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ENVIRONMENT DESIGN GUIDE

HOW TO APPROACH MATERIAL SELECTION FOR WASTE MINIMISATION

A guide for dealing with material suppliers

John Gersakis and Tim Grant

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SUMMARY OF

ACTIONS TOWARDS SUSTAINABLE OUTCOMES

Environmental Issues/Principal Impacts

- Waste minimisation is broader than just reducing solid waste sent to landfill. For material selection, reduction in a wide range of environmental impacts is sought.
- Impacts considered in the article include, global warming, resource depletion and the release of chemicals and toxic substances into the environment.

Basic Strategies

In many design situations boundaries and constraints limit the application of cutting EDGe actions. In these circumstances designers should at least consider the following:

- Use existing materials selection guides, eco-labelled products, or production which has credible third party evaluation of its environmental performance.
- Reuse building material where possible – this avoids both disposal and generation of new materials.
- Keep informed about new product developments and the performance of these products – many products get overlooked due to teething problems in the early versions of the product.

Cutting EDGe Strategies

- Start with the end in mind: the products 'fate'. The best way to minimise waste over the life-cycle is to ensure that the product/material can be reused, reconditioned, and recycled, in that order.
- Consider the actual life in the design selection. A product may be capable of lasting 20 years in an application, but if churn is going to see the product replaced in less than this (e.g. 2-5 years in retail), the focus needs to be on minimising waste in churn rather than inherent durability.
- Work with current recycling capabilities rather than speculating on future technologies in predicting product recyclability.
- Avoid hybrid bonded products where possible. Mechanical fixing typically facilitates end-of-life options and repair.
- Ask your supplier/manufacturer to provide details about the steps they take to minimise waste. Asking the question puts pressure up and down the supply chain to improve practices.

Synergies and References

- *BDP Environment Design Guide*: TEC 1, GEN 10, GEN 51, GEN 58, PRO 1, PRO 2, PRO 9, PRO 11, PRO 14, PRO 30
- State Authorities for recycling and recyclable products, e.g. EcoRecycle Victoria; NSW, QLD, SA, WA EPA
- Ecospecifier, a database of eco-preferable products and materials: http://www.ecospecifier.org

ENVIRONMENT DESIGN GUIDE

HOW TO APPROACH MATERIAL SELECTION FOR WASTE MINIMISATION – A guide for dealing with material suppliers[1]

John Gertsakis and Tim Grant

There is now widespread recognition among government and industry that environmental impacts are best avoided rather than treated. In relation to waste minimisation, this translates into the need for waste avoidance and reduction, rather than end-of-pipe solutions. From a practical perspective, building design professionals and specifiers can undertake some small but significant steps towards facilitating waste minimisation through the materials selection process. This note provides some general background and a step-wise approach to quizzing manufacturers, suppliers and their agents about the 'waste' related environmental performance of their materials so that design professionals can make more informed decisions themselves. The Note is derived from the Australian EcoSpecifier Project - a strategic alliance project between the Centre for Design at RMIT University, EcoRecycle Victoria and the Society for Responsible Design.

Key words: *Waste Avoidance, Resource Recovery, Waste Minimisation, Product Stewardship, Life Cycle Thinking, Life Cycle Assessment, LCA, Sustainable Design, EcoDesign, Source Reduction, Eco-Efficiency*

1.0 INTRODUCTION

The pressure for Australian industry to dramatically improve its environmental performance is growing, albeit much more slowly than most other OECD countries. Various State and Federal Government initiatives, together with developments associated with the Sydney 2000 Olympics, have and are continuing to highlight what is possible when buildings are designed and constructed as though the environment matters. Although information on improving the energy efficiency of buildings is relatively abundant, there is a void of locally relevant tools and resources available for designers to address other issues such as waste minimisation and specifying greener materials.

Despite the rhetoric and propaganda of the need to reduce and reuse construction materials and manufactured products before we get too focussed on recycling, government funding and industry action is still firmly locked into end-of-pipe solutions or treating the environmental problem once it has presented. This is directly reflected in the significant extent to which we see resource recovery or materials recycling taking place on construction sites around the country, either as pilots and trials or as fully integrated environmental management plans. Such activities are significant and are to be commended but not at the cost of failing to move upstream and address waste and resource efficiency at the design and documentation stage of building and construction.

What becomes apparent is the need to exploit the design process so that a variety of environmental objectives can be locked into products, services and buildings from the outset. Trying to implement such strategies once the design is settled, generally reflects an end-of-pipe orientation. In other words, the design process needs to reflect a life cycle or 'cradle to grave' approach if major environmental gains are to be achieved in the area of waste minimisation. Whether it is domestic appliances, packaging, office furniture or residential dwellings - a life cycle design approach can lock-in positive environmental features and lock-out undesirable environmental impacts.

From a building designer's perspective, the opportunity to eliminate and minimise solid and hazardous wastes can in part result from greater attention to waste avoidance or strategies that lock-out undesirable waste generating materials, processes and technologies. At the same time, it is still possible to encourage and support resource recovery through building the demand for construction materials containing recycled content. From a practical perspective, designers and specifiers can undertake some small but significant steps towards facilitating waste avoidance and resource recovery through the materials selection process. This note provides some general background and a step-wise approach to quizzing manufacturers, suppliers and their agents about the 'waste' related environmental performance of their materials, so that design professionals can make more informed decisions.

While it is clearly recognised that rigour and hard data are vital elements in making certain environmental decisions, much can still be done without elaborate computer models, assessment software or employing a full-time environmental scientist or academic. A cautious but resource-efficient qualitative approach, combined with a critical and probing eye can, in most cases, improve the waste-related decisions made by design practitioners and related professionals.

The reality is that environmentally preferable building materials and products exist - some good, some not so good. Their accompanying brochures often float aimlessly around offices and in-trays, waiting for that day when they might be useful. Placeless, poorly organised and in the absence of any independent review, these brochures become next to useless when the crunch comes and some serious reference material is required.

[1] The term 'supplier' refers to any business manufacturing, importing, marketing or selling construction and building materials.

This Note is derived from the Australian EcoSpecifier Project (EcoSpecifier), and is a joint initiative of the Centre for Design at RMIT University and EcoRecycle Victoria, in association with the Society for Responsible Design. The EcoSpecifier Directory of Environmentally Preferable Materials (handbook and web site - [http://ecospecifier.rmit.edu.au]) was launched in November 1999 and was the result of a collaborative process that crosses state boundaries in pursuit of providing designers and specifiers with useful information about materials and the environment. Its essential aim is to streamline the process of sourcing environmentally preferable materials that are commercially available in Australia.

2.0 THE DRIVERS FOR ENVIRONMENTALLY PREFERABLE MATERIALS

There are a range of reasons and drivers for increasing the use of Environmentally Preferable Materials (EPMs), including those containing recycled content, but also those that avoid waste through efficient production processes and resource recovery at the end-of-life, disposal or demolition stage. The following list highlights that the value of increasing the specification of EPMs is not only environment-oriented, but crosses boundaries into competitiveness and also growing client interest and demand.

There is no single reason as to why designers, builders and specifiers should be selecting EPMs. While the environmental reasons are compelling and should be taken very seriously, there are also other drivers that justify the widespread uptake of materials that have some positive environmental attributes. The primary objective of significantly increasing the use of EPMs is to move towards a more sustainable way of fabricating, building and manufacturing the physical world.

Importantly, there is growing evidence, including case studies and commercial projects, that clearly demonstrate the commercial value of specifying EPMs as an alternative to more problematic materials. In other words, the use of EPMs not only provides socio-environmental benefits but, also, direct and indirect business benefits.

A significant uptake of EPMs in the construction and manufacturing industries has numerous benefits and can lead to a range of diverse and productive outcomes.

2.1 Environmental sustainability

Specifying EPMs can help:

- avoid or reduce the dependence on non-renewable resources
- close the loop by reusing materials that would otherwise be disposed of
- increase resource efficiency
- minimise impacts on biodiversity
- to recover, reuse and recycle materials
- encourage the use of more durable materials requiring low ongoing maintenance.

2.2 Human health

Specifying EPMs can help:

- eliminate and reduce problems associated with Sick Building Syndrome
- contribute towards increasing indoor air quality and healthier interiors.

2.3 Commercial advantage and competitiveness

Specifying EPMs can help:

- build competitive advantage by entering new markets with eco materials, remain profitable or create new EPMs for existing markets
- gain industry, government and community recognition through awards, e.g. RAIA Ecologically Sustainable Design Award, Banksia Awards, MBA Victoria Waste Minimisation Award, Galaxy Awards for Appliances
- provide an opportunity to save on manufacturing or construction costs
- provide some very strong marketing tools.

2.4 Supporting the recycling industry

Specifying EPMs can help:

- support and sustain the recycling industry by building demand for recyclables
- disarm critics of the social, environmental and economic benefits of recycling
- demonstrate the potentially powerful position held by designers and specifiers in indirectly developing and growing the market for secondary materials thus making the recycling industry more economically viable and sustainable over the medium to long term
- ensure that those recyclables collected at kerbside end up in quality building and manufacturing products.

2.5 Corporate foresight and professional responsibility

Specifying EPMs can help:

- demonstrate a practical response by building design professionals that shows that positive steps can be taken towards improving the environmental performance of their clients' and company's products, buildings and services
- place designers, builders and specifiers in an assertive position to become part of the solution as opposed to contributing to the problem
- reflect a corporation's philosophy and progressive position on environmental management by implementing specific measures during the manufacturing or construction process
- follow international trends by successful global companies seeking to minimise their environmental impacts and maximise their profitability, i.e. eco-efficiency

2.6 Emerging policies, regulations and standards

Specifying EPMs can help:

- meet government policies, regulations, covenants and other initiatives aimed at developing more sustainable products, buildings and services
- realise and implement government policies and regulations, as the need to develop markets for secondary materials becomes a higher priority
- win government tenders demanding the use of environmentally preferable materials and products.

2.7 Customer and client demand

Specifying EPMs can:

- result in a range of benefits and advantages for clients and customers
- respond to a growing client and customer interest in social and environmental quality and responsibility
- fulfil government tenders and briefs for environmentally improved buildings and products
- help meet the demand for products complying with 'Buy Recycled' criteria.

The overall benefits of specifying EPMs are diverse and respond to the interests of numerous stakeholders and their respective activities and priorities. The value of EPMs rests not only with their inherent environmental qualities, but also with their potential to create a more sustainable future for Australia. While they are only one contribution towards improving the environmental performance of our built environment and the manufactured objects that sit within, their widespread and judicious use can result in a variety of much needed social, environmental and economic benefits.

3.0 THE LIFE CYCLE CONTEXT OF MATERIALS

By far one of the most critical factors in considering the environmental impacts of any material is the need to move beyond the material or product itself and understand its context. This demands contextualising decisions and looking upstream and downstream of where the designer, builder or specifier commences their own interaction with materials.

Too often, the environmental impact of materials is assessed in isolation of their total context, with simplistic comparisons being made about material X being greener than material Y, the classic pitch being 'paper is better for the environment than plastic'. While such claims might be true in some instances or applications, there is a range of other scenarios where the reverse could be just as true. Assessing materials without understanding their wider life cycle environmental impacts has the potential to produce a one-dimensional view of how they might affect ecosystems and human health.

Just like any other materials selection process, numerous factors come into play and all must be juggled with trade-offs, inevitably depending upon cost, availability, customer support, aesthetic requirements, and the list goes on. One way of moving towards a more comprehensive approach to understanding the impacts of a material is to consistently adopt a life cycle approach.

All products and materials have a history. In environmental terms, the activities and processes which lead up to the production of a final product are referred to as the product's life cycle. The life cycle of a product extends, not only backward into its production, but forward into how it will be used, and what will happen at the end of its useful life. Life Cycle Assessment or life cycle thinking is a powerful new approach to environmental management of materials, products and services. While recognising that there may be little an architect can effect in the production of raw materials, choosing the most appropriate material with attention to the life cycle issues, can reduce the overall impact of our activities on the environment.

While the life cycle impacts of materials and products vary from product to product, there are some general guides and principles that can be used to guide life- cycle thinking. Typical impacts for materials and products, at each stage of the life cycle, are outlined in Table 1. Table 1 also includes some of the strategies and considerations that can be used to address these impacts from the perspective of a specifier, designer or architect. Note that while this table is a summary and a simplification of the issues and is presented as an example of how life cycle impacts can be addressed, it is not intended as a definitive list of impacts and strategies.

3.1 Tools for assessing life cycle environmental impacts

There are a range of tools for assessing life cycle impacts, from simple lists which give 'ecoscores' (EcoScan, EcoIT, IDEMAT) or embodied energy values (e.g. Bill Lawson) for basic materials, through to detailed Life Cycle Assessment software packages. (e.g. SimaPro[2], GaBi, TEAM).

Care needs to be taken with this information, particularly the single score approaches, as the material must be assessed in the context of how it is to be used. More detailed LCA software such as SimaPro allows designers to specify how materials will be incorporated in assemblies and products so that fair comparisons can be made based on the function of those materials. Some larger producers in Australia have undertaken life cycle assessment on many of their products, and potential customers should request this information to assist their decision-making. Where local information is not available, the careful use of international material data can prove useful.

Visit the following web sites for more information about LCA tools and resources:

2 Available through the Centre for Design at RMIT

Table 1. Typical environmental impacts and strategies for addressing those impacts

Life-cycle stage	Typical impacts	Strategies for specifiers/architects/designers
Extraction of raw materials	Land degradation, dust, and usually some transport emissions	The main practical steps here are in selection of material types and suppliers. If materials are imported from developing countries – is the company reputable – do they have an environmental management system? Select materials with recycled content, therefore avoiding the need for raw material extraction
Material manufacture	Energy and water use, fugitive emissions, water pollution	
Fabrication of products or components	Energy use, off-cuts and off-spec material	Order materials sizes that best match the application, or design the application to suit the materials. Prefabrication can reduce waste.
Distribution and transport	Fuel use and air pollution	Purchase local materials and avoid unnecessary transport logistics.
Use	Impact of material on building/ component performance in maintaining heat/cooling. Off-gassing	Consider where the material is being used and how it will effect heating and cooling load. Consider what other materials (insulation etc) need to be used in combination with the product.
Maintenance	Use of detergents for cleaning – use of coatings, resource used and waste from repair and replacement	Consider surfaces that require little maintenance. Use durable materials that require less maintenance.
Disposal/ recycling	Solid waste, dust	Select materials and products that have existing recycled systems. Use materials that can be easily separated into recyclable components at the end of life.

- *EcoSite* http://www.ecosite.uk/
  LCA information, software demos, LCA data
- *SimaPro @ Centre for Design* http://simapro.rmit.edu.au
  Australian site for SimaPro LCA software with SimaPro downloads, Australian data and short course information
- *PRé* http://www.pre.nl/
  LCA information, SimaPro and EcoIT demos.
- *Life Cycle Management Guide from Environment Canada* http://www.ec.gc.ca/ecocycle/english/lcmguide.html
  A simple guide on Life Cycle Management
- *The LCA page* http://www.trentu.ca/faculty/lca/
  This is a detailed page of LCA developments which is maintained by Steven B Young
- *Aus LCA Net* http://auslcanet.rmit.edu.au/
  This is a page of LCA research and activity in Australia maintained by RMIT
- *National Greenhouse Gas Inventory* http://www.greenhouse.gov.au/inventory/natinv/96/96.html
  A good site for data on CO_2 and other emissions from many common industrial processes and sectors

4.0 DEALING WITH SUPPLIERS

Making better decisions about materials selection need not always rely on securing copious amounts of data. The key is to get the right information. More often than not, suppliers and their agents lack the information needed by designers and specifiers to make informed environmental decisions. Of course, those suppliers who have made 'environment' an explicit issue within their company, can provide useful data. However, the majority will either evade the questions, get defensive, honestly confess to having no information, or try to bluff, with general claims that have no real substance. There are, however, some basic questions that all suppliers should be confronted with as a way of gauging their environmental commitment and activities. Even if answered unsatisfactorily, these questions should get them thinking about their products, and ultimately they may start to reflect on the changing market for their materials. While the questions don't always focus on the product or material under scrutiny, the answers start to signal a supplier's overall approach and environmental attitude.

4.1 Demand-side pressure – some key questions to ask suppliers

The following list of questions, while not exhaustive nor totally focussed on waste minimisation, does provide a framework for building an environmental profile of a supplier and their materials. It also provides a qualitative checklist that can help establish how waste avoidance and/or resource recovery has been addressed by the supplier and embodied in a particular material or product.

Waste avoidance, recycled content and recyclability

- Does the material contain post-consumer recycled content?
- Does the material contain industrial waste that would otherwise be landfilled or incinerated?
- Does the material have a high potential for extended product life and durability?
- Does the supplier provide a Product Stewardship or 'Take-Back' reuse or recycling service?

- Does the material have a high potential for recovery and reuse without additional processing?
- When discarded, is the material commonly recycled through a widespread recycling collection infrastructure?
- Is the material packaged in an environmentally oriented manner, i.e. nil, minimal or reusable packaging?
- Does the material have the potential for reduced down-stream resource use impacts, through low maintenance requirements?
- Is the material in its least processed state?

Low toxics

- Does the material result in substantially reduced off-gassing or particulate emission levels?
- Has the material been treated with low or non-toxic treatments (as alternatives to mainstream materials)?
- Does the material have non-toxic emissions from upstream production processes?
- Is the material or its production processes free of any listed carcinogens being emitted directly or indirectly?
- When the material is ultimately discarded, are the disposal impacts free of any toxic waste issues?

Reduced greenhouse related impacts

- Does the material result in, lead to or embody substantially reduced greenhouse or energy-related impacts (e.g. low embodied CO_2)?
- Does the material consume low levels of energy during processing or production?
- Does the material have the potential for reduced down-stream resource use and impacts through reduced energy consumption?

Sustainable sources, by-products and biodegradability

- Does the material utilise abundantly available raw material inputs?
- Does the material utilise materials from sustainable sources?
- Does the material contain agricultural by-products that might otherwise be landfilled or incinerated?
- Does the material possess advanced and/or appropriate levels of biodegradability?

Other vital signs

- Can the supplier provide a Material Safety Data Sheet?
- Have any environmental claims associated with the material been independently verified?
- Does the supplier have a company-wide environmental policy in place?
- Does the supplier have an environmental management system in place such as ISO 14000, EMAS or similar?
- Does the material comply with all relevant Australian and/or international standards on environment and/or human health?
- Has the material received an environmental award or similar recognition?
- Has the material received any Eco-labels or other formal environmental accreditation or certification?
- Is the material accompanied by high quality environmental information in hardcopy or on-line formats?

5.0 CONCLUSIONS

Some suppliers are rising to the challenge by investing resources, expertise and research and development to minimise their environmental impacts while simultaneously generating products and materials that are cost effective. The major building products companies are constantly looking for cost-effective opportunities to implement process and product improvements with a view to minimising environmental impacts. In some cases, the incremental environmental improvements, achieved in a high volume mainstream building product from one of the major suppliers is likely to result in more significant environmental gains, compared to an ecologically innovative but relatively specialised material used in limited quantities. In certain instances, minor environmental improvements in high volume products can achieve greater benefits than very 'green' materials in small niche markets.

Several Australian companies have been developing and implementing a range of environmental programs and systems some of which relate directly to the production of environmentally improved materials. Whether for competitive reasons, regulatory requirements, customer demand or fundamental corporate responsibility and foresight, several of these companies are well placed to substantially improve the environmental performance of their products and therefore the buildings, structures and developments that are constructed from them.

It is important for designers and specifiers to be aware of their environmental initiatives and, more importantly, how they translate into environmentally improved products. It is also vital that specifiers consistently request environmental information about all products and materials, regardless of how small or big the supplier might be. The ongoing and reliable development of EPMs partially depends on the marketplace sending suppliers the right signals about their needs and wants, and the importance of integrating positive environmental qualities into building products.

One of the most efficient and effective ways to source environmental information about products and materials is via the World Wide Web. Most of Australia's larger building and construction materials suppliers have comprehensive web sites featuring their products. While not all of the sites contain

detailed environmental information about materials, most of them provide feedback, an enquiries or a 'contact us' type email service. Such opportunities should be actively used to extract environment-related information about their products and materials. As an indication, the following web sites provide a wealth of data about the range of building and construction products manufactured by some of Australia's largest suppliers. Some of the sites also contain environmental information.

- Boral Construction Materials Group
  http://www.boral.com.au
- BHP Building Products
  http://www.bhpbuildingproducts.com.au
- CSR Building Products
  http://www.csr.com.au
- James Hardie Building Products
  http://www.jameshardie.com.au
- Pioneer Building Products
  http://www.easier4u.com.au/index.html

Ultimately, there's a critical need for the market to give industry the correct signals. The more pressure from designers that is directed towards suppliers, the faster the response will be in terms of increasing the total palette of environmentally preferable materials and the necessary literature and product specifications to accompany them. Competition between suppliers will not only generate 'greener' products, it should also lead to quality environmental literature and an informed decision making process.

6.0 INFORMATION RESOURCES

6.1 Publications

Building Designers Association of Victoria Inc, June 1998, *Designing IN Waste Minimisation*

A manual on waste minimisation in the building and construction industry, (funded by and available from EcoRecycle Victoria or the BDAV)

Building Research Establishment (BRE) *Management of Construction and Demolition Wastes*
http://www.bre.co.uk/bre/press/pr96/mar/ip1_96.html
Note: It is possible to order a hardcopy, however an electronic version in not available

Cordan and Building Line Development (report for the Recycling and Resource Recovery Council) November 1995, *The Reuse and Recycling of Timber Window Frames* (available from EcoRecycle Victoria)

CSIRO Building, Construction, Engineering (report for EcoRecycle Victoria) September 1998, *Guide for Specification of Recycled Concrete Aggregates (RCA) for Concrete Production,* (available from EcoRecycle Victoria)

EcoRecycle Victoria and RMIT, 1998-99, *The Resource Efficient Builder*

Goedkoop, M, 1994, *Life-Cycle Analysis for Designers*, European Design Centre, Eindhoven

Gray, AT, and Hall, A, (Eds) 1999, *Forest-Friendly Building Timbers,* Earth Garden Books, Trentham Victoria

Integrated Solid Waste Management Office 1993, *A Resource Guide to Recycled Construction Products and Energy Efficiency*, Los Angeles, Board of Public Works

Integrated Solid Waste Management Office, 1993, *Wood You Recycle: A Guide to Wood Waste Reuse and Recycling in the LA Area*, Los Angeles, Board of Public Works

Lauer, P, 1993, *Construction Materials Recycling Guidebook: A Guide to Reducing and Recycling Construction and Remodelling Waste*, Minnesota, Metropolitan Council of the Twin Cities Area

Lawson, B, 1996, *Building Materials, Energy and the Environment,* Royal Australian Institute of Architects, Red Hill ACT

Mobbs, M, 1998, *Sustainable House,* Choice Books, Marrickville

NSW Environment Protection Authority, 1998, *Construction and Demolition Waste Action Plan,* NSW EPA

Vale, R and B, 1991, *Green Architecture – Design for A Sustainable Future,* Thames + Hudson, London

Willis, A, and Tonkin, C, 1999, *Timber in Context: A Guide to Sustainable Use,* Construction Information Systems Australia, Milsons Point

6.2 Organisations

Centre for Design at RMIT University
School of Architecture and Design
GPO Box 2476V
Melbourne Vic 3001
T (03) 9925 3485/2237 F (03) 9639 3412
http://www.cfd.rmit.edu.au

EcoRecycle Victoria
Level 4/479 Albert Street
East Melbourne Vic 3002
T (03) 9639 3322 F (03) 9639 3077
E mailbox@ecorecycle.vic.gov.au
I http://www.ecorecycle.vic.gov.au

Society for Responsible Design, Inc
PO Box 288,
Leichhardt, NSW, 2040
T (02) 9564 0721 F (02) 9564 1611
E srd@green.net.au
I http://www.green.net.au/srd

Department of Public Works and Services (NSW)
Environment Management Policy
Level 23 - McKell Building
2-24 Rawson Place
Sydney NSW 2000
T (02) 9372 8876 F (02) 9372 8822
I http://www.dpws.nsw.gov.au/wmarp.html

Inner Sydney Waste Planning and Management Board
PO Box 1591
Sydney NSW 2001
T (02) 9261 2777 F (02) 9261 2577
E iswb@wasteboard.nsw.gov.au
I http://www.wasteboard.nsw.gov.au

WasteWise Construction Program
Environment Australia
PO Box E305
Kingston ACT 2604
T (02) 6274 1700 F (02) 6274 1640

Building Research Centre
University of New South Wales
Building 9
22-32 King Street
Randwick NSW 2031
T (02) 9385 0400 F (02) 9385 6178
I http://www.unsw.edu.au/unisearch/brc/index.htm

CSIRO Division of Building and Construction
PO Box 56
Highett Vic 3190
T (03) 9252 6000 F (03) 9252 6244
E information@dbce.csiro.au
I http://www.dbce.csiro.au/ind-serv/brochures/suscon/suscon.htm

Environment Management Industry Assoc of Aust
Ground Floor
217 Northbourne Avenue
Turner ACT 2612
T (02) 6230 1011 F (02) 6230 6814
E emiaa@emiaa.org.au
I http://www.emiaa.org.au/products.htm

National Assoc of Home Builders Research Center (US)
400 Prince George's Boulevard
Upper Marlboro, MD 20774
United States
T +1 (301) 249 4000 F +1 (301) 249 0305
E bmaster@nahbrc.org
I http://www.nahbrc.com/

Environmental Protection Authority (United States)
401 M Street SW
Washington DC 20460
United States
T +1 (202) 260 2090
I http://www.epa.gov/

World Resource Foundation (United Kingdom)
Heath House
133 High Street, Tonbridge
Kent TN9 1DH
United Kingdom
T +44 1732 368 333 F +44 1732 368 337
E wrf@wrf.org.uk
I http://www.wrfound.org.uk

6.3 World Wide Web

EcoMaterials Databases and Directories

The Harris Directory http://www.harrisdirectory.com/

Building Materials Sustainable Resource Guide http://habitatdesigns.com/sbmrg/csi/csistart.htm

Environmental Resource Paints, Finishes and Sealants http://www.enviresource.com/pages/paints.htm

The Athena Sustainable Materials Institute http://www.athenasmi.ca/

King County enCompass http://www.metrokc.gov/market/encompass/

$mart Buildings Materials and Materials Management Resources http://www.smartgrowth.org/resources materials_res.html#Materials and Materials Management General Readings

HOK - Sustainable Design http://www.hok.com/sustainabledesign/

Resources for Environmental Design Index (REDI) 1,800 Green building materials online http://oikos.com/redi/index.html

National Park Service - Sustainable Design and Construction Database http://www.nps.gov/dsc/dsgncnstr/susdb/

Architectural Product Selector http://www.selector.com.au/

Green Building Products and Materials Resource Directory http://www.recycle.net/recycle/ncra/gbdbase.html

The BioComposites Centre http://www.bc.bangor.ac.uk/

Biodegradable Products http://www.technology-catalysts.com/biodprod.htm

Green Resource Guide http://www.diac.com/~ggray/SDRG/sdrg.htm

S*ustainable Design and Construction Database* http://www.nps.gov/dsc/dsgncnstr/susdb/index.htm

Iris Communications, Inc: Energy-efficient and Environmentally-friendly Buildings http://oikos.com/irisinfo/

Environmental Materials Consultants Inc http://www.emcinc.net/

onSITE – Minimising Construction Waste – Maximising Competitiveness http://onsite.rmit.edu.au

Greenbuilder http://www.greenbuilder.com/sourcebook/contents.html

The Sustainable Construction Logo http://www.sustainableconstruction.co.uk/Site/materials.htm

Green Building Resource Guide by John Hermannsson AIA Architect http://www.greenguide.com/

Sustainable Building Technical Manual http://shop.oikos.com/catalog/books/sustainablemanual.html

REDI 96 - Sustainable Materials Database http://oikos.com/redi/index.html

Inner Sydney Waste Planning and Management Board - Waste Resource Finder http://www.wasteboard.nsw.gov.au/finder

Construction and Demolition Waste Web http://www.cdwaste.com/english/index.html

California Integrated Waste Management Board (Recycled Content Construction product) http://www.ciwmb.ca.gov/mrt/cnstdemo/default.htm

Specialist Sustainable Design, Building, Advocacy and Research Groups

Society for Responsible Design http://www.green.net.au/srd

Green Building Information Council - HomePage Introduction http://www.greenbuilding.ca/

Greenspec - Specifications for Environmental Sustainability http://www.spec-net.com/green.html

Resource Efficient Building /CDL http://www.state.wa.us/swfa/cdl/cdlnoframe.htm

Environmental Building News http://www.ebuild.com/

CSIRO: Built Environment Sector: Sustainable Construction http://dbce.csiro.au/ind-serv/brochures/suscon/suscon.htm

Green Building Resource Center (GBRC) http://www.greendesign.net/gbrc/index.html

Government Agencies and Authorities — Environment

EcoRecycle Victoria http://www.ecorecycle.vic.gov.au

EnviroNET Australia http://www.environment.gov.au/portfolio/epg environet/environet.html

Environmentally Friendly Materials/Products Policy http://www.dpws.nsw.gov.au/efmpp.html

Inner Sydney Waste Planning and Management Board http://www.wasteboard.nsw.gov.au/

New South Wales Environment Protection Authority http://www.epa.nsw.gov.au/

A Pollution Prevention Guide for Better Construction and Demolition http://es.epa.gov/program/regional/state/delaware/del-cnst.html

Reusing Construction and Demolition Waste (Environment Canada) http://www.ns.ec.gc.ca/action21/story10.html

General Building and Construction Industry Links

Construction Information Systems Australia Pty Ltd (formerly NATSPEC) http://www.cis.asn.au

Standards Australia http://standards.org.au/

Australian Building and Construction Links http://www.spec-net.com.au/company/linkaus.htm

SPEC-NET: Construction and Engineering Digital Marketing Company http://www.spec-net.com.au/index.htm

Construction InfoNet http://www.dbm.com.au/cinfo/sites.htm

OzBuild http://www.ozbuild.com.au/

Building Industry Connection Magazine http://www.build.com.au/building.htm

The Australian Building Codes Board http://www. dist.gov.au/abcb/

BIOGRAPHIES

John Gertsakis is Acting Director of the Centre for Design at RMIT University and manages a range of research and industry outreach projects related to the policy and practice of EcoDesign and Product Stewardship. He was a key author of the Centre's EcoReDesign Design Manual for product designers, engineers and manufacturers and, together with Michael Abdilla and the Society for Responsible Design, has developed two World Wide Web sites: 'EcoSpecifier - A Guide to Sourcing Environmentally Preferable Materials'; and 'onSITE - A Guide to Information on Waste Minimisation in the Construction and Demolition Industries'.

Tim Grant is Life cycle Assessment Project Manager at the Centre for Design at RMIT University and works exclusively on researching and developing environmental assessment tools and data as a decision-making aid for designers and industry. Tim has conducted several projects and consultancies in applying Life cycle Assessment within a commercial context. He is one of Australia's leading LCA practitioners.

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