

Earth

Earth building methods include:

- structural walls of rammed earth or pisé, where the earth is progressively compacted into removable formwork
- earth bricks (adobe) as a veneer tied back to a structural frame of timber or steel
- rammed earth or earth brick as an infill to a structural timber post and beam structure
- structural walls of earth bricks (adobe) – though this is uncommon.

© BRANZ 2007

Extraction and manufacture

Impact of extraction	Removal of earth has visual impacts, and there is the potential for damage to local ecosystems during extraction. Cement and/or organic matter can be used as a binder. Waste from manufacturing or installation can also be used. Earth used for building must comply with NZS 4298 Materials and workmanship for earth buildings.
Energy use	Only a very small amount of energy is needed to manufacture earth building materials. Embodied energy is quoted as 0.8 MJ/kg for cement stabilised rammed earth, 0.42 MJ/kg for cement stabilised adobe, 0.5 MJ/kg for straw stabilised earth, and 0.42 MJ/kg for pressed blocks. Energy use will increase where materials must be transported to site.
By-products/emissions	Earth is inert.

Sourcing

Material sources	Earth or earth bricks can be obtained locally – including on the building site – if the earth is suitable for use.
Availability	Availability varies – depends on suitability.
Cost	Material costs are low but a significant amount of labour is required.
Transport to site	Transport costs are high if raw or finished materials need to be transported.

Construction/installation

Health and safety during construction/installation	Soil pollutants may cause skin allergies.
Ease of construction	Materials can sometimes be sourced on site. Earth buildings require skilled design.
Adaptability	Earth buildings can be readily cut and repaired.

Performance

Health and safety during life of building	Earth is inert, non-toxic and not generally prone to off-gassing of volatile materials. There is potential for off-gassing from earth mixes that contain bitumen. Earth may have to be sealed to prevent dusting or have an earth plaster finish.
Structural capability	Earth buildings must comply with NZS 4298 Materials and workmanship for earth buildings.
Expected durability (assuming correct installation and maintenance)	80+ years – but this depends significantly on the climate, building design, construction and finish applied. To be durable, earth must be protected from moisture.

Maintenance rating	Earth is relatively high maintenance because of the importance of protecting it from moisture.
Moisture resistance	Moisture resistance is poor when earth is unprotected or exposed to rain wetting or rising damp.
Rot, mould and corrosion	Earth may be attacked by burrowing insects. Material will disintegrate when wet.
Thermal performance	The R-value of earth is low. Earth walls that are at least 300 mm thick provide thermal mass if they exposed to the interior and to direct sunlight through windows/doors. Earth brick veneers used on the exterior provide no thermal mass benefits to the interior when isolated by insulated framing.
Sound insulation	The high mass of earth walls gives good sound deadening/insulation.
Fire performance	Earth won't burn.
Waste disposal/recycling/re-use	
Re-use	Earth building materials can be re-used.
Recycling	Earth building materials can be recycled.
Waste disposal	Earth will return to its natural state when no additives such as bitumen are used.