 4456.3 test method for determination of cumulative dimensions. The values given are measured over 20 units.
2. For DW4 refer to the AS/NZS 4456.3 test method for determination of measurements for individual units.

- (AS/NZS 4455 requires the manufacturer to specify the work size and meet category DW1 or DPA1 as a minimum)



Testing to Category DW1



Length is tested over 20 bricks placed end to end –
Standard equals 4,600mm \pm 60mm



Width is tested over 20 bricks placed side by side
2,200mm \pm 40mm



Height (thickness) is tested over 20 bricks placed top to bottom
1,520mm \pm 40mm

Compressive strength (AS/NZS 4456.4)

This is the ability of the masonry unit (brick or block) to resist crushing loads, e.g. the weight of the roof that the wall is supporting, plus the weight of the wall itself. The designer of the structure needs to be sure that the masonry unit will be able to carry the load being placed upon it, including any live loads.

- This is more relevant to bricks than pavers
- AS/NZS 4455 requires the compressive strength to be specified for masonry units. There is no specified minimum for pavers



The brick sample is crushed in a hydraulic press

Breaking load (AS/NZS 4456.5)

This test, also known as transverse strength, measures the force needed to break a paver (or brick) in half. The paver is supported on two beams, 25 mm in from each end, and the force is applied via another beam in the centre. The results of this test are reported in kilo newtons (kN). They're a measure of the paver's ability to resist the stresses of handling, transporting and laying, and the loads likely to be encountered in service. Pavers with a breaking load of 2kN or more are deemed to be strong enough to be transported and laid. Higher strengths (5kN and up) are needed for driveways, roads, etc. Normally the breaking load test is done on a sample of 10 pavers of the same size.

- AS/NZS 4455 specifies a minimum characteristic breaking load of 2kN for pavers. The is no specified minimum for bricks)
- Sample is broken in half by a hydraulic bar
- More relevant to pavers than bricks

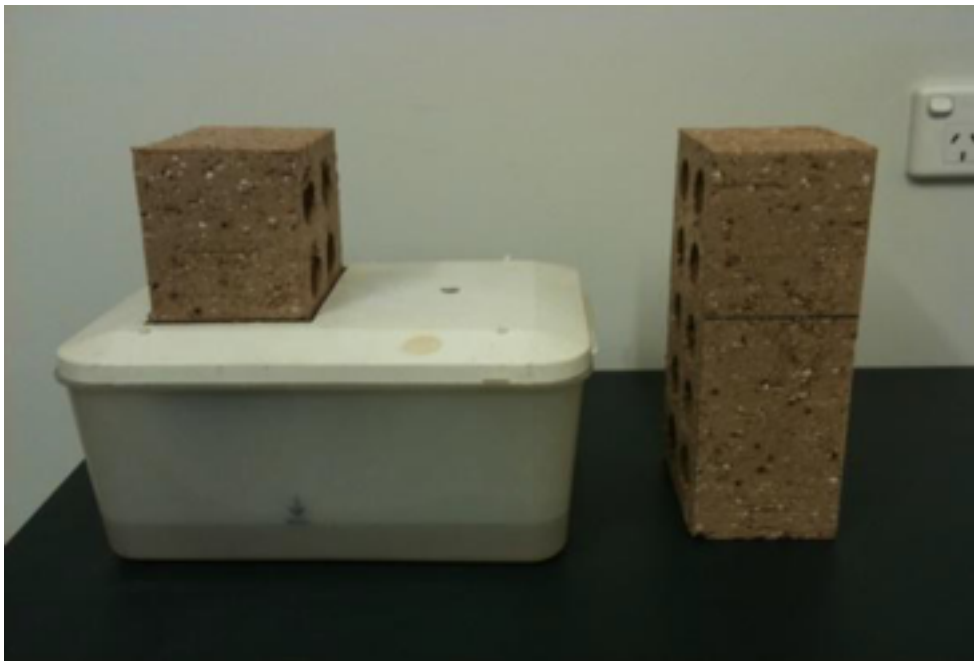


Sample is broken in half by a hydraulic bar

Potential to Effloresce (AS/NZS 4456.6)

Efflorescence is a deposit of salts, usually white, on the surface of bricks and blocks after being laid. The salts usually come from ground water or out of the mortar, but may come from within the masonry units themselves. This test predicts the likelihood that the units will display such unsightly deposits from salts that they already contain.

- The sample sits in water which is drawn into the brick and evaporates from the exposed surfaces
 - After 7 days the sample is removed and compared against a dry sample to determine the level of efflorescence (salts) that have formed
 - Efflorescence categories are:
 - o Nil – No observable efflorescence (salt)
 - o Slight – Less than 10% of surface covered by salt
 - o Moderate – More than 10% but less than 50% of surface covered by salt
 - o Heavy – More than 50% of surface covered by salt
 - o Severe – Any efflorescence that causes powdering or flaking of the surface of the Product
- (AS/NZS 4455 specifies Slight as the maximum category for first quality product)



Sample soaking next to control sample

Perforation volume (AS/NZS 4456.7)

There are three reasons for determining the perforation volume:

When assessing the Initial Rate of Absorption (see page 16), the perforation volume must be taken into account to calculate the net IRA from the gross IRA. This allows the IRA of bricks having different perforation volumes to be directly compared based on the "suction" inherent to the material rather than the gross IRA result that is influenced strongly by the perforation volume.

To ensure that the brick is less than 30% perforated, which then deems the product to comply with applicable fire ratings as per Australian building standards.

To determine the material thickness (through the wall) of the brick, which is sometimes used in engineering calculations as per Australian building standards.

- Sand is poured into the core holes and the volume of sand measured
- The sand volume is divided by the measured volume to determine the percentage of perforation
- (AS/NZS 4455 does not specify a minimum or maximum perforation volume)



The cores of the brick are filled with sand



The brick is removed and the sand collected



The sand volume is measured

Abrasion resistance (AS/NZS 4456.9)

Pavers are generally subjected to abrasive wear on their top surface in use. This is typically from foot traffic (high-heeled shoes are particularly tough on pavers), but also from vehicular traffic.

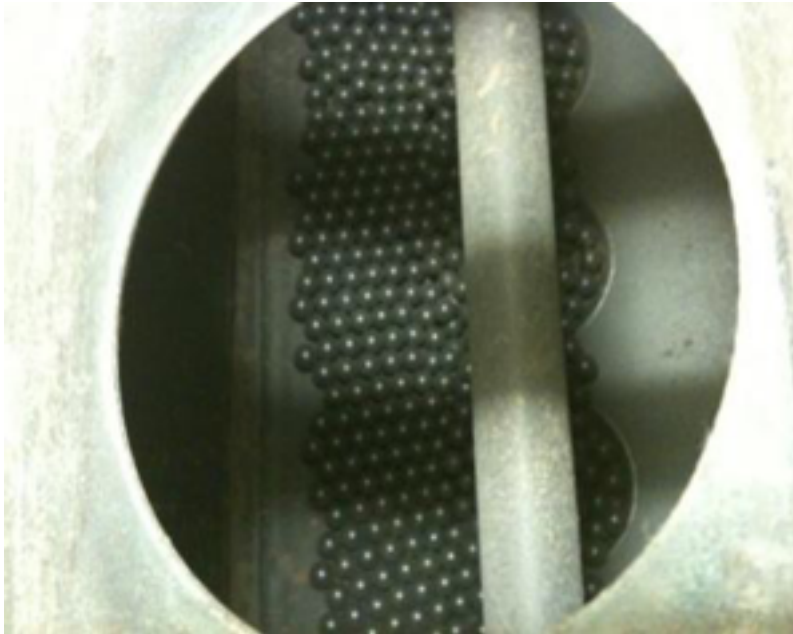
The laboratory test for abrasion resistance involves bombarding the paver surface with hundreds of steel ball bearings. Sixteen pavers (or segments of pavers) are fixed to the outside of a drum containing the ball bearings, and as the drum rotates the ball bearings tumble and roll against the pavers through round holes in the drum. After an hour of this treatment, the pavers are weighed to measure the mass loss, which is then converted to a volume loss and reported as the abrasion index.

Pavers with an abrasion index of 3.5 or less are considered suitable for high-volume pedestrian traffic (e.g. shopping centre entrances & pedestrian malls). Up to 5 is OK for roads and low-volume public footpaths, and for domestic driveways around 7 is acceptable.

- Pavers are abraded by 600 steel ball bearings when rotated through 3600 revolutions on the tumbler abrasion equipment
- The mass of the paver that is lost through tumbling is converted to a volume in cubic centimetres (cm³) which is then used to calculate the mean abrasion index
- This test simulates the action of stiletto heel shoes on pavers used in areas of high pedestrian traffic
- AS/NZS 4455 does not specify a maximum abrasion index



The pavers are clamped to the tumbler ready to rotate (4 pavers on each side of the drum)



There are 600 ball bearings inside the tumbler to simulate stiletto heel impact



The pavers showing the simulated wear after 3600 revolutions

Durability class (AS/NZS 4456.10)

In some situations, bricks/pavers can be attacked by salts from ground water, swimming pools, spas etc. How resistant a given brick/paver is to the effects of salt crystallisation will depend on things like the porosity of the brick/paver and the strength of the material the brick/paver is made from, as well as the concentration and type of salt, and moisture and temperature conditions.

Bricks and blocks may be classed as Exposure Grade if they either have a history of coping with a salty environment, or have passed a laboratory test which simulates such conditions. Units are required to be exposure grade, according to AS 3700 Masonry Structures, wherever they are

- *in contact with aggressive soils (e.g. with high concentrations of salts in the ground- water), or*
- *in a "severe marine environment", i.e. within 1 kilometre of a surf coast or 100 metres of a bay side coast.*

The lab test puts small segments of the masonry units through a series of 40 cycles of alternate soaking in a salt solution, then drying in an oven. If the specimens survive the 40 cycles with less than a specified loss in mass, they've passed the test

- Measures the resistance to attack by sodium sulphate (ground salts) and sodium chloride (sea salts)
- Test runs for 40 cycles of immersion in saline solution followed by oven drying
- Failure is a loss of more than 0.4 grams on any 1 of 5 samples



Samples soaking in salt solution



Samples drying to crystallise salts

There are three classes of durability that the bricks or pavers can be classified as after the results of the testing. AS/NZS 4455 requires the manufacturer to specify the durability.

1. Exposure class durability
 - a. This class is expected to be achieved if the product survives more than 40 cycles without failure.
 - b. Exposure grade products can be used where walls are in contact with ground salts or sea salts, and can be used in retaining walls
 - c. Exposure grade products must be used up to 1kilometres from a surf coast and up to 100 metres from an inlet or bay
2. General Purpose class durability
 - a. This class is expected to be achieved if failure occurs between 15 and 40 cycles, while products that fail before 15 cycles are likely to be Protected
 - b. General Purpose class products can be used in all areas except exposure grade
3. Protected class durability
 - a. These products are suitable only for use in walls above the damp proof course provided they are covered at the top (by a roof or eaves or similar) or rendered/painted or in internal walls
 - b. They are not to be used within 10km of a surf coast or up to 1km from an inlet or bay

This test method is a guide only, and does not over-ride manufacturers or suppliers experience in classifying the durability of a product based on historic performance in the field.

Moisture expansion (AS/NZS 4456.11)

All fired clay bricks expand slowly after their manufacture, by taking up moisture out of the atmosphere. The expansion continues for many years, and needs to be taken into account, in building design. To predict the long-term expansion, a brick length can be accurately measured before and after a laboratory steam treatment and the change in length used to estimate how much the brick will expand in 15 years.

Information on how far a used brick has already expanded ("past expansion") can be gained from re-firing the brick in a laboratory kiln, and measuring its shrinkage. How far the used bricks still have to expand ("residual expansion") can be assessed by the difference between these two measurements.

These expansion characteristics depend on the clays used in making the bricks, and on the manufacturing process itself.

- Kiln-fresh product is measured then steamed and re-measured
- The resulting expansion in millimetres represents the expansion per metre of wall or pavement, and is expressed as mm/m
- Steaming expands the product and represents 15 years of expansion
- There is no maximum expansion specified by AS/NZS 4455



Measuring frame with micrometer



Bricks loaded ready to be steamed

Lime pitting (AS/NZS 4456.13)

- Product is steamed to hydrate (expand) any lime particles in the body
- When lime near the surface expands it causes a thin piece of the product to flake off which makes the surface appear chipped
- Lime pitting categories are:
 - o Nil No visible pits
 - o Slight Up to 5 pits, none over 5mm diameter
 - o Moderate No pit over 10mm diameter
 - o Severe Pit or pits over 10mm diameter
- There is no maximum category specified by AS/NZS 4455



Assessment of lime pitting after steaming for moisture expansion assessment

24 hour cold water absorption (AS/NZS 4456.14)

A standard soaking-in-water test can determine the porosity of bricks and blocks, which can then be used as an indication of the potential for the development of problems related to the penetration of salts and other materials into the units, such as salt attack and efflorescence.

- Dry product is soaked in water for 24 hours
- The percentage increase in mass (based on original dry mass) is the percentage 24 hour cold water absorption (% 24 hour CWA)
- (AS/NZS 4455 does not specify maximum cold water absorption)

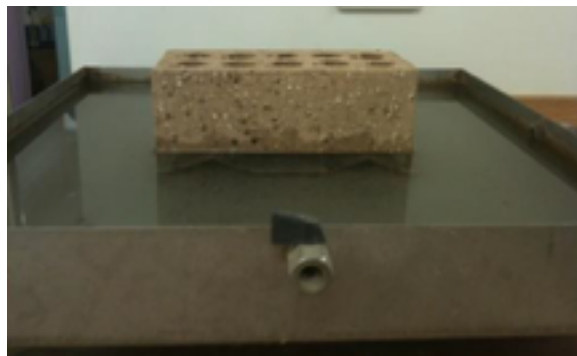
Initial rate of absorption (AS/NZS 4456.17)

As soon as the bricklayer puts the mortar on a brick, the brick starts to absorb water out of the mortar. The microscopic pores in the brick soak up the water, which carries with it some of the partly-dissolved cement and lime. It's the setting of this cementitious material within the brick pores that provides most of the bond between the brick and the mortar, and thus gives the wall its strength.

To get the best bond, it's important to match the "suction" of the brick to the water-retaining properties of the mortar. If the initial rate of absorption of the brick is too high for the mortar that's being used, the mortar may dry out too quickly and stiffen before the next course can be laid. If it's too low, not enough cementitious material is drawn up into the brick pores. In either case, the bond strength will suffer.

The Initial Rate of Absorption test measures the amount of water a dry brick can soak up during the first minute of contact with water.

- The rate of absorption (IRA) is measured in kilograms of water per square metre of bed face per minute (kg/m²/min)
- AS/NZS 4455 does not specify maximum or minimum IRA



Water being soaked up is visible in the brick face

Slip resistance (AS/NZS 4586.1)

The most common test for slip resistance involves sliding a rubber pad on the end of a pendulum across the wet paver surface and measuring how far the pendulum swings up on the other side. The more slippery the paver surface, the lower the test result, which is reported as "British Pendulum Number". Depending on this value, the paver can be classified as Class V (least slippery) through to Class Z (most slippery).

- Spring-loaded rubber slider on foot of pendulum skids over the surface of a wet paver and gives a British Pendulum Number (BPN) result
- The contribution of the floor surface to the risk of slipping when wet is classed (V) - very low if a BPN of >44 is achieved. Class (W) – low is for a BPN between 40 and 44
- AS/NZS 4586 does not specify a minimum slip resistance class



The TRRL rubber slider ready for release over wet paver



British Pendulum Number (BPN) result is read directly from the scale on the machine

Assessment of Aesthetic Properties

Colour (colour reference boards)

- Each batch of product is compared against master reference boards for colour consistency and graded accordingly
- A grade of "5" represents the mid-range blend of colour
- A grade of "4" is the lightest acceptable blend of colour
- A grade of "6" is the darkest acceptable blend of colour



4: Lightest

5: Mid-range

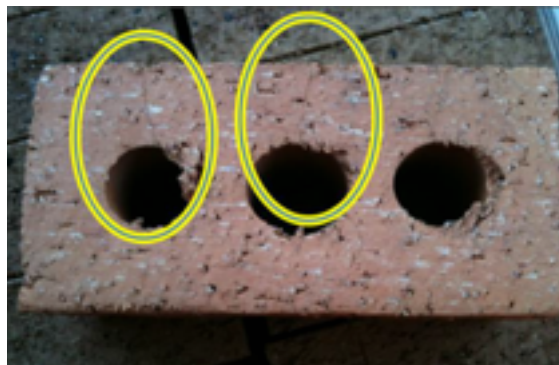
6: Darkest

Cracking (based on ASTM C216-04 8.4.1, 8.5 & ASTM C902-93 7.1, 7.4)

- Since there is no Australian standard for assessment of cracking in clay bricks and pavers, we have adopted the most stringent categories from the relevant American Standard Test Methods (ASTM)
- ASTM C216-04 specifies that Regular type bricks must contain less than 5% visible cracking when viewed from a distance of 6.1 metres
- ASTM C902-93 specifies that High volume pedestrian and Vehicular type pavers must contain less than 5% visible cracking when viewed from a distance of 4.6 metres
- Cracks through the back of a brick, and superficial hairline cracks in the face are not visible from 6.1 metres, and will not affect the technical properties or performance of the brick in a wall



Cracks in the back of the brick



Cracks penetrate to the core but not to the face



Superficial face crack that does not penetrate to the core (above right)

- The wall below contains 100 bricks. Four are cracked (visible from 6.1m). These 100 bricks are of acceptable quality for cracking at 4%.

Can you spot the four examples below in this wall?



Of the 100 bricks in this wall only 4 showed visible cracking when viewed at 6.1 metres



1st example



2nd example

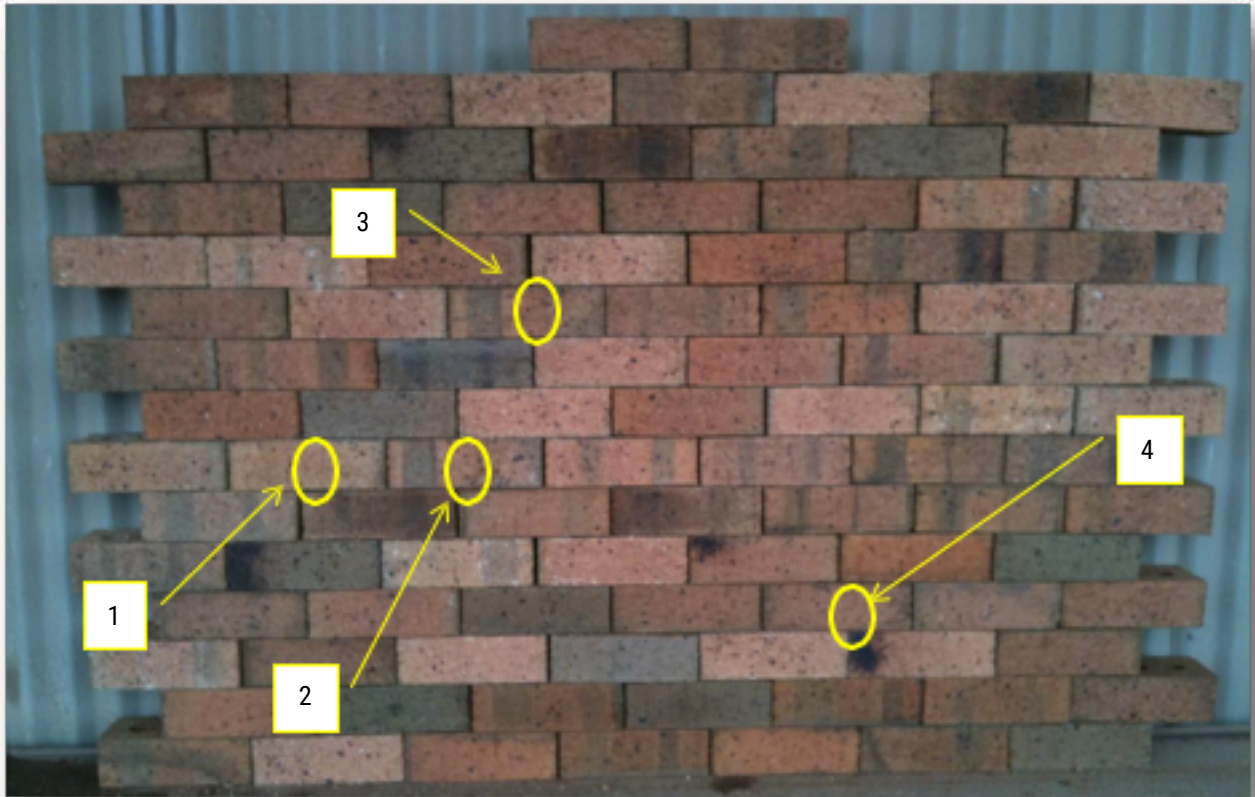


3rd example



4th example

Of the 100 bricks in this wall only 4 showed visible cracking when viewed at 6.1 metres



Brick 1



Brick 2



Brick 3



Brick 4

Chipping (based on ASTM C216-04 8.4 & ASTM C902-93 7.3)

- Since there is no New Zealand and Australian standard for assessment of chipping in clay bricks and pavers, we have adopted the most stringent categories from the relevant American Standard Test Methods (ASTM)
- ASTM C216-04 specifies that Regular type bricks must contain less than 10% of bricks displaying chipping
- ASTM C902-93 specifies that High volume pedestrian and Vehicular type pavers must contain less than 5% of pavers displaying chipping, and that the sum of all chips per paver must be less than 70mm
- Only product with chips greater than 6mm on the edge or greater than 9.5mm on the corner are to be counted when determining the percentage chipped



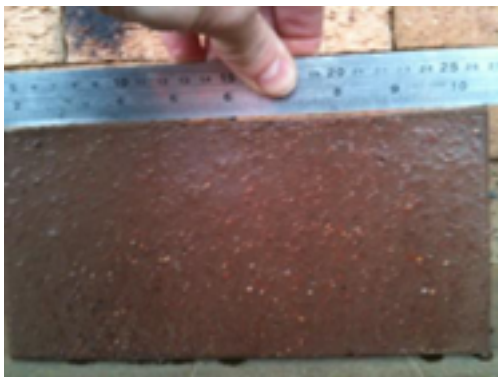
5.9mm chip in edge is acceptable



9.4mm chip in corner is acceptable

Distortion (based on ASTM C216-04 10.2, 10.3 & ASTM C902-93 6.4)

- Since there is no Australian standard for assessment of distortion in clay bricks and pavers, we have adopted the most stringent categories for Warping, Burring, Lipping and Wedging from the relevant American Standard Test Methods (ASTM)
- ASTM C216-04 specifies that Regular type bricks must not be distorted or out of square by more than 3.2mm along the stretcher or 2.4mm along the perpend
- ASTM C902-93 specifies that High volume pedestrian and Vehicular type pavers must not be distorted or out of square by more than 2.4mm along the stretcher or 1.6mm along the header
- All types of distortion and out of square can be measured using a straight-edge, Vernier callipers and measuring wedge



Distortion on Stretcher



Distortion on Perpend



Acceptable on stretcher at 2.25mm



Measuring wedge for distortion

Face marking & Texture (colour reference boards)

- No standard exists for these features of the product
- Face texture and markings that occur occasionally are characteristics of the extrusion process and are typically expected to fall within the range exhibited by samples displayed on colour reference boards
- Face marking/texture similar to the examples below is acceptable when observed on less than 5% of the products in the batch or delivery



Occasional face marking/texture



Arris feature

THE BRICKERY®

100 YEAR WARRANTY

As one of the world's most sought after and trustworthy sources of sustainable building materials, clay bricks are renowned for their strength and secure investment potential. The quality construction, quiet calm and ageless appeal of a solid clay brick home will protect your family for generations to come.

Clay brick is low maintenance, they don't need paint or other treatments to maintain aesthetics and durability. They are strong, reliable and relatively maintenance free, saving you on the cost and time required to upkeep your home, compared to lighter weight materials.

The most endearing quality of a clay brick home is its ability to withstand the test of time, even under the harshest environmental conditions.

We stand behind our bricks with unwavering confidence to ensure that your brick will last. Our 100 year warranty makes it easy to meet our obligations under the new consumer protection measures in the Building Act, effective from 1 January 2015.

Please see over for the Warranty terms and conditions.

AUCKLAND
956 Great South Rd,
Penrose, Auckland 1642
Phone: 09 579 0166

TAURANGA
15 Hynds Rd,
Greerton, Tauranga 3142
Phone: 07 578 7117

HAMILTON
59 Vickery St,
Te Rapa, Hamilton 3200
Phone: 07 958 4650

LOWER NORTH ISLAND
61 River Bank Road,
Otaki, Kapiti Coast 5512
Phone: 021 229 9976

CHRISTCHURCH
1/99 Sawyers Arms Rd,
Papanui, Christchurch 8052
Phone: 03 354 0200

NZ BRICK DISTRIBUTORS' WARRANTY

NZ Brick Distributors Limited Partnership ("We," "Us" or "Our")
The purchaser ("You" or "Your")

1. We manufacture our bricks to satisfy the requirements of the Australian and New Zealand Standard for Masonry Units and Segmental Pavers, AS/NZS 4455. All products are tested to the Australian and New Zealand Standard for Masonry Units and Segmental Pavers – Methods of Test, AS/NZS 4456.
2. We warrant that our bricks will:
 - a. be free from defects outside the acceptable limits specified in AS/NZS4455 due to factory workmanship or materials used in manufacturing the product; and
 - b. will perform to the extent set out in the relevant NZ Bricks published literature current at the time of installation, for a period of 100 years from date of original purchase.
3. The warranty in clause 2 applies if:
 - a. the bricks are stored in accordance with the technical data, plans, specifications, and advice prescribed by Us at the date of purchase;
 - b. the bricks are installed in accordance with the technical data, plans, specifications, and advice prescribed by Us at the date of installation, in compliance with all relevant New Zealand Standards and to the requirements of the Building Act 2004;
 - c. the design of the works complies with all relevant New Zealand Standards and to the requirements of the Building Act 2004; and
 - d. the bricks are maintained in accordance with the technical data, plans, specifications, and advice prescribed by Us at the date of purchase.
4. The warranty in clause 2 does not apply:
 - a. where a defect arises because the bricks are not used for their intended purpose;
 - b. to bricks where the grade selected is not appropriate for the intended purpose;
 - c. to inappropriate choice of product grade;
 - d. to slight variations in product colour - variations in colour and shade are inherent in fired clay products, these factors are not considered defects and are excluded under this warranty;
 - e. to bricks that are damaged by cleaning;
 - f. to bricks that are re-used including any bricks that are removed from their first place of installation and re-installed;
 - g. to normal wear or tear, or damage caused by accident, misuse or abuse;
 - h. to minor chipping, cracking or efflorescence;
 - i. to performance of paint/coating applied to the product, growth of mould, mildew, fungi, or bacteria on the surface of the bricks;
 - j. to damage caused by settlement or structural movement including where faults are caused or contributed to by any third party design or engineering of the building or structure to which the bricks are attached (including but not limited to the design of the frame to which the bricks are affixed);
 - k. to damage caused by events beyond Our control including a 'force majeure' event including earthquake, flood, act of God or war;
 - l. to damage arising out of conditions outside of the limits prescribed by the technical data, plans, specifications, and advice prescribed by Us at the date of purchase / including ingress of higher than normal levels of salts, sandstorms, repeated sub-zero temperatures, severe marine environments;
5. Reasonable evidence of the date of Your original purchase must be provided to qualify for this warranty. The original sales receipt is Your best proof of purchase.
6. In the event of a breach of this warranty during the warranty period We will, at Our sole option, do one of the following:
 - a. supply replacement bricks;
 - b. rectify the defective bricks;
 - c. pay for the cost of supplying replacement bricks; or
 - d. refund of the purchase price of the defective masonry product.

Our liability under this clause 6 is, to the maximum extent permitted by law, limited to carrying out one of the above options and is Your sole remedy in relation to a breach of this warranty.
7. Without limiting clause 6, to the extent permitted by law, all other warranties whether implied or otherwise, not set out in these warranty terms and conditions are excluded and We are not liable in contract, tort (including, without limitation, negligence or breach of statutory duty) or otherwise to compensate you for:
 - a. any increased costs or expenses;
 - b. any loss of profit, revenue, reputation, business, contracts or anticipated savings;
 - c. any loss or expense resulting from a claim by a third party; or
 - d. any special, indirect or consequential loss or damage or any nature.
8. This clause 8 applies if the supply of the bricks is a consumer supply as defined in the New Zealand Consumer Guarantees Act 1993 ("the Act"). In this statement, 'goods' means 'Bricks'.

Our goods come with guarantees that cannot be excluded under New Zealand Consumer Law. If this supply is to a consumer then the basis of Our liability is limited to the implied guarantees under the Act and the remedies available to you as a consumer are limited to those available under the Act.
9. This warranty is not applicable outside New Zealand.
10. This warranty is to be read in conjunction with and subject to Our terms and conditions applicable at the date of purchase.
11. This warranty does not apply to schist or basalt products.
12. This warranty covers only the bricks manufactured by Us.
13. If the project is a newly constructed residential dwelling that is constructed by a developer for the purposes of sale then this warranty is assignable by the developer to the initial purchaser of that dwelling. In all other cases, this warranty is non-transferrable and non-assignable.
14. To make a claim under this warranty, to discuss your warranty, for technical support or to obtain locations for your nearest stockist, please call 0800 274 257 or visit www.thebrickery.co.nz.

SECTION 2 PRODUCT REQUIREMENTS *

2.1 GENERAL

Dimensional deviation, unconfined compressive strength, integrity and durability of masonry units shall comply with the requirements of this Section.

Compliance with the requirements for strength shall be determined in accordance with Appendix A.

NOTE: Additional means of demonstrating compliance with this Section are given in Appendix B.

The suppliers of masonry units shall make available the—

- (a) work sizes, including face-shell width (for hollow units); and
- (b) characteristic unconfined compressive strength (f'_w).

2.2 DIMENSIONAL DEVIATIONS FROM WORK SIZE

2.2.1 Performance requirement

Masonry units shall be manufactured to tolerances that enable the units to be laid in mortar in the wall to give a functional and aesthetically acceptable surface.

2.2.2 Methods

AS/NZS 4456.3 sets out the two following methods for measuring the dimensions of masonry units:

- (a) Determination of cumulative dimensions.
- (b) Determination of dimension of individual units.

The manufacturer shall select the method appropriate to the manufacturing process and the operating quality assurance program.

2.2.3 Deemed to satisfy

Measurement of dimensional deviations shall be carried out in accordance with AS/NZS 4456.3 and declared by the supplier. Categorization of dimensional deviations of masonry units shall be in accordance with Table 2.1.

Additionally, the following requirements apply:

- (a) All masonry units, excluding those listed in Items (b) and (c) below, shall comply with category DW1 unless otherwise specified by the supplier, or agreed between the supplier and purchaser.
- (b) Units intended for dry stack construction or those with thin bed joints shall have tighter tolerance in accordance with DW3.
- (c) Where the intended character of the masonry product is an overall irregular or rough surface, the units shall comply with category DW0. Where it is intended that only the face or faces of a unit are irregular, units shall comply with DW1, except that dimensional deviations shall not apply to the width of the unit if the average width is not less than 90% of the work size, determined for any plane parallel to its bed.

NOTE: Typical overall irregular units are dry or wet tumbled and sandstock type. Typical rough-face units are split face, profiled, textured and rock-face.

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TABLE 2.1
DIMENSIONAL DEVIATIONS OF MASONRY UNITS

Category	Work size dimensions, mm		
	Under 150	150 to 250	Over 250
DW0	No requirement		
DW1 (see Note 1)	±50	±90	±100
DW2 (see Note 1)	±40	±60	±70
DW3	Values declared by the supplier or by agreement between the supplier and purchaser		
DW4 (see Note 2)	Standard deviation of not more than 2 mm and a difference between the mean and the work size of not more than 3 mm		

NOTES:

- 1 For DW1 and DW2 refer to the AS/NZS 4456.3 test method for determination of cumulative dimensions. The values given are measured over 20 units.
- 2 For DW4 refer to the AS/NZS 4456.3 test method for determination of measurements for individual units.

2.2.4 Dimensional consistency between deliveries

For dimensional categories DW1 and DW2, the overall dimensions of 20 units taken from separate deliveries of units of the one type and the subject of a single order shall not differ by more than 40 mm.

2.3 UNCONFINED COMPRESSIVE STRENGTH

2.3.1 Performance requirement

Masonry units shall have sufficient unconfined compressive strength to resist applied loads without rupture or breakage in the completed structure.

2.3.2 Method

The characteristic unconfined compressive strength (f'_m) of masonry units shall be determined in accordance with AS/NZS 4456.4 and declared by the supplier.

NOTE: Means for determining the strength required to resist the applied loads are set out in AS 3700, NZS 4210 and NZS 4230.

2.4 INTEGRITY

2.4.1 Performance requirement

Masonry units shall have sufficient integrity so that they—

- can be handled, transported to the site and laid; and
- are capable of performing their required function in the finished structure.

NOTE: Integrity does not include aesthetic characteristics.

2.4.2 Deemed to satisfy

2.4.2.1 Solid or cored masonry units

For solid or cored masonry units, the requirement for integrity is deemed to be satisfied if the characteristic unconfined compressive strength is at least 3 MPa for solid or vertically cored units and 2.5 MPa for horizontally cored units.

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3 Wall claddings

3.1 Wall claddings generally

3.1 WALL CLADDINGS GENERALLY	
✘	Adjacent claddings are out of alignment (unless otherwise specified).
✘	Paint/plaster/mortar spatter.
✔	Claddings are fixed and/or aligned in accordance with manufacturer's instructions and consented plans.
FLASHINGS	
✘	Corrosion, dents, buckling and/or paint/plaster spatter.
✘	Scratching that goes through the full depth of the coating.
✔	Scratching that is not visible from the normal viewing position (providing it is not the full depth of the coating).
✔	Some minor depressions at fixing points that do not cause denting or buckling.

3.2 Clay brick and masonry veneer

The normal viewing position distance for internal and external exposed architectural masonry feature walls is 6.1 m (see Inspecting surfaces and fixtures). Where it is not possible to achieve this distance, specific issues can be viewed at closer distances in accordance with the details in the below table.

3.2 CLAY BRICK AND MASONRY VENEER	
CRACKS AND CHIPS UNLESS OTHERWISE SPECIFIED, EXPOSED WALLS SHOULD BE:	
✔	Free of visible cracks and chips when viewed from 6.1m in diffused light. (ASTM C90-14 ⁽¹⁾)
✔	From closer distances, chipping of edges on bricks is acceptable provided the total length of chips per brick is no more than 10% of the perimeter length of the brick and: <ul style="list-style-type: none"> ▶ For 95% of the bricks the chips are no longer than 3 mm from edges and 6 mm from corners, and; ▶ For the remaining 5% of the bricks the chips are no longer than 6 mm from edges and 9.5 mm from corners.

(1) ASTM C90-14 (2014) – Standard Specification for Loadbearing Concrete Masonry Units