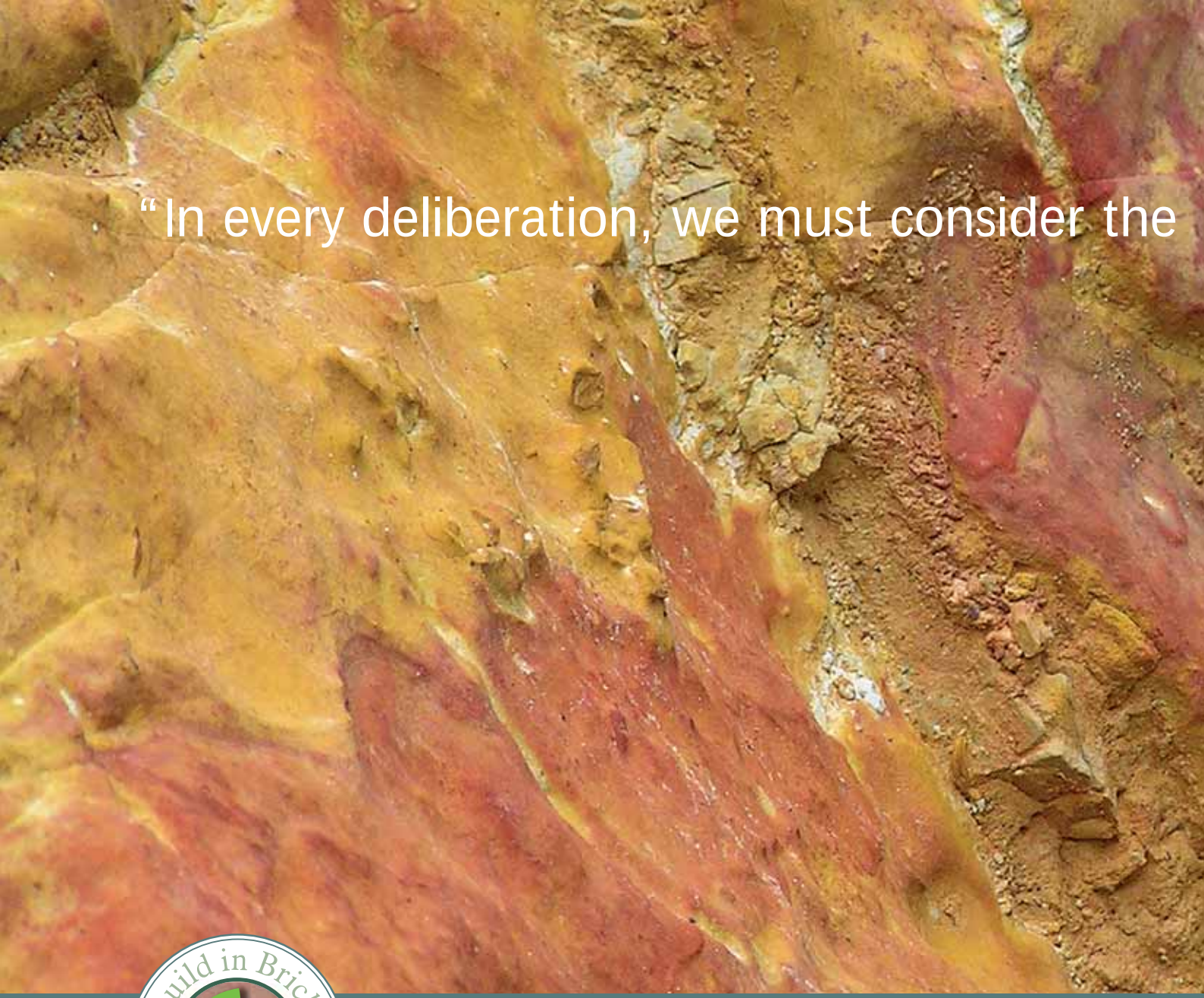
australbricks™

Beyond Lifetimes

Building a sustainable future with brick

Build in Brick • It's Only Natural



“In every deliberation, we must consider the

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All nature photographs in this publication were taken at current or former clay quarries.

impact on the seventh generation.”

A precept of the Great Law of Peace of the Haudenosaunee (Iroquois) native Americans requiring leaders to consider the effect of their actions on generations yet to come.

Building a Sustainable Future

Introduction

Over the past few decades the world has become more aware of environmental issues. At first the focus was on energy consumption but this has now evolved to bring into consideration the efficient use all the materials we consume, under the banner of ‘sustainability.’

What is sustainability? The most widely accepted definition is “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” More simply, sustainability is the ability to maintain a process or state indefinitely.

In recent years building design has also evolved rapidly, along with consumer expectations. Among the wide range of building materials, old and new, clay bricks stand out as the wall material preferred by Australians, generation after generation.

Austral Bricks has been making bricks for a century. In that time we have refined the processes, and changed with the community standards. Today’s clay bricks are made using fewer resources and more than ever are the environmental choice.

Made from the good earth

What are bricks made from? The basic raw materials of bricks are clay and shale, two of the earth's most abundant materials. Other naturally-occurring minerals such as manganese are also used, but in relatively small quantities.

The process of mining clay and shale is called extraction. Manufacturing facilities are usually located close to (or even at) the extraction site. This reduces the cost of transporting the raw materials but also acknowledges that most clay and shale quarries are operational for many years. Many Austral Bricks quarries have been operational for over 50 years.

Unlike many other mining or quarrying processes, extracting clay and shale generally doesn't require the removal of other materials. Virtually all the material extracted is useable. No chemicals are required to process the minerals.

At the end of their productive lives, Austral Bricks rehabilitates these sites for use by future generations. In the past, our quarries have been highly prized as landfill sites, often for green or household waste. Once filled the site is capped with top soil and planted with flora native to the area. Many inner city parklands are the site of long-forgotten brickworks. More frequently today, these quarries are clean filled in highly-compacted layers (to eliminate settlement) and reused as residential and industrial estates.

Sydney Olympic Park is one of the world's highest profile rehabilitated brickwork sites. The former clay quarry was developed in a freshwater wetland and habitat for the endangered green and golden bell frog.

Energy-efficient production

All products consume energy in their manufacture. Timber is often kiln dried. Paint, cement and aluminium require large amounts of energy in their manufacture.

Energy is required to form, dry and fire bricks. Firing – the process of 'baking'a brick – consumes the largest proportion of energy. Most Austral Bricks plants changed many years ago to efficient and plentiful natural gas. This also has the advantage of producing considerably fewer greenhouse gases than other energy sources such as coal-fired electricity.

We even reuse heat from kiln firing to assist in drying newly-formed bricks before they enter the kiln.

Austral Bricks is constantly striving to improve its energy utilisation by reinvesting in more efficient plant, redesigning existing plant and updating control systems.

Low water use

Only relatively small amounts of water are used in brick manufacture. However many Austral Bricks plants have active water management, recycling and treatment programs. A number of sites collect and store rainwater and are largely or wholly self-sufficient in water usage. Water is also used for dust suppression at extraction sites.

Photo courtesy Sydney Olympic Park Authority

"Sydney Olympic Park is one of the world's highest profile rehabilitated brickwork sites."

Production wastage minimised

Because of the nature of the process raw material wastage is extremely low. Clay and shale waste produced during manufacture is recycled back into the process. Fired bricks that do not meet our standards are crushed and returned to the manufacturing process.

Timber and cardboard waste in production is collected for recycling and even the steel parts that wear during the manufacturing process are recycled after decommissioning.

Emissions controlled

Emissions of gases and other matter from brick manufacturing processes are highly regulated and monitored to ensure compliance, as they are for all manufacturing processes. Austral Bricks has spent millions of dollars in recent years updating plant to reduce emissions and installing devices such as scrubbers to remove potential pollutants before they are discharged.

Packaging and transport – the final link

Packaging is always an important consideration and bricks are no exception. Because of their ruggedness, bricks generally require only basic packaging. Traditionally bricks are made locally and transported a relatively short distance from the point of manufacture to the building site. Austral Bricks uses a variety of packaging methods, all of which can be collected for reuse or disposal.

Commitment to research

Continuous improvement is central to Austral Bricks corporate culture. The company has a long history of investment in research and development and new technologies to improve the quality of our products and services and respond to changing consumer tastes and the needs of the construction industry.

This has led to industry-leading product developments such as Terraçade™ terracotta facade system and Riviera™ Series large format clay pavers. It has also seen the continuous development of our established products to improve quality, durability and resource efficiency.

Austral Bricks is a GreenSmart Leader, a program conducted by the Housing Industry Association promoting environmental performance in Australia's building industry.

The company is also a member of the Clay Brick and Paver Institute, the Australian authority on bricks, brickwork and segmental paving. Through the Institute, Austral Bricks is actively contributing to ongoing research programs at The University of Newcastle. This research is contributing significantly to our understanding of the thermal benefits of brickwork and has been used by the Australian Greenhouse Office to help frame its technical advice on designing and constructing energy efficient housing.

HIA GreenSmart®

C · B · P · I

New Brick Plant Promises

The view from the front boundary of Austral Bricks 700-hectare super-site on Melbourne's northern fringe is breathtaking, sweeping across the plains to the city skyline perched on the distant horizon.

Since 1947 this former grazing land has given up the raw materials of untold millions of bricks. Joining the two brick plants on the site is a new state-of-the-art site that promises to be one of the most resource efficient in the world.

Low Cost, Low Impact

Extensive clay deposits

The ancient weathered topsoil thinly covers massive reserves of clay and shale. “Even the clay type for which we have the least volume will last another 50 years,” says Doug Willmot, Austral Bricks group general manager – east coast manufacturing. “Some of our reserves of other clay types will last hundreds of years!”

Clay and shale is mined from open quarries. Almost all the minerals extracted are useable, with minimal overburden (the low-value material covering a mineral deposit). To reduce dust, only currently mined areas are exposed. The new plant is centrally located to current and future reserves, thus reducing haulage costs.

After an area is mined, the pit is filled with organic waste and clean fill, and the land rehabilitated. Grasses and trees native to the region are planted and the area returns to nature.

Large-scale production uses fewer resources

Scale is part of the key to resource efficiency. The new high-tech brick plant will occupy what Doug Willmot describes as “one of the biggest sheds in the Southern Hemisphere.” It will operate 24/7, with a handful of staff per shift (and a large contingent of robots) producing about 85 million bricks per year. That’s enough for more than 12,000 typical new Melbourne homes.

The new kiln will be fuelled by natural gas. However this kiln will use about one-third less fuel than those presently operated in Victoria by Austral Bricks, a substantial cost saving and a significant reduction in embodied energy. A new state of the art emission filter is being installed on the kiln stack to reduce emissions to well below legal limits.

Waste will be minimised or eliminated. All clay and shale is crushed and placed in the mix. Fewer brick bats – deformed or part bricks – will be produced and any faulty units will be crushed and recycled back into the mix.

Electricity consumption will also be significantly reduced, due to the replacement of large hydraulic power-pack controls with highly-efficient variable-frequency electric drives which use only the power required to do the job. Constant operation will allow the plant to maximise off-peak electricity use. The energy used is expected to be about one-third less than that of an older plant.

The site has been self-sufficient in water for many years. Runoff water is captured from roofs and in quarries and stored in deep reservoirs on the site. This water is re-used in the brickmaking process.

The final step is packaging and delivery. All brick packs will be plastic strapped, eliminating the onsite disposal of plastic shrink-wrapping or metal bands, or the supply and return of timber pallets. The Hume Highway Craigieburn bypass follows the site’s front boundary, allowing fast and efficient delivery into all parts of Melbourne and to regional Victoria.

Ongoing development

Currently organic waste is being disposed on the site. Austral Bricks is investigating the consolidation and composting of garden waste collected from households across Melbourne. The methane gas generated in this process could be used to make electricity or fire the new kiln, eliminating or reducing natural gas consumption.

Austral Bricks has committed $44 million to this project. However it is just one of many such update and development programs across Australia that maintain the company’s leadership record.

Embodied energy

What is embodied energy?

The Australian Government's Australian Greenhouse Office defines embodied energy as "the energy consumed by all of the processes associated with the production of a building, from the acquisition of natural resources to product delivery."

All building materials require energy for their manufacture. The CSIRO chart opposite shows that brick is well down the scale of embodied energy (by weight) in popular building materials. Aluminium, polystyrene, glass, paint, particleboard, steel and even oregon have higher levels of embodied energy than bricks. The embodied energy in hardwood is only slightly lower.

Unlike less durable materials, the energy embodied in bricks does not need to be continually "topped up" with repairs, refinishing or even replacement. "In choosing between alternative building materials or products on the basis of embodied energy," says the CSIRO, "not only the initial materials should be considered but also the materials consumed over the life of the building during maintenance, repair and replacement." (www.cmit.csiro.au/brochures/tech/embodied/).

The energy embodied in bricks is a once-off investment that pays dividends now, and in the future.

Life-cycle analysis highlights energy use

The Australian Greenhouse Office acknowledges the importance of these ongoing costs (environmental and otherwise) and recommends a more comprehensive approach called life cycle analysis (LCA).

"LCA examines the total environmental impact of a material or product through every step of its life – from obtaining raw materials (for example, through mining or logging) all the way through manufacture, transport to a store, using it in the home and disposal or recycling." (www.greenhouse.gov.au/yourhome/technical/fs31.htm)

A life cycle analysis of five popular forms of housing construction was conducted by the Centre for Sustainable Technology at The University of Newcastle. It concluded that "the materials of construction have only a small impact on the overall energy and greenhouse emissions."

The study also showed that the greatest environmental impact in a typical house was in day-to-day living, which accounted for over 90 percent of energy consumed and greenhouse gases emitted over a 60 year life cycle. Brick houses that have functioned well for a many more years than this are all around us and would produce even greater savings.

According to the Australian Greenhouse Office, in an average household a massive 39 percent of energy is consumed in heating and cooling. More recently there has been a marked increase in the use of air-conditioners. Therefore designing and building to improve household energy efficiency will pay major dividends, both financially and environmentally.

The thermal mass inherent in clay bricks is ideal as part of passive design, a well established system that allows a high level of natural thermal comfort, while reducing our growing dependence on artificial heating and cooling.

Greenhouse Gas Emissions in Perspective

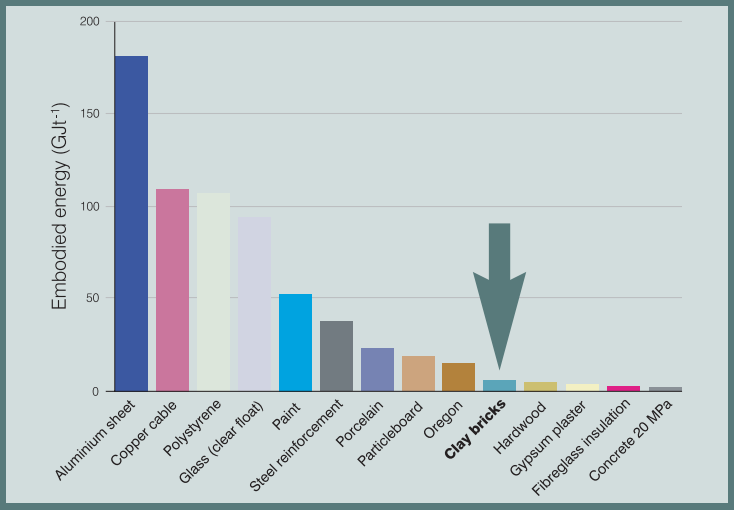
- How much greenhouse gas is created making 8000 bricks (average brick veneer house) *to last a lifetime*? * 5.1 tonnes
- How much greenhouse gas is created in day-to-day living in an average household over 50 years? † 400 tonnes
- How much greenhouse gas could the average household save with these simple changes? †

	Each year	Over 50 years
Replace electric hot water service with gas	3 tonnes	150 tonnes
Replace five 100 watt standard light globes with 20 watt compact fluorescents	650 kg	32.5 tonnes
Install a AAA rated showerhead (with electric hot water service)	500 kg	25 tonnes
Provide adequate air circulation around refrigerator coils	up to 150 kg	up to 7.5 tonnes

* Source: LCA Fact Sheet, Centre for Sustainable Technology, The University of Newcastle

† Source: Australian Greenhouse Office, *Your Home Technical Manual* and *Global Warming Cool It!*

"The energy embodied in bricks is a once-off investment that pays dividends now, and in the future."



Source: CSIRO Manufacturing & Infrastructure Technology

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A Lifetime of Benefits

Bricks offer a long life

From the Great Wall of China to the cities and towns of Australia, bricks have stood the test of time. Conservatively a brick will last for a century but the evidence of longer life is all around us. Typically, brick walls outlast multiple renovations and extensions `that see the total replacement of less durable materials.

Bricks are low maintenance

Bricks are almost unique in requiring little or no maintenance to retain their good looks and performance. Rendering, painting or sealing not only cost money but have environmental costs. Paint, for example, has associated levels of embodied energy and there can be concerns about the emission of volatile organic solvents.

Bricks are durable

Because bricks are fired at very high temperatures – typically over 1000°C – they are extremely durable. Bricks will resist impact damage and termite attack. Many bricks are also graded as Exposure class and are suitable for use in areas prone to salt attack, such as coastal regions, areas with high pollution levels, and houses built on soil that has been heavily fertilised, such as former orchards.

Life cycle analysis, which examines the total environmental input to a material, reinforces the long term benefits of brick construction.

Brick walls are energy efficient

A study by The University of Newcastle has demonstrated that brick walls in a well-designed home are effective in maintaining a high level of thermal comfort. This is mainly due to brickwork's high 'thermal mass' which slows the passage through the wall of the hot summer sun. In winter the same mass stores and slowly releases the heat generated in the house. See Austral Bricks *Energy-Efficient Homes* brochure for more information.

Brickwork resists fire

Again because they are fired at extreme temperatures, bricks are highly resistant to damage in a fire. For this reason some insurance companies reserve their lowest rates for brick homes. Their inherent fire resistance makes bricks the ideal choice when building in a bushfire prone area.

Brick walls have excellent acoustic properties

Whether it be screening out the neighbours on the other side of a common wall or providing a shield from traffic noise, a well-designed brick wall offers excellent acoustic properties. Internal brick walls (instead of lightweight stud walls) also limit the spread of sound within a house. Some designers use an internal brick wall to separate the sleeping zone from the living zone (which also adds beneficial thermal mass).

Bricks are healthy

Being of the earth, bricks don't give off any gases or chemical fumes such as volatile organic compounds (VOCs). Emissions from some materials can build up in a home with poor ventilation. Bricks are slightly porous, allowing the building to breathe easy. The result is a healthier home, for you and your family.

Bricks are reusable

Bricks are one of the few building materials that can be reused with all their original properties intact. Many other materials can be recycled but this requires reprocessing that incurs additional energy and environmental costs.

Bricks are inert

Because they are chemically inert, bricks can be safely consigned to landfill without the pollution or chemical leaching often associated with other building materials. They are simply returning to the earth from which they were made.

What Do the Authorities Say?

Please note: Use of the following quotations and logos does not imply endorsement by these organisations.

Australian Greenhouse Office

"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."

(www.greenhouse.gov.au/yourhome/technical/fs17.htm)

"Clay brickwork has high thermal mass. If a building with internal clay brickwork walls and concrete floors is subjected to a heating and cooling cycle that crosses the comfort zone, the brickwork and concrete will maintain a stable level of heat energy for an extended period. In summer, they will remain relatively cool and in winter, the same building will remain relatively warm."

(www.greenhouse.gov.au/yourhome/technical/fs34g.htm)

US Environmental Protection Agency

"(T)raditional building materials of wood, iron, stone, bricks, etc were replaced by man made materials that offered advantages of reduced weight, lower cost, and lent themselves to new building techniques. However, in many cases these materials are prone to out gas chemicals over the short, or long, term that may have negative health considerations."

(www.epa.gov/reg3artd/Indoor/iaq.htm)

US Department of Energy

"Thermal mass stores heat by changing its temperature, which can be done by storing heat from a warm room or by converting direct solar radiation into heat. The more thermal mass, the more heat can be stored for each degree rise in temperature."

(www.eere.energy.gov/consumer/your_home/designing_remodeling/index.cfm/mytopic=10260)

American Institute of Architects Colorado

"Although brick has a relatively low R-value, its mass can provide thermal storage to temper a living space and store solar gains. The durability, compressive strength, acoustical performance, chemical makeup and fire resistance of brick make it a more sustainable choice."

Sustainable Design Resource Guide (www.aiasdrg.org click on Division 4: Masonry)

Canadian Architect (journal)

"... the sustainability of high embodied energy building components with a relatively long service life may be better than lower embodied energy alternatives with a shorter service life, especially if the former provide superior operating energy performance."

"... non-durable building components, especially the envelope, result in high life cycle costs due to maintenance, repair and premature replacement. Durability is often compromised when designers and owners confuse it with the issue of first costs."

Measures of Sustainability (www.cdnarchitect.com/asf/perspectives_sustainibility/measures_of_sustainablity/measures_of_sustainablity_durability.htm)

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