GREEN MATERIALS = HEALTHY MATERIALS

All materials used in building construction will have an impact on the environment and potentially your health ranging from relatively benign to reasonably toxic.

To be considered 'green', healthy or 'low impact', building materials will have the following characteristics:

- Renewable and abundant, low resource depletion
- Low embodied energy
- Non polluting
- Durable
- Recyclable and able to be re-used
- High recycled content
- Minimal impact on air and water quality
- Non-hazardous formulation (avoiding constituents such as formaldehyde, PVC)
- Equitable, local production
- 3rd party accreditation

Materials which are renewable and abundant will incur minimal resource depletion and come from diverse natural sources whose production has a low impact on the environment.

Low resource depletion materials include mud brick, rammed earth, reinforcing steel, particle board and plywood whereas materials requiring substantial resource extraction include metals (copper, aluminium) and plastics.

Embodied energy is the energy used to extract, transport, manufacture and fix in place. Metals used in building (eg copper pipe and sheet, aluminium extrusions) and some plastics (eg PVC pipes, ducts and conduits) have high embodied energy, whereas materials such as mud bricks, rammed earth, clay bricks and timber products have low embodied energy.

Durable materials will last longer performing their required function than inferior, cheaper materials and will therefore not require replacement for much longer.

Materials which are recyclable will have another life when they have finished their current function, so will reduce the need for new materials to be created. This also applies to how materials are fixed into a building, for example bolting members together can facilitate later re-use without damaging the original material.

Materials with a high recycled content include recycled timber (which can be 100% recycled), 'green' concrete with a cement substitute and a recycled aggregate content, building boards made from timber waste with a binding agent, steel reinforcement made from scrap metal.

Materials which 'off-gas' or emit harmful vapours, particles or toxins into the environment due to their manufacturing processes will have an impact on air quality over a long period of time, often resulting in VOCs (volatile organic compounds) being released into the atmosphere well after the material has been fixed in place. Other materials, such as lead flashing, can contaminate the soil and waterways by carrying lead particles in rainwater.

This is amply demonstrated where lead flashing is used in conjunction with galvanised gutters resulting in corrosion of the gutters due to the galvanic reaction between the lead runoff in rainwater and the zinc in the galvanised gutters.

Materials with a non-hazardous formulation present no risk to builders or users by virtue of the nature of their constituent materials. E0 MDF (zero emission medium density fibreboard) boards for example use no toxic glues in their manufacture, so they don't off-gas during use and present no problem to fabricators working with the material (cutting, sanding, drilling etc).

Where possible, materials which are derived and produced ethically via socially fair means and through local production will maximise equitability and local employment whilst minimising the environmental impact by virtue of the shorter distances required to transport the material in both

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raw and manufactured states.

3rd party accreditation organisations will attest to the environmental impacts of mainly timber materials, eg the Australian Forestry Standard (AFS) and the Forest Stewardship Council (FSC) organisations which certify timber as being a single species from a managed resource, a mixture of species from managed resources or recycled material.

The following list comprises preferred materials with a low environmental impact:

- Timber products generally, with AFS or FSC certification
- Recycled solid timber
- Plantation timber for framing, lining and cladding
- Green concrete with 40% less cement and 60% recycled aggregate
- Stone (sandstone, limestone, granite, marble)
- Natural insulation such as wool, mineral wool, paper
- Hay bales
- Straw based wall panels
- Cork, linoleum
- HDPE (high density polyethylene) drainage pipes
- Stainless steel mesh termite management
- Clay brick and tile
- Terra cotta
- Double and triple glazing in a timber or thermally isolated aluminium frame
- Zero emission MDF board (E0 MDF)
- Plant based oils, paints and, stains and beeswax
- Polyethylene electrical and data cables

The following are examples of materials which have positive ecological properties and contribute to a healthy environment both during construction and occupation.

Drainage pipes
HDPE (High Density Polyethylene) drainage pipes

Adhesives and tile grout
Non-polyurethane or formaldehyde based adhesives for carpentry and timber joinery generally

Paints, oils and stains
Plant based paints with no VOCs (volatile organic compounds) for both interior and exterior use. Linseed oil based finishes and natural waxes protect and enhance the life and appearance of timber

Joinery
Cupboard carcasses and other joinery items constructed from E0 MDF boards (zero emission, medium density fibre board) are VOC-free.

Ecoply plywood uses VOC free adhesives

Non chemical pest control
The only non-chemical system for managing termites is a stainless steel mesh barrier ('Termimesh').

Where cost is a significant factor, low-impact chemical membranes which are impregnated with chemicals (eg 'HomeGuard' and 'Kordon') are approved under the Building Code of Australia for termite management.

Chemical spray/saturation techniques are also approved under the BCA but are to be avoided as the chemical residue remains in the soil for a considerable period after application and requires regular re-application.

INDOOR ENVIRONMENT QUALITY-SICK BUILDING SYNDROME

Unhealthy/toxic materials pose a risk both to the environment and to those who use the materials as well as those who live within them. As buildings have become more airtight for energy efficiency reasons, so has the need to minimise the amount of emissions from building and furnishing materials released into the interior environment.

When chemicals build up in the internal environment and there is a lack of ventilation, sick building syndrome can develop, potentially causing headaches, fatigue, sleepiness, loss of concentration, nausea. This can be exacerbated by the type of lighting employed, the temperature and humidity of the air and factors relating to ability to control the indoor environment.

The following materials are unhealthy - some dangerously

so and should be avoided:

- Asbestos
- Lead
- Lead cadmium
- Mercury
- Chlorinated polyethylene
- Chlorosulphonated polyethylene
- Petrochemical fertilisers and pesticides
- Chlorofluorocarbons (CFCs)
- Phthalates chloroprene (neoprene)
- Polyvinyl chloride (PVC)
- Formaldehyde
- Wood treatments containing creosote, arsenic, cyanide or pentachlorophenal
- Halogenated flame retardants