



Ministry for the
Environment
Manatū Mō Te Taiao

A Guide to Sustainable Office Fit-outs

Published in December 2005 by the
Ministry for the Environment
Manatū Mō Te Taiao
PO Box 10-362, Wellington, New Zealand

ISBN: 0-478-25943-3
ME number: 703

This document is available on the Ministry for the Environment's website:
www.mfe.govt.nz



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What's the Purpose of this guide?

Most central government staff work in office buildings. The operation of such buildings accounts for up to 40% of energy consumption in OECD countries – and that's before adding in the energy consumed for manufacturing building materials and so on.

In New Zealand, the government sector – both local and central – plays a significant role in the commercial building sector as tenant and commissioning authority.

Managers, project managers, procurement advisors, staff and others who play a part in organising and designing the office environment have important roles in helping to ensure a healthy and environmentally sound office environment.

This guide aims to offer suggestions and guidelines to help with that task.

From time to time, office arrangements need to change – organisations and units expand and contract, functions change, furnishings wear out. Typically, an office fit-out or refurbishment may involve all or some of these:

- removal and replacement of wall, ceiling and floor coverings
- rewiring
- installing new fixtures, fittings, furniture, equipment and appliances.

This guide has a number of practical suggestions and checklists to help you make sustainable decisions when undertaking this type of work.

How Does the Guide Work?

This guide is designed to help you consider how moving into new offices (fit-out) – or changing around existing offices to meet new needs (refurbishment) – can be done in ways that are as mindful of the environment as possible.

It is aimed mainly at **project managers**, who are normally responsible for coordinating the process and ensuring the right outcome. Your purchasing power also means you can influence the market for more sustainable products and services. Whilst targeted specifically at government the advice contained in this site is equally relevant for all others undertaking refits and refurbishment projects.

This guide will help you consider ways to achieve good practice in the areas under consideration as well as value for money.

There are many things to consider and the ‘green’ option is not always the most obvious.

Project management for office refurbishment or fit-out may involve anything from commissioning the entire project to selecting materials and buying individual products. Some of the product groups used in office refurbishment have significant environmental impacts associated with their manufacture, use and disposal.

This guide will help you consider and make decisions that include environmental criteria. It:

- sets out some general principles
- explains the reasons behind environmental criteria and how they should be considered
- considers issues from planning and supply chain management through to implementation
- offers more detailed and technical advice in the form of checklists in some major areas of procurement
- provides links to relevant information and resources
- discusses some of the Ministry for the Environment’s experiences during our own recent building move.

We recommend that you use this guide at the initial planning stage, alongside other key criteria such as value for money and the image your organisation wants to present.

This guide is not completely comprehensive because buildings are complex with thousands of components, further information will be added to this guide over time, so please continue to visit to access this new information. For now this guide covers what we consider to be the key, highest impact, aspects of office building fit-outs and refurbishments.

Your input will be valuable in keeping this guidance up-to-date. We’d appreciate your feedback and your experiences. You can contact us with these at govt3@mfe.govt.nz

Useful resources and information

- Fitting out and retrofitting are both addressed (with a focus on energy efficiency) in EECA's series *Before the First Pour*. The guides in this series are available online at: http://www.emprove.org.nz/knowledgecentre/building_design/index.asp
- The Waitakere City Council's 'Better Building Code' on retrofits takes a wider focus: http://www.waitakere.govt.nz/AbtCit/ec/bldsus/pdf/bbc_sec5.pdf
- A useful guide to sustainable office design, fit-out and operation is available from the Auckland Environmental Business Network at: <http://www.greenoffice.org.nz/downloads.php>
- A useful example of an environmental office rating system is the GreenStar office interiors V1, available from the Green Building Council Australia at: <http://www.gbcaus.org/greenstar/page.asp?id=117>

What Does ‘Sustainable’ Mean?

The definition of sustainability as applied to buildings is not fixed, but ‘green’ or sustainable buildings are sensitive to:

- the environment – local and global
- resource, water and energy consumption
- the quality of the work environment – impact on occupants
- financial impact – cost-effective from a long term, full financial cost-return point of view
- long term energy efficiency over the life of the building.

When looking at what’s involved with refurbishing or fitting-out a building, this could mean:

- using resources efficiently – getting more from less
- minimising waste
- focusing on energy and water use
- choosing products carefully to ensure they are not harmful to the environment or to occupants health.

Value for money

Greater cost savings and benefit to the environment are possible when sustainability principles are incorporated into new buildings right from the design and construction phase, but the important principles can also be incorporated into refurbishment and fit-out – if planned for from the beginning. This is dealt with in greater detail in the Ministry’s *Value Case Study on Sustainable Building in New Zealand*: <http://www.mfe.govt.nz/issues/sustainable-industry/govt3/topic-areas/sustainable-buildings/building-design.html>

Sustainability inevitably links to costs. It is important to dispel the myth that decisions which are more sustainable and products which minimise environmental impacts are inevitably more expensive. For example:

- measures that save energy and water may be cost-effective in their own right
- taking a whole-of-life approach lets you work out how any additional capital expenditure – for example, to buy better quality appliances – can be off-set by energy and other savings over the life span of the item
- funding for energy efficiency for government agencies is available under the Energy Efficiency and Conservation Authority’s Crown Loan Scheme. Payback periods of less than five years are considered acceptable, however longer payback periods may be acceptable subject to the availability of funds. For more information and an application form visit the EECA Crown Loan webpage at: <http://www.eeca.govt.nz/government/crown-loans/index.html>

Apart from the purely financial terms, other sources of value are real, but less easy to measure:

- **Credibility, reputation and leadership.** Many government agencies work directly in fields where it is important to lead by example. Cabinet expects government agencies to show leadership in areas such as energy efficiency and best value procurement.
- **Risk management.** Quantifying environmental risks associated with office fit-outs and refurbishment may be difficult, but this does not mean these risks do not exist. The continuum stretches from ‘sick building syndrome’ through to staff developing headaches from new carpet emissions. This guide provides advice designed to avoid these potentially serious problems.
- **Productivity.** A growing body of research attests that sustainable buildings are associated with greater productivity. Relevant factors include better staff recruitment and retention, lower levels of sickness and absence, and higher quality work. This is dealt with in greater detail in the *Value Case for Sustainable Building in New Zealand* which suggests, for example, that indoor environmental quality can account for a 5–15% effect in terms of productivity. Sustainable fit-out and refurbishment practices are an essential part of realising these potential benefits.

Another benefit of sustainable fitting out relates to the Government purchasing guidelines (available at: http://www.med.govt.nz/irdev/gov_pur/purchasers/purchasers-01.html). These require public service departments to be guided by the principle of ‘best value for money over whole-of-life’, so sustainable practice also supports compliance with this guidance.

Principles

We used a number of sources to compile a list of principles that can be applied to office fit-outs in New Zealand. We should strive to:

1. Conserve water and energy

This includes the embodied energy in the raw materials used during the fit-out or refurbishment as well as the ongoing operation of the building. Water is also used in manufacturing as well as for amenities within the building.

In New Zealand, the use of water and energy is mainly limited only by cost. While this controls the use of energy to some extent, water is generally inexpensive. Conserving water during the operation of the building also saves energy: eg, used in pumping for distribution, heating to provide hot water, and treatment and disposal of waste water.

2. Minimise impact on indoor air quality

Staff can spend at least eight hours a day in the office. The quality of the air they breathe is important to both short-term and long term health.

Paint, carpets, furniture and other office items can release volatile organic compounds (VOCs), formaldehyde and other emissions, as well as exposing staff to toxins and allergens. Health and safety, occupational health and other building regulations may also be relevant here.

3. Minimise the use of toxic and hazardous materials

Hazardous solid, liquid and gaseous wastes are produced during manufacture, as well as at the end of the life of a product. These wastes can be minimised if sustainable alternatives are specified during the project.

4. Reduce waste – reuse, recycle, minimise

Waste is created at all stages of a fit-out or refurbishment: manufacturing products; building processes and operations; and disposal. Reducing waste at source means deciding if you actually need a product at all, and looking for ways in which to reuse existing products – getting more from less.

Using recycled products is also likely to use less energy and fewer valuable raw materials than buying new.

The Ministry for the Environment has developed with partners a number of tools to help reduce, reuse or recycle construction and demolition waste. These are available at: <http://www.rebri.org.nz/>

5. Use renewable, sustainably harvested natural materials, and consider biodiversity protection

Wood is the main natural material used in office fit-outs, while the manufacture of vinyl flooring or aluminium cladding relies on scarce minerals. Use products with certification from the Forestry Stewardship Council or the Tropical Timber Trust, or local non-indigenous sources.

6. Minimise pollution of air, land and water

Pollutants can be produced at all stages of the life-cycle of a product or building. Minimise the risk by ensuring product specifications, legal compliance and best practice standards are met – during the installation, operation, maintenance and disposal of the products.

7. Encourage environmental stewardship by suppliers and manufacturers

Some manufacturers are prepared to take responsibility for the environmental impacts of their products throughout their manufacture, distribution, operation, maintenance and disposal. You can help promote this approach by asking for details of product composition, manufacturing processes including energy and water use, packaging take-back schemes, and disposal options – and using this information when deciding between different products. Visit Environmental Choice, New Zealand's ecolabel, for a list of environmentally sound building products: <http://www.enviro-choice.org.nz/>

8. Ensure durability

A durable product with an extended life is generally more resource efficient. Look for quality products with replaceable or upgradable parts. You may need to balance this against other factors such as the inclusion of materials with high adverse environmental impact (eg, adhesives or synthetics).

These principles are at the heart of the checklist in [Getting started](#).

Useful resources and information

- Environmental Choice New Zealand (ecolabel criteria): <http://www.enviro-choice.org.nz/>
- Ecospecifier is a guide to eco-preferable products and materials for the Australian construction industry: <http://www.ecospecifier.org/>
- For examples of environmentally preferable product-specific contract language, check out the US EPA website at <http://www.epa.gov/opptintr/epp/tools/toolsuite.htm>
- Building Research Establishment. BREEAM offices 2004: Design & Procurement. Assessment prediction checklist: <http://www.breeam.org/offices.html>
- Government Construction Client's Panel (GCCP): Achieving sustainability in construction procurement Sustainability Action Plan June 2002: <http://www.ogc.gov.uk/>
- United States Environmental Protection Agency: Mid-Atlantic Region pollution prevention: green buildings: <http://www.epa.gov/>

Government Legislation and Policies

A number of Government policies and legislation support sustainable building in New Zealand. All new building work in New Zealand must comply with the New Zealand Building Act (2004), which requires through both its purpose and principles that “buildings are designed, constructed, and able to be used in ways that promote sustainable development”. The Building Code prescribes functional requirements for buildings and the performance criteria with which buildings must comply.

The Government’s ‘Sustainable Development Programme of Action’ (SDPOA) requires government agencies to consider implementing the Government’s sustainable development policies such as the Energy Efficiency and Conservation Strategy 2001 (NEECS), and the New Zealand Waste Strategy 2002. A number of these same agencies are also signatories to the New Zealand Urban Design Protocol which commits them to consider and use good urban design principles when undertaking a new building project.

Useful resources and information

- The Sustainable Development Programme of Action is available from the Ministry for the Environment website at: <http://www.mfe.govt.nz/issues/susdev/programme.html>
- The New Zealand Waste Strategy 2002 is available from the Ministry for the Environment website at: <http://www.mfe.govt.nz/publications/waste/waste-strategy-mar02/>
- The Energy Efficiency and Conservation Strategy 2001 (NEECS) is available from the Energy Efficiency and Conservation Authority website at: <http://www.eeca.govt.nz/eeca-library/eeca-reports/neeecs/report/national-energy-efficiency-and-conservation-strategy-01.pdf>
- The New Zealand Building Act (2004) and Building Code are available from the Department of Building and Housing website at <http://www.building.govt.nz/publish/buildingact.php>

Getting Started

Many of the issues you may face around the fit-out or refurbishment of your building will depend on the extent to which you can influence its construction (of a new building) or redevelopment (of an existing building).

A sustainable approach involves a hierarchy of issues:

- Rethink
- Reduce
- Reuse
- Recycle.

Rethink

Do you need to refurbish?

Refurbishing will have greater adverse environmental impacts than not refurbishing. However, any changes to achieve greater energy efficiency, healthy air quality etc should be undertaken as worthwhile activities in their own right.

Other options include:

- hot desking (do staff require their own private working space?)
- flexible working arrangements
- working from home.

Reduce

Does it need to be a full refurbishment or can the scope be reduced?

As a rule of thumb, the more extensive the refurbishment the greater the adverse impacts.

Reuse

Do you need to buy new?

Buying a new product is likely to have greater environmental impacts overall than reusing existing items – even where the older items are not made of sustainable materials or not operating in an energy efficient manner (but see exception under ‘Rethink’ above).

If you do decide to replace existing items, check your organisation’s storage facilities – sometimes suitable items are being kept but are not in current use.

Items no longer required in the new office setting should be considered carefully – is it worth storing them for future use? If not, how can you dispose of them in ways that promote their continuing usage elsewhere?

Recycle

If you cannot reuse existing items, can they be recycled?

Recycling means that an item itself cannot be reused but its components can be.

Top 12 Steps for Planning a Sustainable Building Project

1. **Establish a vision** that embraces sustainable principles and an integrated sustainable design approach. Develop a clear statement of intent for the project's vision, goals, design criteria and priorities.
2. **Appoint a project manager** who will be responsible for overseeing the project's planning and implementation. If internally appointed, which is often the case, ensure enough of their time and effort is dedicated to the building project.
3. **Encourage all staff to participate** in the project from the beginning. Offer information, training and incentives to get their participation and buy-in to the project's vision and intent.
4. **Develop a project budget** that incorporates sustainable building measures. Seek sponsorship or grant opportunities and allocate adequate funds for specific sustainable options.
5. **Adapt the tender selection process** to select a design and construction team that is committed to the project's vision and has sustainable building experience.
6. **Build effective relationships** with your architects, designers, contractors, and suppliers so there is a common understanding of your vision and aims. Make environmental issues an agenda item in meetings with suppliers.
7. **Focus on the big picture** by looking for ways that will make the largest impact. Design and fit-out choices should, over the life of the building, address the key issues of:
 - location
 - energy
 - water
 - materials
 - waste.
8. **Use space planning** and other material efficiency strategies to reduce the amount of building materials needed and to cut construction costs.
9. **Facilitate recycling collection** and solid waste management by allocating space for these activities.
10. **Develop a project schedule** that allows time for the investigation of sustainable issues including time for building systems testing and commissioning.
11. **Once commissioned** ensure all building systems are operating at, or above, their optimum designed efficiency ratings.
12. **Use the opportunity** to add sustainable practices to your organisation's other activities (procurement, vehicles and waste management).

First Steps

Site selection

Select a site that enables staff and visitors to **use public transport**.

Protect and retain existing landscaping and natural features – chose plants with low water, pesticide and maintenance needs. Use compost and mulches to reduce watering requirements.

Ensure your suppliers plan for managing materials through both the demolition and construction phases. **Reuse and recycle construction and demolition materials**.

Purchasing

Include environmental considerations as part of the normal purchasing process.

Emphasise pollution prevention early in the purchasing process.

Collect accurate and meaningful information about environmental performance, and use it to make purchasing decisions. Select sustainable construction materials and products by looking for:

- reused and recycled
- zero or low harmful air emissions
- zero or low toxicity
- sustainably harvested materials
- high recyclability
- durability, longevity and local production.

(See general purchasing checklist below as well as specific topic checklists.)

Ask suppliers and contractors for samples of materials as well as names of previous users of the product or service (references). Consider trialling new products until performance and technical requirements have been proven.

Get appropriate documentation to support supplier or manufacturer claims on first-time buys or if any of the original information changes. Supporting documentation could include:

- toxicological information
- test results from a recognised or accredited laboratory
- source of recycled content information (domestic or foreign, post-consumer or reprocessed manufacturing scraps)
- accreditation from a recognised programme such as Environmental Choice.

Deal with suppliers/manufacturers that implement environmental policies. Ask for responses to checklist questions below and ensure the environmental claims can be verified.

Technical

Most products suitable for use in a sustainable fit-out have one or more of the following health and/or environmental attributes. They:

- are made using natural and/or renewable resources
- have low ‘embodied energy’ (the energy required to produce and transport materials)
- are obtained from local resources and manufacturers
- may incorporate recycled content (post-consumer and/or post-industrial)
- promote good indoor air quality (typically through reduced emissions of volatile organic compounds VOCs and/or formaldehyde)
- are durable, and have low maintenance requirements
- have been salvaged from existing or demolished buildings for reuse
- do not contain CFCs, HCFCs or other ozone-depleting substances
- do not contain highly toxic compounds, and their production does not result in highly toxic by-products
- employ ‘sustainable harvesting’ practices for wood or bio-based products
- can be easily reused (either whole or through disassembly)
- can be readily recycled (preferably in a closed-loop recycling system)
- are biodegradable.

Useful resources and information

- Environmental Choice New Zealand (ecolabel criteria): <http://www.enviro-choice.org.nz/>
- Ministry of Economic Development’s government procurement information: http://www.med.govt.nz/irdev/gov_pur.html
- For examples of environmentally preferable product-specific contract language, check out the US EPA website at: <http://www.epa.gov/opptintr/epp/tools/toolsuite.htm>
- World Business Council for Sustainable Development: <http://www.wbcsd.ch/>
- United State Environmental Protection Agency: Mid-Atlantic Region pollution prevention: green buildings: <http://www.epa.gov/>
- Sustainable facilities management guide: <http://www.tefma.com/>
- Eco Sustainable Hub: <http://www.ecosustainable.com.au/links.htm>

Checklist

Use this checklist to help make environmentally preferable purchasing decisions. It is based on [eight basic environmental principles](#) and can be used when there are no product specifications with environmental criteria or where products with an ecolabel (eg, Environmental Choice New Zealand) are unavailable.

Ask the supplier/manufacturer:

Principle	Questions
Water and energy conservation	<p>Do you have an energy and water management programme for the manufacture of the product?</p> <p>Is the product energy and/or water efficient (ie, energy efficiency / water conservation rating schemes)?</p> <p>Does the product have a water and/or energy efficiency rating?</p>
Minimal impact on indoor air quality	<p>Does the product release volatile organic compounds (VOCs), formaldehyde or other emissions that reduce indoor air quality during its manufacture or use?</p>
Toxic and hazardous materials minimised	<p>Does the product contain toxic or hazardous materials or use toxic or hazardous materials in its manufacture, use or disposal?</p>
Reduction of waste	<p>Can I buy the product in the exact size and quantity I need (ie, what sizes are available)?</p> <p>Can the product be reused, refilled or recycled at the end of its useful life?</p> <p>Does the product have recycled content?</p> <p>Will you take back the packaging?</p> <p>Do you have a waste minimisation programme?</p> <p>Is the product made of a single material or materials that are easily separated for recycling and reuse?</p>
Renewable and sustainably harvested materials, biodiversity protection	<p>Are the materials in the product obtained from renewable and sustainably harvested sources?</p> <p>Do you have a positive management programme for habitats and native species?</p>
Minimal pollution of air, land and water	<p>Do you have a pollution prevention programme?</p> <p>Do the instructions supplied with the product provide guidance on minimising pollution when installing, operating, maintaining and disposing of the product?</p>
Environmental stewardship	<p>Is your company ISO 14000 certified?</p> <p>Do you have an environmental policy statement?</p> <p>Do you provide information about the composition of products, take-back schemes, lease options, and other information over and above regulatory requirements?</p>
Durable and upgradeable	<p>Does the product contain upgradeable, repairable or replaceable parts?</p> <p>Is the product durable (life expectancy)?</p>

Case study: Environment House

The Ministry for the Environment moved into Environment House in June 2005, bringing together all National Office personnel at one site.

The Ministry leases the building, but was heavily involved with its construction from an early stage, influencing the fit-out and the way in which the building operates. We are happy to share our experiences of trying to make the building as sustainable as possible.

The Ministry decided at the outset that it would take out a net lease, which includes taking responsibility for all power, water, insurance and other building operating costs. This means the overall rental cost of the building becomes flexible (making budgeting harder), but gives the Ministry control over all aspects of the building management, including choice of products used for maintenance and cleaning, and the frequency with which activities are undertaken. This decision provided a further driver for energy efficiency and other cost-saving measures.

Location and design

Selection of the **building location** was an important first step. For our purpose, it had to be close to Parliament. We also wanted to ensure the building worked well for staff and would enable both staff and visitors to make best use of public transport.

Environment House's location stood out as the best option – just one block from the Railway Station and central bus depot. Provision was also made for staff to be able to cycle to and from work, with 40 bike stands and lockers in a secure area in the basement, along with shower facilities.

Building consent had already been provided for the building's concept design, so some decisions had already been made. These included:

- placement of the lifts and services on the northern face of the building
- full air conditioning of the building with no opening windows
- the overall orientation of the building.

Because of this, most of the sustainability features in the building come from the fit-out rather than the early design. For advice on incorporating sustainability into the design stage, see the Value Case for Sustainable Building on our website: <http://www.mfe.govt.nz/issues/sustainable-industry/govt3/topic-areas/sustainable-buildings/building-design.html>

Getting started

A senior staff member managed the project with the assistance of a contracted Sustainability Advisory Group who provided specialist advice for the fit-out. This group comprised Landcare Research and environmental and engineering consultants Tonkin & Taylor.

Getting it right from the start depends on establishing good relationships with the architects and designers carrying out the fit-out. It's important to ensure that sustainability is seen as a priority from the start of the project.

We found that early agreement and **shared commitment** helped with decision-making during the project. The commitment came in the form of a shared understanding developed during negotiations and recorded in a general ‘sustainability clause’ in the lease. The clause committed the lessor to take account of sustainability issues wherever possible. A more detailed letter from the Ministry to the construction company (who also won the fit-out contract) on sustainability expectations was also attached to the contract as a schedule.

Pointer

Include in the contract a detailed clause committing parties to implement **specific** sustainable elements in the project such as construction waste management and certified sustainable timber use. Note for the developer that sustainability can decrease upfront costs, as well as ongoing costs.

The Ministry decided to prioritise products with an **Environmental Choice eco-label** where possible, as this guarantees that the products have been fully verified by life-cycle analysis. When no such products were available, we decided to use internationally accepted sustainability criteria, adapted for New Zealand conditions. For those keen to ensure sustainable materials are sourced throughout, we recommend that decisions on materials are made early, as sourcing some materials in New Zealand can take time. Using architects and fit-out consultants with experience of sustainable building will speed up this process considerably.

Pointers

- Choose products with an Environmental Choice eco-label wherever available.
- Decide on materials early.
- Select architects and fit-out consultants with practical experience of sustainable building.

Principles for sustainable fit-out

The general rules we followed when planning for a sustainable fit-out were to:

- deal with large-scale impacts before small ones
- choose the lowest-impact product that would do the job for the best value for money
- consider impacts in terms of scale – local/regional/global. Global impacts such as ozone depletion and climate change are usually the worst in terms of sustainability. Materials and designs which exacerbate global impacts should be the first to be avoided
- choose a local source rather than imported materials/components, where possible
- if imported, choose products that come by sea rather than by air, as air-freighted products generate considerably more CO₂ (a climate change gas).

Cost sharing

The Ministry gained agreement from the developer to share some of the extra costs of installing sustainable features in the building. For example, the original air conditioning system proposed by the developer and architects was a VAV (Variable Air Volume) system.

The Ministry felt there would be considerable benefits from using a more energy-efficient VRV system (Variable Refrigerant Volume). Recognising the whole-of-life costs savings and other benefits to the building owner and the construction company, a cost-sharing agreement was struck to share the additional \$80,000 for the VRV system. The Ministry calculated that the potential future energy savings, combined with other cost benefits (such as removing the need for extra plant for conference rooms), made contribution to the VRV a viable financial option.

Pointer

Negotiate for additional capital costs on sustainability features to be shared with the developer.

Energy Efficiency

Passive design strategies can dramatically affect building energy performance. These measures include building shape and orientation, passive solar design, and the use of natural lighting. If you are fitting out an existing building, or working with developers to fit-out a new building, you may be limited in how far you can go with these. Some key approaches include:

- **Develop strategies to provide natural lighting.** Studies have shown that it has a positive impact on productivity and well-being.
- **Install high-efficiency lighting systems** with advanced lighting controls. Include motion sensors and dimmable lighting controls where practical. Task lighting reduces general overhead light levels.
- **Use a properly sized and energy-efficient heat/cooling system** in conjunction with a thermally efficient building shell. Over-specifying air conditioning and heating is one of the most common problems in modern buildings. Maximise light colours for roofing and wall finish materials; install high R-value wall and ceiling insulation; and use minimal glass on east and west exposures.
- **Minimise the electric loads** from lighting, equipment and appliances. Look for appliances with the most energy stars.
- **Consider alternative energy sources** such as photovoltaic or fuel cells now available in new products and applications. Renewable energy sources provide a great symbol of emerging technologies for the future.
- **Considering outsourcing computer services** or using thin servers and LCD screens. Computer rooms use considerable amounts of energy.
- **Computer modelling** is an extremely useful tool in optimising design of electrical and mechanical systems and the building shell.

Useful resources and information

- Technical guides on energy efficiency:
<http://www.eeca.govt.nz/eeca-library/libsearch.html>

Building Operation and Maintenance

Sustainable building measures can only achieve their goals when they work as intended. Building commissioning includes testing and adjusting the mechanical, electrical and plumbing systems to ensure all equipment meets design criteria. It also includes training staff on the operation and maintenance of equipment.

Over time, building performance can be assured through measurement, adjustment and upgrading. Proper maintenance ensures a building continues to perform as designed and commissioned.

Building Users' Guide

A useful tool to help tenants get used to and understand the new technologies and systems after a fit-out is a building users' guide, which might include:

- commissioning timeframes
- how to use the technologies (HVAC and lighting systems)
- expectations of staff (energy, waste and recycling strategies)
- who to contact (building faults or repairs)
- fire evacuation plan.

The building users' guide should be tailored to your organisation's needs, and may be used as part of the induction process for new employees.

Useful resources and information

- *Business Guide to Energy Efficiency*, New Zealand Business Council for Sustainable Development: <http://www.energyinfonze.com/>
- A copy of the *Building Owners' evacuation guide to Evacuation Schemes* available from the New Zealand Fire Service at: <http://www.fire.org.nz/download/EvacGuide.pdf>
- An example of a building users' guide (for external users) is the DFM building's Rules & Information available at: <http://da.state.ks.us/fm/dfm/information/handbook.htm>

Appliances

Bathrooms

Hand dryers, towels or paper towels? The 'green' answer is not always straightforward.

In New Zealand, the energy source needs to be considered along with other factors when making this decision. With most of our energy coming from renewable sources, electric hand dryers are probably the first choice, followed by cloth, then recycled paper towels.

Kitchens

At present, there are no kitchen appliances with an Environment Choice ecolabel. However, the Energy Star labelling system has recently been introduced to New Zealand. All imported products should already carry these labels and from 2005 the scheme will gradually be introduced for New Zealand products. From 2006 Energy Star rated refrigerators and freezers will become available.

The Energy Efficiency and Conservation Authority (ECCA) also operates an Energy Rating Label scheme, designed to help you make an energy-wise choice when buying new appliances such as fridges and freezers, and dishwashers. The labels make it easy to compare the energy efficiency of models of the same size and class.

Refrigerator

Choose the appropriate size for your needs to minimise under or over loading. Position the refrigerator away from heat sources, including direct sunlight. Install it with a good 3 cm gap all around for good air circulation.

Dishwasher

Base your choice on the expected usage. If you are likely to run smaller loads more frequently, then a dish-drawer type dishwasher is more appropriate. For larger loads, or a dishwasher that is used only when full, choose a standard dishwasher with a good energy rating.

Copiers/printers

A large percentage of energy usage in an office is associated with office machines. EECA's Energy Star office products use less energy by automatically switching to 'sleep' when not in use, and/or saving power when on standby. Energy Star qualified computers, monitors, printers, fax machines, copiers and scanners are available in New Zealand.

Most printers and some copiers and fax machines use toner cartridges that contain heavy metals. Copiers and printers produce VOCs, ozone, styrene, toxic dust, heat and noise.

Pointers

Use Energy Star qualified computers, monitors, printers, fax machines, copiers and scanners.

Choose the appropriate printer and copier for your needs to minimise noise and heat.

Reduce exposure to toxins, heat and noise, by separating these operations from the rest of the office environment. A dedicated copier/printer room that is separately vented from the buildings main ventilation system is best.

Useful resources and information

- For details of EECA's energy efficiency programmes see: <http://www.eeca.govt.nz/eeca-library/products/report/forward-programme-05.pdf>
- For details of EECA's approved Energy Star products see: <http://www.energystar.govt.nz/>

Case study: energy efficiency

The main areas the Ministry for the Environment looked at here were:

- the building management system
- HVAC – heating, ventilation and air conditioning
- lighting
- appliances
- hot water use.

The building management system

We chose an efficient building management system (BMS) for Environment House. The BMS monitors, measures and manages the overall energy use of the building including HVAC, lifts and security, and can also manage a sophisticated lighting system.

A BMS is vital in managing energy use and we anticipate it will deliver financial savings because it allows a building manager to avoid significant 'peak load changes'. Electricity retailers usually charge commercial buildings for a whole month at the rate that applies to their peak load during that month. If you can spread current energy use more evenly, you can save money.

Appliances

Kitchen areas on each floor service up to 50 people, so large refrigerators were required. No Environmental Choice eco-labelled products were available, so energy efficiency (Energy Star ratings and energy use) was the key criterion for selection. Currently several imported brands have higher ratings than local equivalents. The fridge chosen was the GRAM KS360 from Germany – a highly energy-efficient fridge.

The Ministry has reused dishwashers from its previous sites. Where new appliances are required, dish-drawers (Fisher and Paykel) are worth considering as these can do half loads and are highly water efficient. When loads are usually full, a standard dishwasher is recommended.

The Ministry analysed hand drying options and chose electric hand dryers in toilets. As most of New Zealand's electricity is supplied from renewable sources, we decided this option was marginally preferable to the paper and cloth towel alternatives.

Paint

A fresh coat of paint is one of the quickest and easiest ways to refurbish an office. A number of issues are associated with the ingredients, manufacturing progress, application, and disposal of paint. However, several paint manufacturers produce products that carry the Environmental Choice eco-label and offer a sustainable alternative.

Issues

- Mineral turps is occasionally used as a thinner and solvent and may contain up to 20% benzene, which is a confirmed carcinogen and mutagen in chronically exposed workers.
- Emulsion paints are much safer to work with as they contain little or no hydrocarbon solvent.

Pointers

Ensure painting contractors:

- use paints that meet the Environmental Choice criteria
- dispose of used pails/cans and excess paint responsibly. Paint recycling facilities exist in some centres. See Paintwise for more details:
<http://www.resene.co.nz/paintwise.htm>
- complete painting at least two days before occupancy and consider full 'flushing' of the building before occupancy (for example, by leaving windows open or running the building ventilation system for two days).

Useful resources and information

The following companies have products licensed by Environmental Choice New Zealand. An up-to-date list of the license criteria is on the Environmental Choice New Zealand website:
<http://www.enviro-choice.org.nz/>

For further information on the products contact the companies directly:

- Enviropaints Ltd (email: info@enviropaints.co.nz; <http://www.enviropaints.co.nz/>)
- Dulux Paints Ltd (<http://www.dulux.co.nz/>)
- PaintPlus (email: enquiries@paintplus.co.nz; <http://www.paintplus.co.nz/>)
- Resene (email: advice@resene.co.nz; <http://resene.co.nz/comn/envissue/paintlst.htm>).

For examples of environmentally preferable product specific contract language, check the US EPA website at: <http://www.epa.gov/opptintr/epp/tools/tools.htm>

- Building Research Association New Zealand (BRANZ) produce guidelines and publications in all areas of building and construction: http://www.branz.co.nz/main.php?page=BRANZ_Ltd_home
- Environmental Choice New Zealand Trust: Licence criteria for paint EC-07-01: <http://www.enviro-choice.org.nz/>
- Environmental Choice Canada: Criteria for low VOC paints and surface coatings: <http://www.environmentalchoice.com/>

Case study: paint

Plenty of options are available with the Environmental Choice eco-label. The Ministry selected paint from the wide range available.

Technical checklist

Key things to avoid: aromatic hydrocarbon solvents, halogenated solvents, ethylene glycol, mercury, arsenic, selenium, lead, cadmium, chromium VI, antimony, formaldehyde, lead or titanium dioxide.

To help you compare different products, use the following questionnaire with suppliers and/or manufacturers, where products with an ecolabel (eg, Environmental Choice New Zealand) are unavailable:

Does the product meet the required levels of volatile organic compounds (VOCs) in the Environmental Choice New Zealand Trust licence criteria?	
Has the product been formulated and/or manufactured with the use of aromatic hydrocarbon solvents, halogenated solvents, or ethylene glycol?	
Has the product been formulated and/or manufactured (includes tinting) with the use of mercury, arsenic, selenium, lead, cadmium, chromium VI or antimony?	
Has the product been formulated and/or manufactured with the use of formaldehyde or is it likely to release formaldehyde during use?	
Have paint containers and their components been fabricated with the use of lead or titanium dioxide?	
Are paint containers made of material(s) that can be recycled, eg, plastic resin code 2 (high density polyethylene)?	
Do you provide clear disposal guidelines consistent with the Hazardous Substances (Disposal) Regulations 2001?	

Cabling and Wiring

Wiring includes:

- communications data wiring – fibre optics, copper and copper alloy-based
- electrical power wiring – copper or aluminium with plastic coating (usually PVC).

The most important considerations for electrical installations are that they are safe and suitable for their purpose – best achieved by ensuring they meet the appropriate standard. Sustainable materials can be used, but the standard should come first.

Issues

- PVC (polyvinyl chloride) is the most common insulation and jacketing material for wiring in buildings, mainly because of its good flame resistance and low cost. Some PVC wire insulation and jacketing are 5 to 10 percent lead by weight.
- Various halogen-based compounds, especially fluorinated ethylene propylene (FEP), are also common in data wiring insulation.

Pointers

Design

- **Design for easy access and future removal.** Install wiring in readily accessible wiring chases to simplify future modifications.
- **Minimise wiring runs.**
 - Design for future wiring needs, but avoid installing wires unless there is an immediate need for them.
 - Reduce material use by installing high-capacity runs to local hubs, rather than connecting each directly to a central hub. Local hubs can connect to workstations via wireless or short-wired connections.
- **Install voice-data-video (VDV) cable** that can serve upgraded networks so that cable will not become obsolete as quickly.
- **Avoid wiring in exterior walls.** This can interfere with insulation and may result in significant air leakage.
- **Minimise electromagnetic fields.** Rely on 'prudent avoidance' strategies to minimise exposure of building occupants to electromagnetic fields.
- **Go wireless.** Use wireless data connections instead of hard-wired ones for maximum flexibility and minimum material use. Wireless connections may be usable in some local areas, even if they are not usable building-wide.

Specifications

- **Specify halogen-free products** – look for polyolefin products; to use these for insulation and jacketing, compounds are typically added for flame resistance. Or specify polyolefin cable with lower flame resistance and place it in a fire-protected environment (eg, metal conduit or cellular cores of concrete floor panels).
- Wherever possible, **specify wire and cable insulation and jacketing that do not contain PVC, chlorinated polyethylene, FEP, or products containing brominated flame retardants**. Some PVC wire insulation and jacketing comprise 5 to 10 percent lead by weight. Specify products that don't contain lead stabilizers.
- Use **fibre-optic cable**. Fibre optics, widely used to carry voice and data signals, require less insulation and jacketing than copper wiring because they transmit light signals instead of electricity. It may be possible to run fibre-optic trunk lines to smaller copper distribution lines, thus reducing total insulated cable use.
- **Avoid the need for plenum-rated and limited-combustion cable**. Run data cable in metal conduit, sealed wiring chases, or cellular raceways in concrete decking to avoid the need for highly flame-resistant cable.
- **Specify heavy-metal-free wire and cable**. Cadmium, chromium, and other heavy metals are often used in pigments for wire insulation and jackets. Avoid them whenever possible.

Removal

- Remove old cable and recycle where possible.
- Follow safety precautions when removing old cable, which may contain high levels of lead dust.
- Reuse suitable components such as electrical boxes, flush boxes and fittings where possible.

Useful resources and information

- For examples of environmentally preferable product-specific contract language, check the US EPA website at: <http://www.epa.gov/opptintr/epp/tools/toolsuite.htm>
- Recycling wiring (Christchurch): <http://www.molten.org.nz/pages/recyclingmetals.html>
- Public Works and Government Services Canada: Environmentally responsible construction and renovation handbook Appendix A.12 – Products directory: <http://www.pwgsc.gc.ca/>
- Massachusetts Toxics Use Reduction Institute (TURI). Wiring: <http://www.turi.org/content/content/view/full/45/>
- Useful ideas guide for wiring: <http://archrecord.construction.com/features/digital/archives/0412feature-2.asp>

Technical checklist

Key ingredients to avoid: PVC or PVC that cannot be separated for recycling.

No specific New Zealand standards or environmental criteria currently exist for these products, but information on PVC is available (eg, a European Union green paper on PVC at: <http://europe.eu.int/comm/environment/pvc/index.htm>).

To help you compare different products, use the following questionnaire with suppliers and/or manufacturers, where products with an ecolabel (eg, Environmental Choice New Zealand) are unavailable:

Is the product PVC free?	
If the product is not PVC free, is the PVC easy to separate for recycling?	
Has the product been made from recycled PVC?	
Does the manufacturer/supplier take-back PVC for regeneration/recycling?	
Are the cable and wiring made from recycled copper?	
Does the supplier take-back all suitable metal waste for recycling?	
Are all insulants durable to maximise the lifetime of the wiring?	
Can you locate suitable recycling facilities for any metal waste or recyclables that you will not take-back?	

Heating, Ventilation and Cooling (HVAC) Systems

If you work in an air conditioned office, up to half the building's energy use will go on heating, ventilating and cooling the building. This can be a highly technical area, so use the pointers provided here as discussion topics with your consultant.

Issues

- Older cooling systems may use chlorofluorocarbons (CFCs) that deplete the ozone layer and are active greenhouse gases. (Look for alternative cooling agents.)
- Inefficient heating/cooling systems increase energy use.

Pointers

Maximise natural ventilation

- If possible, have windows that open so you can naturally ventilate the office. If this is not an option make sure the air quality is regularly assessed to avoid sick building syndrome. Avoid overheating in summer months – look for summer shading ideas (eg, trees, climbers or blinds).

Insulate your office

- Ensure the building is properly insulated above 'building code' requirements. Insulation will save energy and provide a healthier, more comfortable environment. Most heat is lost through the ceiling (42%), the rest through windows (12%), cracks (12%), or the floor (10%).

Don't let engineers over-specify HVAC equipment

- Conservative approaches often lead to 30% excess capacity in HVAC plant, which creates enormous ongoing inefficiencies. Ask your engineers how they decided on the HVAC plant size and test their assumptions.
- If possible, retain existing systems or ductwork but ensure all air ductwork is cleaned to remove dust, dirt and mould before occupation.

Don't skip commissioning

- Time over-runs may mean essential testing and balancing of the HVAC is not done until the building is occupied. This can lead to an unbalanced and inefficient HVAC system.
- A building needs to be 'tuned' over a full year's running to ensure all systems are operating properly in all climatic conditions.

Look after HVAC systems

- Ensure you have a building users' guide for the engineering systems.
- Your HVAC system must be designed, operated and maintained to a required standard or it may cause air pollution as a result of poor maintenance.
- Set thermostats, with adjustable dead bands, between 20–24°C.
- Avoid after-hours use of the HVAC system. Find out how the HVAC system is zoned. Ensure that after-hours switches service an area not greater than 500m² and that they automatically switch off the HVAC system after a pre-set time.
- Avoid using single heaters as much as possible. If you have heaters use radiant heaters, not fan heaters.
- Have your HVAC system serviced regularly.

Useful resources and information

Although there is presently little New Zealand based information available about efficient HVAC systems, the Energy Efficiency and Conservation Authority has produced a local case study (Wellington District Court) highlighting one of the countries most energy efficient air conditioned buildings. The case study is available at: <http://www.emprove.org.nz/knowledgecentre/pdf/04-06-wgtn-court-440kB.pdf>

Case study: heating, ventilation and air conditioning (HVAC)

Improved building design with good insulation, natural ventilation and an optimised glazing-to-wall ratio can reduce the need for air conditioning. The Landcare Research building in Tamaki, Auckland is an example of this, with climate control used only in specific areas with functional requirements such as preserving specimens or meeting biological containment requirements.

As for many public service agencies considering leasing office space, the footprint and design of Environment House were already established, so the Ministry had to consider what sort of HVAC system would best deal with the specific issues it faced, including:

- the desire for a highly energy-efficient system
- the lack of natural ventilation – no opening windows
- the need to service a large meeting room.

A Variable Air Volume (VAV) system was originally proposed for the building. These are common in office buildings, and modern systems can be reasonably efficient. However, they need considerable exterior plant space, unless space has been allowed for within the building.

Variable Refrigerant Volume (VRV) systems use reverse heat-cycle heat pumps and offer flexibility for customising air conditioning to meet the requirements of different areas. They also allow scope for optimising energy-efficient operation, in particular through heat recovery, and need less outdoor space than VAV systems.

The VRV system installed in Environment House allows for heat exchange to occur between areas needing heating and those needing cooling, improving its energy efficiency.

The choice of refrigerant is also important. Refrigerants can be ozone-depleting and add to global warming. The refrigerant in the installed system (R410A) is a zero ozone-depleting refrigerant and therefore the most environmentally friendly available.

Pointers

- Install a building management system.
- Select options that are as energy efficient as possible.

Lighting

Lighting accounts for one-third of the energy used in commercial spaces. About half of the lighting is wasted either through inefficient bulbs, poor design or improper maintenance.

The main reasons are:

- older bulbs and reflectors use inefficient technology and give off more heat than light (which in summer has to be removed by the air conditioning system, using more energy)
- companies don't effectively plan their lighting needs when they design their buildings or offices
- tenants don't move existing lighting to suit their changing layout needs
- over-lighting is a waste of energy.

Pointers

Plan your lighting carefully

- Look for opportunities to maximise natural light by placing offices in areas that get the most natural light. Placing open plan offices around the building perimeter maximises daylight. Cellular offices block out the light to other areas. Place cellular offices and meeting rooms near the core, or middle of the building so they don't block light.
- Work out how the office is going to be used and then allocate areas by:
 - general lighting to illuminate the office (the Green Star guide is 400 lux)
 - task lighting for desks or work stations to localise light to where it is really needed
 - accent lighting if required to create mood or to highlight a feature. Be economical with accent lighting as it generally isn't efficient to run.

Install a lighting control system

- Timers that switch lights off after a preset period are a suitable solution in open plan offices or large conference rooms where it is difficult to make a particular individual responsible for turning off lights.
- Occupancy sensors are another solution. These sensors turn lights off when they have not detected movement for around 15 minutes.
- Daylight dimming control systems can be very cost-effective over time. Ask your electrical engineers about DALI (Digital Addressable Lighting Interface) and similar systems.
- Ensure that switching to individual areas is provided and labelled so that during after-hours use, a whole floor doesn't need to be switched on.

Upgrade fittings or bulbs

- Install reflectors into fittings to redirect light. Without them about half the light from a fluorescent tube is absorbed by the inside of the fitting.
- Clean fittings regularly.
- Install 'occupancy sensors' in rooms that are infrequently used (toilets, store rooms, meeting rooms etc).
- Install electronic control gear and more efficient new-generation lamps to increase efficiency.
- Replace bright lamps with lower power ones in over-lit areas, or remove some lamps altogether.

Encourage energy saving behaviour

- Obtain "Switch Off when not in use" stickers for light switches from the Energy Efficiency and Conservation Authority.
- Remind people to switch off lights in meeting rooms and other rooms that are used only part of the time.

Useful resources and information

- Energy Efficiency and Conservation Authority for an energy audit publication. See: <http://www.eeca.govt.nz/>
- A technical guide on how to improve office lighting is available from the EECA improve website at: http://www.improve.org.nz/knowledgecentre/docs/Office_Lighting.doc

Case study: lighting

Lighting accounts for about 30% of the total energy consumed by an office building.

Most of the fittings at the Ministry are T5 fluorescents running off high-frequency ballasts with a highly reflective (KRN) fitting which maximises the amount of light reflected. The building's lighting control system includes occupancy sensors for intermittent-use areas such as stairs, toilets, utility areas and meeting rooms. Large numbers of switches for different areas enable specific sections of lighting to be turned off and on as required, rather than having to light entire floors.

The Ministry considered installing a lighting control system that would enable automatic sensing of daylight conditions, variable control in different areas and so on. The Digital Addressable Lighting Interface (DALI) system originally envisaged for the building:

- allows lights to be individually dimmed from 1% to 100%
- automatically dims lights near windows
- uses predetermined levels in meeting rooms so users can choose a level suited to the need
- sets reduced lighting levels (usually 15%) for cleaners, security rounds and so on.

This system has been successfully installed in the Treasury building but did not meet the cost/benefit assessment for inclusion during the construction process at Environment House.

The Ministry is looking at the possibility of a gradual rollout of DALI or a similar system during the first couple of years of its occupancy.

The Energy Efficiency and Conservation Authority has an excellent guide available on improving office lighting:
http://www.emprove.org.nz/knowledgecentre/energy_use/lighting/index.asp

Glazing

Glazing plays a role in the lighting, noise, insulation and glare of an office. Natural ventilation can be used as an alternative to air conditioning systems. Although not always an option in all office fit-outs, windows that open offer passive heating/cooling options.

Issues

- Air conditioning systems require energy to run (10%-50% of energy consumption).
- Sealed windows have been identified as a factor in Sick Building Syndrome (SBS).
- Personal control over temperature and ventilation positively influences work performance.
- Access to daylight is associated with more positive moods, stress reduction and increased job satisfaction.

Pointers

- Utilise existing opening windows.
- Consider replacing some, or all, non-opening windows with opening windows.

Useful resources and information

At present there is little information about glazing specifically targeted at commercial offices in New Zealand. The following list will be updated as more information becomes available.

- For a range of simple technical manuals showing glazing options visit the Australian Your Home website at: <http://www.greenhouse.gov.au/yourhome/technical/fs18a.htm>
- For an in-depth explanation of the Window Energy Rating Scheme (WERS) visit the WERS website: <http://www.wers.net/default.htm>
- For WERS in a New Zealand context with New Zealand localised WERS Star Charts visit the Window Association of New Zealand website: http://www.wanz.org.nz/star_charts.htm

Office Partitioning

Office partitioning contains various materials, including:

- aluminium componentry
- structural steel
- pinex softboard
- whiteboard MDF
- gypsum board wall
- clear and opaque glass
- panel finishes such as wool, wool blends, vinyl, upholstery and other synthetic fabrics.

Issues

Issues for partitioning are similar to those for office furniture and gypsum products outlined in the relevant checklists and may include:

- unsustainably harvested wood products
- possible emissions from formaldehyde, adhesives, binding agents, paints or finishes used in the product. Processed wood and wood waste products such as particleboard, chipboard, and hardboard often utilise formaldehyde-based resins as a binder or adhesive. Formaldehyde is considered a ‘probable’ carcinogen based on animal testing data. Formaldehyde-free particle boards are now available
- high quantities of heavy metals from mined gypsum, gypsum from the processing of flue gas in coal-fired power station, glass wool from recycled glass, and mineral wool from rock. These also create problems in the recovery of materials from these products
- environmental impacts associated with gypsum mining
- toxic smoke given off during a building fire.

Pointers

- Design your layout carefully. Most wastage comes from poor initial designs that are quickly changed.
- Use a flexible partitioning system that can be adjusted and repositioned easily. Avoid systems that cannot be moved without destroying most of the components.
- Timber systems offer some flexibility and have the lowest embedded energy, followed by steel and aluminium.
- Avoid using treated timber where possible (eg, for purely internal partitioning systems).
- Use formaldehyde-free particle boards.
- Partitioning systems that include recycled materials are now available, as well as ones using materials with very low embedded energy, such as bamboo. Use these where practicable.

Useful resources and information

- Government Procurement Timber and Timber Products Procurement Policy Guidelines. Available from the Ministry of Agriculture and Forestry: <http://www.maf.govt.nz/forestry/publications/timber-procurement-policy/>
- For examples of environmentally preferable product specific contract language, check out the US EPA website at: <http://www.epa.gov/opptintr/epp/tools/tools.htm>
- Building Research Association New Zealand (BRANZ) produce guidelines and publications in all areas of building and construction: http://www.branz.co.nz/main.php?page=BRANZ_Ltd_home
- Environmental Choice New Zealand Licence criteria for gypsum plasterboard products EC-19-01: <http://www.enviro-choice.org.nz/>
- Environmental Choice Canada: Criteria for gypsum wallboard: <http://www.environmentalchoice.com/>

Case study: partitions

Most of the partitioning used for the offices in Environmental House is glass/steel stud. However significant amounts of reuse occurred, including Huppé doors in the large meeting rooms and individual desk partitioning in open-plan areas.

Technical checklist

Key ingredients to avoid: Formaldehyde; high-VOC adhesives paints and finishes.

To help compare different products, use the following questionnaire with suppliers and/or manufacturers, when products with an ecolabel (eg, Environmental Choice New Zealand) are unavailable:

Do the timber products have a recognised Timber and Timber Product Certification Scheme, eg, Forest Stewardship Council (FSC)? (See Annex 2 of the Government Procurement Timber and Timber Products Procurement Policy Guidelines for a full list of recognised schemes.)	
If timber products are not certified, can you provide other evidence that the wood is sourced from sustainably managed forests or plantations that limit adverse habitat, biodiversity and toxicity impacts?	
If the timber is from a local source, can you provide evidence that the harvest is in compliance with New Zealand environmental legislation?	
Have low-VOC adhesives, paints and finishes been used on the product?	
Does the product contain recyclable materials such as steel and aluminium as well as products with a recycled content such as recycled PVC and post-consumer PET plastic?	
Is the product easy to disassemble into separate components to make eventual recycling easier?	
Does any gypsum board used include recycled gypsum content?	
Does the product include other recycled raw materials (eg, fabric offcuts)?	
What potential does the product have to release formaldehyde?	
Does the product have any impregnated, labelled, coated or other treatment that would prevent recycling in New Zealand?	

Floor Coverings

Floor coverings are a key item when looking for ‘big hits’ in sustainability – both because they are always used in large quantities in fit-outs and refurbishments, and because there are good options to choose between.

Carpet

Issues to consider

Manufacturing processes:

- raw materials – artificial, recycled or natural fibres?
- waste and toxic emissions
- energy use – both during the manufacturing process and for transport of the finished goods
- locally made or sourced from overseas?
- ISO 14001 or other accreditation for manufacturers.

During use:

- appeal to staff
- ease of installation and maintenance
- adhesives – levels of VOC emissions
- durability
- flexibility – can you make small changes easily?
- reusability
- look for natural latex, jute or woollen felt backing and underlay
- value for money.

After use:

- disposal options: recyclable or designed for disassembly?

Pointers

- Check out the Environmental Choice New Zealand Trust list for details of carpets that meet the Environmental Choice standards: <http://www.mfe.govt.nz/issues/sustainable-industry/govt3/topic-areas/enviro-choice-list.html>
- Ensure any adhesive used has the lowest possible VOC emissions. Water-based latex ones are typically best.
- Can you lease instead of buying the carpet, with a life-long servicing contract?
- Is it possible to use recycled product for underlay (if used)?

Useful resources and information

- Feltex has a range of carpets licensed by Environmental Choice: <http://www.feltexcommercial.com/environment.asp>
- Modular carpet tiles – Interface New Zealand: <http://www.interfacenz.com/>
- Modular carpet tiles – Ontera: <http://www.ontera.com.au/>
- Environmental Choice New Zealand Trust: Licence criteria (for wool-rich pile carpets EC-05-98 and wool pile carpets EC-04098): <http://www.enviro-choice.org.nz/>
- For examples of environmentally preferable product-specific contract language, consult the US EPA website at: <http://www.epa.gov/opptintr/epp/tools/toolsuite.htm>
- Environmental Choice Canada: Criteria for carpeting, commercial modular: <http://www.environmentalchoice.com/>
- Nordic Ecolabelling: Ecolabelling of flooring (English language version): <http://www.svanen.nu/Eng/default.asp>
- Carpet and Rug Institute United States: ‘Green Label’ Testing Programme – Carpet Criteria: <http://www.carpet-rug.com/>

Technical checklist

To help you compare different products, use the following questionnaire with suppliers and/or manufacturers:

Wool scouring process	
Does the scouring plant comply with any acts, regulations, bylaws and regional plans relating to the environmental impacts of the operation, eg, consented discharge of heavy effluent and meeting the consent conditions?	
Does the total water use measured at intake comply with or come below the Environmental Choice New Zealand Trust licence criteria for carpets?	
Are the detergents used to scour the product free of alkyl phenol?	
Was the insect-resistance treatment during the scouring process free of synthetic pyrethroids?	
Manufacturing process	
Do you have an environmental or sustainability programme in place?	
What chemical products are used for wool washing?	
What finishes and stainblockers are used during manufacturing?	
Are the yarn-scouring surfactants readily biodegradable?	
Is the washing and/or cleaning process free of the use of organic solvents?	
What other chemical compounds are used in the treatment or manufacturing processes?	
Is a minimum of 50% of process water recycled by the manufacturer or exclusively coloured using solution dyeing?	
Does the manufacturer have an energy management programme aimed at reducing the use of fossil fuels?	
Is the product accompanied by detailed instructions for proper application, maintenance and disposal methods?	

Does the product meet the required emission rates of volatile organic compounds (VOCs) as specified in the Environmental Choice New Zealand Trust licence criteria?	
Do you offer a take-back programme at the end of life and/or recycling of worn carpet throughout its life?	

Hard floor coverings

This category includes floor coverings such as parquet, wooden planks, laminate, vinyl and linoleum that:

- are fixed to the floor and laid on top of an underlying foundation of concrete or wood/beams, and
- have no structural purpose.

Issues to consider

Manufacturing processes:

- raw materials – recycled or natural fibres?
- sustainably harvested?
- waste and toxic emissions
- energy use
- locally made or sourced from overseas?
- ISO 14001 or other accreditation for manufacturers.

During use:

- appeal to staff
- ease of installation and maintenance
- adhesives for installation – formaldehyde and VOC emissions
- moisture underneath the floor covering (avoid formation of chemicals, fungus and bacterial growth, as found in ‘sick buildings’)
- cleaning agents
- maintenance and renovation methods (eg, sanding)
- durability
- flexibility – can you make small changes easily?
- reusability
- value for money.

After use:

- disposal options: reusable, recyclable or designed for disassembly?

Pointers

- Consult the Environmental Choice New Zealand Trust list for details of products that meet Environmental Choice standards (www.enviro-choice.org.nz)
- Ensure adhesives have the lowest possible VOC emissions. Water-based latex adhesives are most likely to be suitable. Some flooring products are now interlocking and require no adhesives.
- If looking at wooden flooring:
 - consider buying recycled or second-hand
 - choose sustainably grown timber – look for timber grown from New Zealand sustainably managed forests or for Forest Stewardship Council certification on imported wood.
- Ensure the product you choose is supplied with recommendations on underlay or base, adhesives, cleaning agents and methods, maintenance agents and methods, abrasion resistance treatment and renovation methods.
- Solid wood flooring, followed by linoleum (made of linseed oil, pine rosins, limestone and wood flour rendered onto a natural jute backing), has the highest use of renewable resources. Vinyl flooring has the highest use of non-renewable resources, but requires less land to produce the raw materials.

Useful resources and information

- The Good Wood Guide – a guide to purchasing wood from sustainably developed resources being developed by Greenpeace: <http://www.greenpeace.org.nz/campaigns/forests/goodwoodguide.asp>
- Forest Stewardship Council: <http://www.fsc.org/en/>
- Forbo linoleum flooring have an Environmental Choice enviro-choice label: <http://www.forbo.com/>

Case study: flooring/carpets

After considering the carpet tile alternatives, the Ministry made a policy to select from the range of carpets available from Environmental Choice.

For areas such as kitchens, we selected a linoleum product rather than vinyl and specified a water-based adhesive with low volatile organic compound (VOC) emissions.

Technical checklist

Key ingredients to avoid: heavy metals, chlorinated/brominated paraffins, brominated flame-retardants, organic tin compounds, phthalates or polybrominated diphenyl ethers.

To help you compare products, use the following questionnaire with suppliers and/or manufacturers:

Manufacturing process	
Does the manufacturer have an environmental or sustainability programme in place?	
Are the products used in manufacturing renewable or sustainably sourced? (eg, wood from Forest Stewardship Council approved sources)	
What chemical compounds are used in the treatment or manufacturing processes?	
Does the manufacturer have an energy management programme aimed at reducing the use of fossil fuels?	
Is the product accompanied by detailed instructions for proper application, maintenance and disposal methods?	
Does the product meet the required emission rates of volatile organic compounds (VOCs) as specified in the Environmental Choice New Zealand Trust licence criteria?	
Does the manufacturer offer a take-back programme at the end of life and/or recycling throughout its life?	

Water

Issues

- Conservation of water and energy.
- Health and safety issues for staff.
- Saving money – more efficient water use will save money for your organisation in water and energy bills.

Pointers

Nearly all offices have hot water available for hand washing, general kitchen use and in some cases for showering. There are plenty of ways of reducing demand for hot water:

Layout and design

- See if installing a hot water heater close to the point of use will improve the service and be more efficient.
- Where possible, design for dual plumbing to use recycled water for toilet flushing or a grey water system that recovers rainwater or other non-potable water for site irrigation.
- Minimise wastewater by using ultra low-flush toilets, low-flow shower heads, and other water conserving fixtures.
- Often hot water temperatures are set at over 70°C. Set the temperature to 65°C.
- Insulate hot water pipes between the cylinder and the tap to reduce heat loss.
- Showers use the most hot water; so specify low-flow shower heads. Specify low flow taps to conserve both hot and cold water.
- Stack kitchenettes, showers and toilets above each other to reduce the pipe runs and heat loss.
- Install a mixer valve to reduce the temperature of the water at the tap (also a good safety feature).
- Meter landscape water usage separately from buildings. Use micro-irrigation (which excludes sprinklers and high-pressure sprayers) to supply water in non-turf areas.
- Use state-of-the-art irrigation controllers and self-closing nozzles on hoses.

Use alternative energy sources

- Consider solar water heaters to supplement electricity. They can be cost-effective in buildings with high-use facilities such as gyms.
- Heat pumps, which use a compressor, can heat water far more efficiently than conventional heaters.

Use it wisely

- Ensure pipes and cylinders are insulated to reduce heat loss.
- Ensure the plumbing system is maintained to reduce wastage (leaky pipes and taps).
- If a dishwasher has heating elements, make sure the incoming water supply is cold (unless you have gas fired or solar hot water).
- Always do **full dishwasher loads**.

Useful resources and information

- Energy Efficiency and Conservation Authority for renewable energy information: <http://www.eeca.govt.nz/>
- New Zealand Solar Industries Association for information on New Zealand suppliers and installers of solar water heating systems: <http://www.solarindustries.org.nz/>

Case study: water

The Ministry for the Environment opted for point-of-use filtered/boiling water systems in each kitchen area to avoid the need for heating large amounts of standing water.

Solar options for bathrooms and showers were considered. However, this proved impractical because use patterns mean hot water requirements are generally low but – with showers – peak early when people arrive at work after cycling/walking and when solar-heated hot water is not at its most efficient.

Waste

An effective waste management plan is vital for planning and operating a sustainable office building – right from the initial stages of a fit-out or refurbishment. Much of the advice in the Getting Started section relates to effective waste reduction, including materials reuse and recycling.

- On the construction site:
 - ensure sub-contractors sign up to your policy of reducing waste, recycling and ‘measure twice and cut once’
 - have recycling bins on site during construction
 - Ask suppliers to avoid unnecessary packaging and take back reusable and recyclable packaging
 - whenever possible, design for and use prefabricated building materials
 - ensure building materials are sorted and stacked, and offcuts saved for later use
- In the building:
 - design the fit-out for the material sizes to minimise waste
 - design easily accessible areas for recycling bins inside and outside the building
 - build recycling facilities into cabinetry, it looks good and makes for ease of use.
 - re-use materials from previous buildings such as interior fittings and fixtures
 - use materials with recycled content
 - specify and use materials that are recyclable at end of life.

Useful resources and information

- The Sustainable Business Network for case studies, resources and advice on planning waste minimisation: <http://www.sustainable.org.nz/>
- Resource Efficiency in Building and Related Industries: *Your guide to reducing building material wastes*: <http://www.rebri.org.nz/>
- A Guide to Implementing Recycling Systems in Multi-Tenanted Office Buildings: <http://www.mfe.govt.nz/publications/sus-dev/recycling-jan04/html/index.html>
- Waitakere City Council’s Better Building Code Section 4 covers building waste: www.waitakere.govt.nz/AbtCit/ec/bldsus/pdf/bbc_sec4.pdf

Case study: waste

The Ministry found it difficult to insist on waste recycling and minimisation during construction. Specific advice has since been developed to make it easier to encourage construction teams in this area. See the REBRI website for further information: <http://www.rebri.org.nz/>

Fit-out waste was minimised by reusing materials as much as possible.

Waste-reduction systems have been integrated into the fit-out and operating arrangements. Staff do not have rubbish bins at their desks. Each person has a small (10cm x 10cm) box sitting on the desk for any non-recyclable rubbish. Paper goes into paper containers under desks, and then into recycling bins on each floor.

Food scraps are put into bags in recycling drawers in each floor's kitchen, and bottles and tins go into adjacent recycling bins. From there they are taken by cleaning staff to the basement, where there is also a large container for cardboard. Extensive consultation with the cleaning company was carried out to ensure cleaners understood what was required to operate the system. The organic waste bin is emptied once a week by a contractor who delivers to Living Earth (a compost manufacturer).

Office Furniture

Office furniture includes chairs and other types of seating, desks, tables, filing and storage cabinets and their associated components and accessories. These can be made from a variety of materials including metal, wood and wood-based products, plastic and fabric.

Issues

Some of the environmental issues associated with office furniture include:

- using wood from a non-sustainable harvest
- possible emissions from formaldehyde, adhesives, binding agents, paints or finishes used in the product
- HCFCs used as blowing agents for polyurethane foam
- metal plating process for furniture that can contain toxic chemicals and human carcinogens such as hexavalent chromium and nickel.

Pointers

- Reuse existing furniture where possible.
- Check the Environmental Choice list for any licensed products, including paints to be used for finishing: <http://www.mfe.govt.nz/issues/sustainable-industry/govt3/topic-areas/enviro-choice-list.html>
- Use the checklist (below) with suppliers and manufacturers if no Environmental Choice products are specified.
- Check the New Zealand Government Procurement Timber and Timber Products Procurement Policy Guidelines. The Government expects its agencies to take all reasonable steps to ensure that timber and timber products, including tropical timber and timber products, are from legally logged and sustainably managed sources. This includes rough-sawn and dressed timber; plywood and veneers; fabricated wood; wood structural components, fittings and joinery; and wooden furniture.

These Guidelines apply to procurements of products for use within New Zealand with a contract value over \$50,000. The Guidelines also state that sustainability issues should be considered in the procurement of timber valued at or below \$50,000. The Guidelines give a list of recognised timber and timber product certification schemes: <http://www.maf.govt.nz/forestry/publications/timber-procurement-policy/>

Useful resources and information

- For examples of environmentally preferable product-specific contract language, check out the US EPA website at: <http://www.epa.gov/opptintr/epp/tools/toolsuite.htm>
- Building Research Association New Zealand (BRANZ): Guidelines and publications in all areas of building and construction: http://www.branz.co.nz/main.php?page=BRANZ_Ltd_home
- Green Seal Choose Green Report – Office Furniture: http://www.doi.gov/oepc/reports/cgr_officefurn.pdf
- Government Procurement Timber and Timber Products Procurement Policy Guidelines. Available from the Ministry of Agriculture and Forestry: <http://www.maf.govt.nz/forestry/publications/timber-procurement-policy/>
- GREEN GUARD: Certification standards for low emitting products for the indoor environment. Air Quality Sciences Inc. USA: <http://www.greenguard.org/>
- Environmental Choice Canada: Criteria for office furniture and panel systems: <http://www.environmentalchoice.com/>
- Der Blauer-engel: Basic criteria for the award of the environmental label. Low-emission wood products and wood-base products RAL-UZ 38: <http://www.blauer-engel.de/>

Case study: furniture

Very little new furniture was used in Environment House, as the Ministry decided to re-use existing furniture, including screen dividers, desks, chairs, meeting tables, filing cabinets, book shelves etc.

Technical checklist

Key ingredients to avoid: formaldehyde, aldehydes, and 4-phenylcyclohexene, other volatile organic compounds, CFCs or HCFCs.

Use this checklist with your supplier or a manufacturer if there are no product specifications with environmental criteria or when products with an ecolabel (eg, Environmental Choice New Zealand) are unavailable.

Do the timber products have a recognised Timber and Timber Product Certification Scheme, eg, Forest Stewardship Council (FSC)? (See Annex 2 of the Government Procurement: Timber and Timber Products Procurement Policy Guidelines for a full list of recognised schemes.)	
If timber products are not certified, can you provide other evidence that the wood is sourced from sustainably managed forests or plantations that limit adverse habitat, biodiversity and toxicity impacts?	
If the timber is from a local source, can you provide evidence that the harvest is in compliance with New Zealand environmental legislation?	
Does the product contain low-VOC adhesives, paints and finishes?	
Was the manufacturing process free of carcinogenic and/or toxic chemicals wherever practicable? How?	
Were CFCs or HCFCs used as blowing agents in manufacturing any foam components?	

Can the product be remanufactured at the end of its life?	
Does the product contain recyclable materials such as steel and aluminium as well as products with a recycled content such as recycled PVC or post-consumer PET plastic?	
Is the product easy to disassemble? Or does it contain co-injected plastics, ie, materials that contain two types of plastic or plastic and a fibre (which makes recycling difficult)?	

Noise

Noise is an environmental and health issue of increasing concern, due, in part, to the move to open-plan design. In a modern open-plan office, noise can be distracting and stressful.

Office noise can be separated into three categories; ambient, transfer and external.

Ambient noise is the background noise associated with the office environment. Typically ambient noise is a composite of sounds from many sources within an office, where no particular sound is dominant.

Transfer noise is noise transferred, either airborne or by direct transfer, through a surface such as an internal meeting room wall.

External noise is generated from the external environment, such as traffic noise.

Pointers

- Specify HVAC and other mechanical systems that generate low noise levels.
- Soundproof office and meeting room partitions, and ceilings, to prevent noise transfer.
- Separate desks as much as possible, and/or make offices available for phone calls.
- Design layouts with sufficient quiet rooms and meeting rooms so staff can have the opportunity for uninterrupted phone conversations and meetings.

Useful resources and information

- Occupational safety and health service code of practice for the management of noise in the workplace is available from the Department of Labour at: <http://www.osh.dol.govt.nz/order/catalogue/15.shtml>
- Australian/New Zealand Standard AS/NZS 2107:2000 Acoustics – Recommended design sound levels and reverberation times for building interiors are available from Occupational Safety and Health at: <http://www.osh.dol.govt.nz/order/catalogue/pdf/noise2a-ac.pdf>
- The Australian Your Home website has a number of simple technical methods of reducing noise: <http://www.greenhouse.gov.au/yourhome/technical/fs53.htm>

Case study: noise

The Ministry chose an open plan layout for its new building which meant the issue of noise needed to be taken into consideration. The planning for, and location of, the senior staff offices, quiet rooms, and meeting rooms in Environment House allows an opportunity for all staff to access quiet areas for phone conversations and meetings. All of these spaces, and the ceiling on each floor, have been insulated with noise insulation to dull any sound generated by general office activities and the mechanical services installed in the ceiling cavities.

Safety

More often than not people's safety during the construction and end-use phases of a building project are seen as separate issues. However, decisions made during the development and design stages of a project can have an impact on the downstream safety of contractors and end-users. Safety should be made a priority from the very beginning of any building project and by bringing together architects, designers, contractors and end-users, devastating and costly accidents and delays can be minimised.

Issues

Some of the safety issues associated with a building project are:

- in New Zealand, construction workers are three times more likely to be killed and twice as likely to be seriously injured than in any other occupation
- proactive contractors have fewer costly accidents, which results in fewer project problems and delays.

Pointers

- Seek advice, for instance, from the Department of Labour, Occupational Health and Safety, or other organisations such as Site Safe.
- Bring all parties together early to consider how safety issues can be managed.
- During the design phase, consider how you will provide safe access to work areas and safety features (such as anchor points), for all maintenance and cleaning activities.
- Only use contractors and suppliers with a good health and safety record.
- Ensure the building is well maintained to minimise accidents associated with faulty or loose fixtures and fittings.
- Ensure there is a fire safety strategy in place, including fire drill training, and that all staff are familiar and comfortable with it.
- Provide first aid equipment, facilities and training.

Useful resources and information

- Site Safe New Zealand provides training for the construction industry: <http://www.sitesafe.org.nz/>
- A copy of the requirements of the Health and Safety in Employment Act 1992 and Regulations 1995 are available at: <http://www.osh.dol.govt.nz/order/catalogue/252.shtml>
- Best Practice Procurement in Construction and Infrastructure in New Zealand – New Zealand Construction Industry Council: <http://www.nzcic.co.nz/>
- A copy of the New Zealand injury prevention strategy is available from the ACC website at: <http://www.nzips.govt.nz/implementation/index.html#themes>

- The Health and Safety procurement guide *Achieving Excellence in Construction*, is available from the UK Office of Government Commerce at: <http://www.ogc.gov.uk/>

Glossary

Carcinogen	A chemical capable of causing cancer in humans or animals.
CFCs	Chlorofluorocarbon, a chemical compound found in many aerosol products or manufacturing processes and believed to be responsible for depleting the Earth's diminishing ozone layer.
Embedded energy	The energy used to manufacture a product.
Embodied energy	The energy used during the entire life-cycle of a commodity, ie, manufacture, transportation and disposal.
EMF electromagnetic field	Low-energy radiation that comes from the interaction of electric and magnetic fields. Sources include power lines, electric appliances, radio waves, microwaves, and others. Also called electromagnetic radiation.
Emulsion paint	A coating comprised of an emulsion of a resin binder in water.
Formaldehyde	An organic, carbon-containing gas chemical. It is a volatile organic compound. It poses health threats including headaches, fatigue, and moodiness, irritation of mucus membranes, respiratory problems, and cancer.
Halogenated solvent	Formed by substituting one of the halogen elements (chlorine, bromine, or fluorine) into a chemical compound to change both the physical and chemical natures of the compound.
HCFCs	One of a class of compounds used primarily as a CFC substitute. Work on CFC alternatives began in the late 1970s after the first warnings of CFC damage to stratospheric ozone. By adding hydrogen to the chemical formulation, chemists made CFCs less stable in the lower atmosphere enabling them to break down before reaching the ozone layer. However, HCFCs do release chlorine and have contributed more to atmospheric chlorine build-up than originally predicted.
ISO 14001	A series of international standards for environmental management systems (ISO 14001), life-cycle assessments, environmental audits, environmental labelling, environmental performance evaluation and environment-related terms and definitions.
Mutagen	Anything that can cause a change (or mutation) in the genetic material of a living cell.
Passive design strategies	Passive design is energy efficient design which makes the most of local conditions to make your building more comfortable while reducing your bills.
Polyvinyl chloride (PVC)	Widely used plastic and one of the major end-uses of chlorine. It is a polymer consisting of thousands of vinyl chloride monomer (VCM) molecules joined end to end in a chain. The pure polymer is hard, brittle and difficult to process, but it becomes flexible when plasticizers are added.

Solvent	A liquid capable of dissolving another substance to form a solution. Water is sometimes called “the universal solvent” because it dissolves so many things. Organic solvents are used in paints, varnishes, lacquers, industrial cleaners and printing inks, for example. The use of such solvents in coatings and cleaners has declined over the past several years, because the most common ones are toxic, contribute to air pollution and may be fire hazards.
Volatile organic compounds (VOCs)	Carbon-containing compounds that evaporate into the air (with a few exceptions). VOCs contribute to the formation of smog and/or may themselves be toxic. VOCs often have an odour, and some examples include gasoline, alcohol, and the solvents used in paints.