



Building the Education Revolution —Advancing Sustainability

The chance to make a difference is now

The most potent opportunity for improving the sustainability of a building is in the design phase, before the project is built. It is now a critical time for decision-making about the projects that are happening quickly as part of the Federal Government's Building the Education Revolution (BER). These decisions will affect not only the environmental impact of the building works, but the future operation of the buildings themselves for generations to come.

This factsheet provides an overview of key areas to consider when making design decisions about such issues as: water, energy and materials. Many of the points listed are based on existing building sustainability tools.



Business as usual building and design practices does not maximise the potential for environmental performance. The considerations below can make a real difference:

Energy

What are the issues?

Only a small portion of Australia's energy comes from renewable resources¹. This means that most of the energy used within Australia contributes to global warming. The most obvious strategies for reducing the impact of energy use are to:

- design our built environment to not use energy where possible (e.g. by using natural ventilation wherever possible instead of airconditioning)
- when energy use is unavoidable, use it wisely
- obtain energy from a Government certified Green Power² source or produce energy onsite via sustainable means, such as solar generation.

Strategies to reduce energy consumption that can make a difference

Light efficiently

- utilise daylight wherever possible, utilising well positioned windows and skylights
- avoid glare in offices and classrooms, and beware of heat loads from direct sun, as well as heat loss through both windows and skylights
- use 'light shelves' at windows to provide shade to windows, while reflecting sunlight up onto ceilings, thus penetrating deeper into the building

- utilise energy efficient lighting, and design switching that can turn off lights on bright days, in low-use areas or for after hours security lighting
- avoid 'over-lighting' with electric lighting by matching illumination levels to use
- use daylight sensors, movement sensors and timers where possible to avoid lighting running unnecessarily, and avoid light pollution (i.e. wasted light)

Manage sunlight

- optimise passive strategies such as correct building orientation, fenestration to allow winter sun to warm buildings, shade to limit unwanted summer sun, and allow for thermal mass within interiors to store warmth in winter and cool in summer

Heating, cooling & ventilation

- be clear on the level of comfort required, and the areas that require it (e.g. supplementary heating or cooling might be required in classrooms or offices, however foyers and hallways may not)
- maximise natural ventilation in such a way that it does not provide a security risk for daytime or night time operation, and so that it can be used in wet weather
- increase thermal insulation to all occupied spaces beyond minimum legal code requirements
- ensure gaps which provide potential for air leakage are sealed
- allow sufficient doors or operable walls to reduce the volume of space requiring heating or cooling (beware of noise transference through openings from room to room and from exterior to interior)
- provide optimised heating, ventilation and airconditioning efficiency through well designed



systems, that have 'economy' or fresh air cycles, which can be zoned, operated at part load efficiently and avoid Legionella risk (e.g. consider the use of reverse cycle heat pumps but be conscious of compressor noise)

- provide increased fresh air rates to the internal environment and maximise air-change effectiveness
- use efficient heating and cooling appliances that minimise greenhouse gas emissions from refrigerants, and eliminate those gases with Ozone Depletion Potential (ODP) from refrigerants and insulation, and ensure that these gases are captured when servicing and decommissioning equipment

Efficient appliances

- use energy efficient appliances e.g. microwaves, induction hotplates, refrigerators, computers and dishwashers (the higher the star rating, the higher the efficiency³)
- use combined energy systems where these deliver greater efficiency

Power monitoring & demand

- install electricity meters to all major circuits within the facility so that areas of high energy use can be identified and thus allow facility managers to clearly understand the facility's actual energy usage and correct malfunctions as they occur
- employ strategies that spread electrical loads and diminish loads at times of peak demand

Hot water

- don't automatically provide hot water to all fixtures unless needed
- locate hot water storage units as close as possible to areas of highest use, to avoid 'dead-legs' of pipe (which require wasted water to clear the pipe before hot water reaches the fixture)
- use hot water from solar or reverse cycle heat pump sources in preference to direct electric sources (e.g. typical hot water tank). Where co-generation is possible, waste heat can be considered for water heating

Building Code of Australia & other regulations

- In recent years the Building Code of Australia has mandated some minimum requirements around energy efficiency in buildings. Observing these as well as ongoing improved standards in other regulations only achieves the minimum legal requirements, and maximising energy efficiency will require going beyond these.

Water

What are the issues?

As populations grow, and the impact of climate change on the reliability of water supplies become more intense, conserving and reusing water becomes vital⁴.

Initiatives that can make a difference

- collect and re-use rainwater onsite
- use water efficient appliances, including, but not limited to toilets, showers, basins and dishwashers and install flow restrictors to taps (provide a fitting efficiency sheet stating WELS (see Water Efficiency Labelling and Standards) efficiency and flow rates per minute for all plumbed fixtures and fittings)
- install water meters on all major water uses within the facility so that building managers can monitor water efficiency
- reduce use of potable water (e.g. for laundry, gardening and landscaping, and testing of fire protection systems, by capturing test water for reuse)
- if water-cooled airconditioning is used, employ a system that minimises water use
- employ Water Sensitive Urban Design (WSUD) where possible to capture, reuse and conserve stormwater onsite where possible (e.g. stormwater swales and retention basins)
- recycle greywater (e.g. for subsurface landscape irrigation), and reduce the amount of sewage leaving the site where possible

Land use and impact

What are the issues?

Every time a new building is built or land cleared, an impact is made on the environment, and usually, it is negative. Reusing already disturbed land can lessen this impact and improve the sustainability of a project.

Initiatives that can make a difference

Siting

- try to use land that has been previously been built on or disturbed. In particular avoid use of areas of native vegetation, wetland or land within 100m of waterways, or prime agricultural land
- where possible retain existing vegetation and topsoil onsite, particularly, deep-rooted trees



- if cut and fill is required, aim to balance ratios so there is minimal or no need to import or export soil to or from the site

Transport

- provide cycling facilities, including secure bicycle parking, showers, changing facilities and lockers
- limit car spaces to encourage greater use of public transport where it is available and provide car-sharing facilities, such as dedicated parking spaces for car-share vehicles to reduce car use

Planning

- design a ‘thin’ building to maximise the potential for natural cross ventilation and lighting
- provide all workspaces and classrooms with a view to an external environment or an appropriately sized internal courtyard/atrium space
- design to allow buildings to have maximum flexibility of use, such as out of school hours community use
- design for adaptability, allowing for cost-effective future reconfiguration of spaces, and where possible, services and ventilation systems
- buildings can be utilised so that they provide teaching tools or outputs (e.g. energy efficient light fittings, passive solar design)
- design low-maintenance outdoor spaces that locate occupants away from outdoor air pollutants (e.g. vehicular traffic and air expelled from buildings)
- design and detail outdoor areas with adequate shade/covered space for protection from rain and summer sun, as well as providing access to sunlight for winter warmth

Choosing better materials and limiting waste

What are the issues?

Production of most building materials requires significant amounts of energy and water and their manufacture can have other negative impacts on the environment⁵. The ‘3 Rs’ waste hierarchy of ‘Reduce, Reuse and Recycle’ is a useful adage in considering building materials.

Initiatives that can make a difference

Material and component selection

- re-use existing building structures, facades and materials where it is possible and safe to do so

- select materials with recycled content and/or that are able to be recycled. This is particularly relevant in regard to shorter-life finishes such as carpet. Other examples include concrete and steel with recycled content, aluminium or steel which are 100% recyclable
- select materials from renewable sources such as timber products from sustainably managed forests and avoid those that have ozone-depleting or toxic emissions
- Wood products certified under credible, internationally recognised forest certification schemes, including both the Australian Forest Certification Scheme (AFCS), which is recognised under the Programme for the Endorsement of Forest Certification (PEFC) schemes, and the Forest Stewardship Council (FSC), can be used as a guarantee that these products have been sourced from sustainably managed forests
- reduce the use of PVC in building elements such as piping, electrical cabling, flooring, furniture
- use standard sizes and types of building elements, modular construction and prefabrication to minimise waste in production and construction
- design and detail for low materials usage, low maintenance requirements, durable building materials and components, and fittings and finishes that allow for disassembly and deconstruction at the end of a component’s life
- where possible use locally produced and manufactured materials and components

Indoor Environmental Quality

- minimise noise pollution in the internal environment, from external and internal sources
- select materials that minimise the emission of formaldehyde in the internal environment, and paints and finishes that minimise the emission of Volatile Organic Compounds (VOCs)
- select materials that minimise the trapping of indoor air pollutants
- design and detail for minimal use of chemicals for maintenance and cleaning, and so that chemicals that are harmful to contractors or building occupants are not required (particularly floor finishes as these are generally the largest surfaces with the most intensive cleaning)
- conduct a review of hazardous materials such as asbestos, within an existing building, when it is being refurbished or refitted



Reducing waste

- when demolishing, disassemble where possible to allow materials to be reused (on or offsite) or failing this, separated for recycling
- when ordering materials, avoid excess packaging to reduce the amount of construction waste leaving the site for landfill, and implement a facility-wide recycling regime during construction
- provide in buildings and on grounds, facilities that allow for the separate collection and storage of segregated waste

Resources to help make better decisions

Online web resource—Green Star

The Green Building Council of Australia has developed a rating tool which can be used to assess the sustainability of educational buildings. Whilst the application process for Green Star accreditation may not be achievable in the timeframes for some BER projects, there is great value in making reference to the freely available Green Star—Education v1 rating tool as it lists more strategies to improving sustainability than what are provided above. The Tool, which is contained in a spreadsheet, is downloadable from the GBCA website, and includes many strategies for improving sustainability and has formed the basis of this document.

www.gbca.org.au/green-star/rating-tools

Online web resource— Environment Design Guide

A selection of key papers relevant to BER projects has been made available online to participants involved in design, procurement and construction. These papers discuss specific issues such as energy efficiency and day lighting, and also include case studies of education projects.

www.environmentdesignguide.net.au

User name: SchoolsEDG Password: Password1

Online web resource— Your Building and Your Home

A Government/industry initiated web portal for sustainability of commercial buildings. www.yourbuilding.org

Although aimed at housing, many of the basic views of improved sustainability such as insulation, noise control etc, are contained in the Government initiated web portal, the Your Home Technical Manual. www.yourhome.gov.au

¹ <http://www.garnautreview.org.au/chp20.htm>

² www.greenpower.gov.au/what-is-greenpower.aspx

³ www.energyrating.gov.au/appsearch/

⁴ www.climatechange.gov.au/impacts/water.html

⁵ [www.ces.vic.gov.au/CA256F310024B628/0/AAAF8F19F02593C00CA25754400011064/\\$File/fact+sheet+21.pdf](http://www.ces.vic.gov.au/CA256F310024B628/0/AAAF8F19F02593C00CA25754400011064/$File/fact+sheet+21.pdf)

Design Strategies from the Australian Institute of Architects

The Environment Policy of the Australian Institute of Architects contains a 'Supplementary Document' that lists useful Design Strategies in 8 categories from pre-design of the project, through to construction and occupation.

www.architecture.com.au/i-cms_file?page=5947/RAIA_Env_Policy_SDS_for_Arch.pdf

Water efficiency guide from the Australian Government

The Department of the Environment and Heritage suggests ways to improve water efficiency with discussion of various fixtures in the Water Efficiency Guide: Office and Public Buildings. www.environment.gov.au/settlements/publications/government/water-efficiency-guide.html

Details of the Water Efficiency Labelling and Standards (WELS) Scheme are explained online. Remember—the higher the star rating, the higher the efficiency.

www.waterrating.gov.au/consumers/index.html

Forest certification schemes

Wood products certified under independent third-party forest certification schemes carry a guarantee that these products have been sourced from sustainably managed forests.

Information on these schemes can be found at:

Australian Forest Certification Scheme –

www.foreststandard.org.au

Forest Stewardship Council (FSC) Australia –

www.fscaustralia.org

Programme for the Endorsement of Forest

Certification (PEFC) schemes – www.pefc.org

Forest Stewardship Council (FSC) International – www.fsc.org