

## Stone

Stone is a natural product that can be quarried or sourced from gravel areas such as river beds.

In domestic buildings stone is typically used as cut stone or coursed natural stone veneer attached to a timber frame, or as a cut tile applied to wall and floor surfaces.

A wide range of stone types are available – the most common being schist, limestone, scoria, sandstone, bluestone, granite and marble.

© BRANZ 2013

Extraction and manufacture	
Impact of extraction	Quarrying of stone creates dust, noise and a significant visual impact. There is also potential for damage to local ecosystems during extraction. See the <a href="http://www.level.org.nz">www.level.org.nz</a> factsheet on plaster for impacts related to mortar bedding.
Energy and resource use	Embodied energy of locally sourced dimensioned (cut) stone is quoted <sup>1</sup> as 0.8 MJ/kg.
By-products/emissions	There are typically no emissions from the stone – granite may emit low level radioactivity. Coatings applied to porous stones to seal the surface may have VOC emissions.
Sourcing	
Material sources	Schist can be sourced in Central Otago. Scoria is generally sourced from the Auckland region. Limestone is generally sourced Oamaru and Waikato. Marble is quarried in the Nelson region. Granite and marble are imported.
Availability	Common NZ-sourced stone (limestone and schist) is readily available in most parts on the country. Availability of imported products is limited – they're available on indent (special order).
Cost	Up-front materials costs are relatively high, but those costs are partly offset by low maintenance and long life.
Transport to site	Stone is heavy to transport. Costs increase with distance from quarry or port of entry.
Construction/installation	
Health and safety during construction/installation	Safety equipment is required when cutting with a masonry saw (ear muffs, safety glasses, mask and overalls) to eliminate risk of skin irritation and lung damage.
Ease of construction/installation	Natural (uncut) stone is labour intensive to install – cut stone is easier to lay. Stone is usually installed as a veneer supported off a framed structure or as a thin slab finish to wall and floors. Specialist skills are required. Once delivered, materials can be handled by site labour.
Adaptability	Limited
Performance	
Health and safety during life of building	Stone is inert, non-toxic and not generally prone to off-gassing of volatile materials.
Structural capability	Stone is typically used as structural veneer – structural stone must be specifically engineered.

<b>Expected durability</b> (assuming correct installation and maintenance)	Durability depends on stone type and environment but stone is usually very durable. Limestones, marble and sandstones can be affected by aggressive (industrial) environments.
<b>Maintenance rating</b>	Generally low
<b>Moisture resistance</b>	Limestone and sandstone can absorb some moisture.
<b>Rot, mould and corrosion</b>	Lichens and mosses will grow on damp, weathered surfaces.
<b>Thermal performance</b>	Stone has a low R-value.  Stone can provides high thermal mass if it is exposed to a home's interior and to direct sunlight – the amount varies with stone type. Thermal mass is reduced if the stone is isolated from interior warmth by insulation.  Stone as a tile or thin slab can be applied as a finish surface to thermal mass elements without affecting the mass performance.
<b>Sound insulation</b>	Stone deadens sound.
<b>Fire performance</b>	Stone is non-combustible
<b>Waste disposal/recycling/re-use</b>	
<b>Re-use</b>	Stone may be re-used if carefully removed.
<b>Recycling</b>	Stone can be crushed and used as aggregate or decorative chip.
<b>Waste disposal</b>	Stone is non-toxic so can be safely scrapped.

1. Embodied energy figures taken from work © J. Andrew Alcorn, 2010. (Alcorn, J. Andrew, Global Sustainability and the New Zealand House, a thesis submitted to Victoria University of Wellington in fulfilment of the requirements for the degree of Doctor of Philosophy in Architecture, Wellington, 2010.)