Waste Reduction – DEMOLITION

This guide is part of the REBRI series developed to encourage and assist everyone involved in the construction and demolition (C&D) industry to reduce waste disposal to landfill and cleanfill.

In the long term, design for deconstruction is a key solution to reducing waste at the end of a building's life. In the shorter term, however, reducing building waste by focusing on dismantling and deconstruction rather than demolition will help achieve this objective. This guide provides good practice guidance to:

- demolition firms
- building owners
- builders and developers.

The aims of this guide are to:

- help maximise the amount of material recovered at the end of a building's life (and reduce waste to landfill and cleanfill)
- foster environmental awareness among those involved in building demolition and deconstruction.

The guidelines cover:

- planning for deconstruction
- initial assessment of site and building
- reusable and recyclable building materials
- deconstruction scheduling
- monitoring and recording procedures
- tendering and contracts
- setting up a waste management system
- principles for deconstruction and dismantling
- on-site sorting and storage of materials
- when deconstruction is complete
- marketing and external accreditation
- training staff and subcontractors
- links, resources, and information.

Note that the focus of this guide is reducing waste. It is not a comprehensive guide to demolition or deconstruction. You will still need to:

- check with your city or district council for consent requirements under the Building Act (2004) or the Resource Management Act (1991)
- assess the current situation regarding markets for salvaged materials
- assess the costs and benefits of deconstruction, taking into account revenue from salvaged materials, transport costs, labour costs and time availability
- research or devise deconstruction techniques
- comply with the Health and Safety in Employment Act (1992).

The waste issue

Waste is generated on building sites during each phase of the building life cycle. Evidence suggests that C&D waste may represent up to 50% of all waste to landfills in New Zealand and the majority of waste to cleanfills or C&D dumps. That means that up to 1.7 million tonnes of C&D waste is sent to landfills every year and similar amounts to cleanfills.

That's a lot of waste to bury in the ground. Not only is this a waste of good resources, it is also filling up valuable landfill and cleanfill space and contributing to serious environmental problems such as air and water pollution. Increased consumer spending and the relatively low cost of waste disposal means that, unless we take action now, it is a problem that is likely to get bigger.

Waste minimisation is a principle of the Building Act 2004 and must be taken into account by local authorities when undertaking their duties under the Act.

Opportunities to reduce waste exist at all stages of construction and demolition projects. Most buildings that have reached the end of their desired life or are undergoing renovations have materials and systems that still have some useful life, and most items recovered from existing buildings can be reused or recycled into usable materials. It is well known that careful and selective dismantling and separation for reuse and recycling reduces the volume of waste disposed to landfill and cleanfill.

10 top tips for waste reduction during demolition

1. Have a plan for the project to maximise the salvage of building parts and materials.
2. Undertake an initial assessment of the site and create an inventory of all the types and quantities of materials to be salvaged, recycled or disposed of. Consider what could be reused on the site, such as concrete as recycled aggregate base course.
3. Can the building be relocated? This would mean very little waste is created.
4. Find markets for materials prior to the project starting. Refer to the Yellow Pages, industry directories (www.nothrow.co.nz) or trade magazines and websites.
5. Ensure the project manager or client schedules enough time for dismantling. Explain the difference in cost, environmental benefit and so on during the tender phase.
6. Mark out waste storage areas before dismantling begins to make the process smoother and help reduce damage to salvaged materials.
7. Dismantle buildings into components in the reverse order to construction. Do the soft strip of interiors manually to reduce damage. Keep latches, hinges, framing etc. with the window, door or other building part.
8. Separate the materials on site or at source to reduce the cost and time of handling materials. Store material types separately (metal, concrete, timber etc.).
9. Ensure safe and dry storage of salvaged items and careful removal from the site to reduce damage and contamination that could devalue the materials. Store material types separately (metal, concrete, timber etc.).
10. Market your services and the salvaged items to encourage the building industry to increase the use of second-hand materials. Use the Yellow Pages, industry directories (www.nothrow.co.nz) or trade magazines and websites.

The three Rs: reduce, reuse, recycle

Applying the three Rs of waste minimisation to your practices will lower the volume of waste going to landfill, reduce demand for new materials and conserve precious materials for use by future generations. The three Rs work in a hierarchy:

1. Reduce

Preventing waste from being created in the first place is the best way to reduce waste. The way products are designed, used or installed can prevent wastage in adhesives, packaging, off-cuts, extra finishes or cleaning products.

2. Reuse

Reusing materials as much as possible is the next best way to reduce waste. For building products, this could mean having reusable packaging or creating products that can be reinstalled or used for another purpose after their original use.

3. Recycle

Resources that have reached the end of their useful life and off-cuts of materials should be recycled where possible. Where products cannot be reused, the components or materials should be designed to be recycled at the end of their original use. Of course, recycling materials is not enough. You need to help create a market for recycled resources by designing products or promoting the use of products with high recycled content.

Benefits of reducing waste

While reducing waste is good for the environment, businesses that reduce waste through deconstruction may also experience the following benefits:

- Earning revenue from salvaged building parts.
- A high level of client satisfaction could enhance the company's image and encourage repeat business.
- The training and skills required for deconstruction can help to attract and retain employees who are keen to develop skills.
- Reduced risks from deconstruction that allows for correct removal and disposal of hazardous materials such as asbestos.
- Winning contracts for projects that specify waste reduction procedures.

Manual removal of windows (Ward

Planning for deconstruction

The amount of material that can be salvaged for reuse or recycling is largely dependent on the type of building being deconstructed, time constraints and the local recycling market. Good planning will help to improve salvage and reduce waste. Planning includes:

- developing a deconstruction plan
- undertaking an initial assessment of the site and building
- finding out what materials are recyclable or reusable and if possible arranging prior sales for salvaged and recyclable material
- developing an inventory of materials
- ensuring sufficient time is scheduled

- establishing monitoring and recording procedures
- establishing a system for managing waste.

These are discussed in detail in the following sections.

Deconstruction plan

Collate all the planning work into a written plan. Follow the Waste Management Plan template or adapt one for your own business.

The plan can then be used when tendering for contracts and to provide staff with information on the project and can be included as part of the application for a building consent, required for demolition of all buildings in New Zealand. The plan should include:

> The application for a consent to demolish commercial or industrial buildings must also include details of the work that will be undertaken and handling and disposal of hazardous materials.

- quantities of materials to be salvaged for reuse, recycled or sent for disposal
- destination and/or intended end use of the buildings various components, including appropriate disposal of residual waste
- deconstruction methodology and sequencing
- schedule for deconstruction
- location, security and protection of storage areas (if materials are to be stored on site) – clearly mark the location of all storage areas on a site plan if this is available
- details on materials handling and removal procedures, particularly on project sites with space constraints.

Initial assessment of site and building

An initial assessment of the building and the site will help identify salvage opportunities. At this stage, consider whether to sell the whole building or dismantle and sell individual parts.

Types of buildings likely to be good candidates for removal for reuse

- Structurally sound and generally weathertight to minimise rotted and decayed materials and with minimal borer damage.
- Able to be removed from the site (protected trees or other buildings may hinder removal).
- Examples of buildings that currently have a market for reuse are greenhouses, steel-framed warehouses, temporary buildings, houses that are good specimens (e.g. timber-framed, wooden houses such as turn of the century villas).

Ward Demolition.

Types of buildings likely to be good candidates for deconstruction

- Timber-framed with heavy timbers and beams or with unique timbers.
- Constructed with specialty materials such as native or hardwood flooring or wall timbers, multi-paned windows, architectural mouldings and unique doors or plumbing/electrical fixtures.
- Constructed with high-quality brick laid with low-quality mortar (to allow relatively easy break-up and cleaning).
- Structurally sound and generally weathertight to minimise rotted and decayed materials.
- Commercial buildings constructed using high-quality reusable items such as steel beams and steel cladding.

Paperwork

A review of paperwork to determine types of materials, construction techniques and the location of all services is a good place to start. Review plans, working drawings and engineers' reports obtained from your city or district council or from your client. The architect or engineer may have already prepared a deconstruction plan that includes:

- a list of building materials and components as well as their design or service life and the best options for reuse, refurbishment or recycling
- instructions on how to deconstruct elements.

Site survey

A survey of the site should be made to determine whether the building will be removed for reuse or deconstructed and to identify salvage opportunities and hazardous materials.

Consider involving some of the following people in the building assessment:

- Builder, carpenter, architect or anyone with expertise in the methods and materials of construction.
- Tradesperson experienced in repair/restoration of equipment, appliances, materials.
- Structural engineer/materials inspector who can provide information on the structural integrity of building components and/or the existence of hazardous materials requiring special handling.
- Someone who has a good understanding of the salvage value of building materials in the local market.

Tools to perform a building assessment:

- Inspection forms – to ensure that you have collected all the information you need.
- Camera – photographs can be helpful in recalling important characteristics of the building and the site.
- Hand/power tools – it may be useful to look behind walls or beneath flooring to verify the size and condition of structural components or the existence of hazardous materials.
- Respirators or dust masks – these should be worn whenever any cutting, drilling or removal of materials is done.

Inventory of materials

- Each material type in the building should be quantified using industry standard units of measurement.
- Evaluate each material for salvage for reuse, recycling or disposal.
- Determine costs and savings associated with reuse, recycling and disposal. Make sure you include payment for recyclables and reusable materials, reduced landfill/cleanfill disposal costs, transport costs and time required for sorting or preparing materials for reuse or recycling.
- Document the information using the REBRI Waste Management Plan (downloadable from www.rebri.org.nz).

During deconstruction of the DB Mangere Tavern in Auckland in 2005, Burrell Demolition Ltd were able to salvage all reinforcing steel, scrap metals and concrete (including roofing tiles), 90% of the doors and fittings and 80% of the framing timber.

Reusable and recyclable building materials

How do you know if a material is reusable or recyclable?

Most materials from demolition sites can be reused or recycled. The materials that are salvaged for reuse and recycling depend on:

- current facilities and market demand in your area, which may change over time
- quality and condition of materials
- time available for salvage.

To find out what materials have markets for reuse or recycling:

- talk to the client, architect and builder for the site about the possibility of reusing materials from deconstruction for construction or renovation on the same site
- find out what can be recycled in your area by using local waste recycling directories (www.branz.co.nz/REBRI_Recycling_Directory)
- find out if there is a demand for your waste by visiting www.nothrow.co.nz or www.zerowaste.co.nz/resources-education/buy-it-back-guide – these change often, so it pays to keep checking.

Do business with recycling operators, sorting facilities and other agencies that follow the REBRI Guide to C&D Resource Recovery or are accredited to a nationally recognised environmental management programme such as ISO14001 or Enviro-Mark® NZ. This way, you can have greater assurance that they are working to good environmental standards and are doing what they say they do.

Understand the requirements of your clients and any industry-accepted specifications

Each market will have their own specifications for recycled or reusable materials – it's best to confirm these before you start. Getting it wrong can cost you.

- Obtain specifications from recycling operators and supply materials according to the specifications. Things to check include:
  - material type
  - acceptable and unacceptable types of contamination or damage
  - minimum or maximum quantities accepted, including suitable containers or transportation requirements
  - documentation required, including waste tracking forms
  - sorting and handling requirements for each material type.
- Use the REBRI Waste Transfer Form to confirm to clients the source and nature of the C&D waste provided.

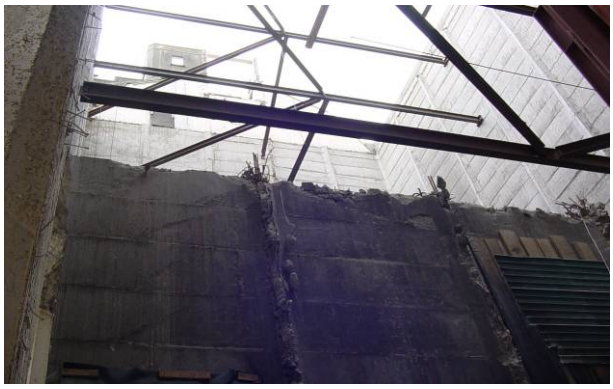
Building parts at Ward Demolition salvage yard, Auckland.

Reusable and recyclable building materials

Depending on local markets, in general, the following can be recycled or reused:

SITEWORK AND VEGETATION

- **Asphalt paving:** reusable, can be broken up and reused on site for temporary road construction. Can be removed and recycled.
- **Chain link fencing:** reusable or recyclable.
- **Wood fencing:** reusable.
- **Trees:** specimen trees can be removed and replanted. Vegetation can be mulched or chipped for use a groundcover, mulch, compost.



Steel beams and concrete panels can be recycled (Ward Demolition).

CONCRETE

- **Cast-in-place and precast concrete:** recyclable or can be reused either in construction, landscaping or earth stabilisation.

MASONRY

- **Concrete block:** reusable, if not concrete filled – recyclable if filled with concrete.
- **Paving stones:** reusable or recyclable.
- **Brick:** reusable, if set with lime-based mortar – recyclable if set with concrete. Can be used on site as landscape cover, sub-base material or fill.
- **Decorative concrete block:** reusable if not concrete filled – recyclable if filled with concrete.

METALS

- **Reinforcing steel (rebar):** recyclable – usually embedded in concrete therefore not reusable.
- **Steel and zinc roofing:** reusable, recyclable.
- **Steel flashing:** recyclable – usually not in suitable condition for reuse.
- **Interior metal wall studs:** recyclable.
- **Structural steel:** reusable, includes I-beams, square tubing, pipe and channel iron – otherwise recyclable.
- **Cast iron:** recyclable.
- **Copper:** recyclable.
- **Aluminium soffit:** recyclable.
- **Miscellaneous steel:** includes pipe, Q-decking, square tubing and Wilson joists **–** reusable, recyclable.
- **Copper flashing:** recyclable.
- **Roof drains, metal:** recyclable.
- **Lead:** recyclable.
- **Electrical and plumbing fixtures:** reusable (see below) – otherwise recyclable.

Metal sorted for recycling (Ward Demolition).

TIMBER

- **Untreated timber framing:** reusable – can be used as firewood or chipped into a mulch product.
- **Treated timber framing:** reusable.
- **Engineered timber panels:** reusable.
- **Untreated engineered timber panels:** reusable.
- **Hardwood flooring:** reusable, if tongue and groove flooring – thin strip flooring is not reusable (too thin for refinishing).
- **Laminated beams:** reusable.
- **Timber truss joists:** reusable.
- **Treated or untreated heavy timbers/posts:** reusable.
- **Joinery, windows, doors:** reusable (see below).
- **Untreated timber –** all types of untreated timber without finishings (paint, varnish etc.) that is not good enough for salvage can be separated for firewood or chipped into a mulch product.

Waste wood ready for processing into mulch (Crusaders Landscaping).

THERMAL INSULATION

- **Fibreglass bat insulation:** reusable.
- **Rigid fibreglass insulation:** reusable.
- **Polystyrene rigid insulation:** reusable – metal part of sandwich panel is recyclable.

DOORS AND WINDOWS

- **Doors – metal:** reusable with full frame and hardware.
- **Doors – timber:** reusable with full frame and hardware.
- **Bifold doors – metal:** reusable.
- **Bifold doors – timber:** reusable.
- **Overhead doors:** reusable.
- **Metal sliding doors:** reusable, recyclable by removing glass and recycling frame and glass separately.
- **Mechanical closures:** reusable.
- **Panic hardware:** reusable.
- **Patio doors:** reusable.
- **Aluminium windows:** reusable, recyclable by removing glass and recycling frame and glass separately.
- **Steel windows:** reusable, recyclable by removing glass and recycling metal frame and glass separately.
- **Sealed glass units:** reusable.
- **Unframed glass mirrors:** reusable.
- **Store fronts:** reusable, best to be kept in one unit.
- **Skylights:** reusable, ensure that seal is not broken.
- **Glass from windows and doors:** reusable, recyclable.
- **Wood or metal from frames**: recyclable.

Second-hand building materials at Ward Demolition salvage yard.

LININGS AND FINISHINGS

- **Carpet/carpet tiles:** reusable for original purpose or for planting projects, recyclable.
- **Terracotta tile:** reusable – otherwise recyclable with concrete.
- **Architraves and skirtings:** reusable.
- **Wood panelling:** reusable, recyclable – with untreated, check regarding paint/varnish finishes.
- **Specialty wood fittings:** reusable – includes mantels, built-in shelving, bookcases, crown mouldings and window sash.
- **Joinery:** reusable, recyclable.

ELECTRICAL AND PLUMBING FIXTURES AND FITTINGS

- **Baths, sinks, toilets etc:** reusable.
- **Taps:** reusable – metal is recyclable.
- **Switches:** reusable.
- **Light fittings:** reusable.
- **Service equipment:** stoves, heaters, air-conditioners all reusable – metal components recyclable.
- **Wiring**: recyclable without insulation.

HAZARDOUS MATERIALS

In the interests of health and safety you should check the removal and disposal requirements of hazardous materials with your city or district council. Hazardous wastes from demolition of buildings includes:

- fluorescent light ballasts manufactured prior to 1978 – contain PCBs
- fluorescent lamps – contain mercury

- refrigeration, air-conditioning and other equipment that contain refrigerants made using CFCs
- batteries – contain lead, mercury and acid
- paints, solvents and other hazardous fluids
- asbestos-based materials
- materials with lead-based finishes.

Deconstruction scheduling

The amount, type and condition of materials salvaged is affected by the time available to do the work and the methodology and sequencing of deconstruction. To maximise recovery rates and avoid contaminating or damaging materials (which then precludes reuse), it is important to:

- ensure adequate time is scheduled for deconstruction methods
- explain to clients that, because deconstruction involves careful planning and preparation and is more labour intensive than demolition, more time is required.
- use plans and working drawings to help determine how to deconstruct using reverse construction sequencing.

Monitoring and recording procedures

It is important to monitor the deconstruction project to ensure materials are salvaged, recycled and disposed of as specified and to provide valuable lessons for future work.

- Decide what will be recorded, for example:
  - materials salvaged and recycled or otherwise disposed of
  - a summary of amount (volume, quantity, number)
  - destinations, costs etc.
- Give one person the responsibility for recording information on materials recovered.
- Develop forms for recording information or use the REBRI Waste Management Plan (downloadable from www.rebri.org.nz).
- Set up a system to document transfer of the materials from the building site and their destination. Keeping invoices and receipts for all salvage and recycled materials is a good idea or use the REBRI Waste Transfer Form (downloadable from www.rebri.org.nz).

Tendering and contracts

Tendering process

Respond to tender requests for waste reduction practices by submitting a detailed deconstruction plan (use the REBRI Waste Management Plan template).

Contract documentation

Once the tender has been awarded, negotiate the terms of the contract to maximise the benefits of salvage and recycling.

- Agree the deconstruction plan with the principal, main contractor or client and with subcontractors. The deconstruction plan will form the basis for targets, on-site methods, responsibilities and so on.
- Identify a point of responsibility for maintaining materials and waste management. This will ensure that the deconstruction waste management plan is followed. Note it is important that the individuals responsible know who they are!

- Agree which party or parties receive financial benefits of recycling and salvage – this is usually the demolition contractor.
- Agree on any economic incentives for recycling and salvage with staff and subcontractors – this will help keep workers motivated.
- Consider the inclusion of salvage and recycling performance clauses in the contract.

Setting up a waste management system

Establishing the system for managing waste on site and ensuring adequate site preparation before dismantling begins will make the process smoother and help reduce damage to salvaged materials.

- On-site or off-site waste management? Decide whether you will separate waste types on site for various recycling, reuse and disposal options or haul mixed waste off site for sorting and separation. You could even have a combination of the two. Most deconstruction projects involve a large amount of on-site sorting. Key factors are:
  - space on site for waste and salvage materials storage areas (where space is limited, off-site sorting is usually best)
  - costs
  - availability of recycling services and waste haulers or whether you will transport your own waste, recyclables and salvaged building items from site
  - availability, training and commitment of the labour force on site
  - whether materials will be reused in the new development
  - whether materials will be directly on-sold from site
  - potential for damage or contamination during transportation off site or during storage on site.

When Ward Demolition deconstructed the Blows Building in Auckland in 1996, they salvaged 95% of the building and saved $153,000 on demolition costs, easily covering additional labour costs.

- Increased space for storage of materials is likely to be needed for deconstruction versus demolition.
- Check with clients, salvaged goods dealers and recycling operators regarding any particular specifications for storage and transportation.
- When designating the storage areas, consider space for loading and unloading containers, need for hoists etc.
- Clearly demarcate storage areas on the ground, for example, by using barriers such as salvaged concrete to create bays.
- Set up separate areas for sorting and storage of reusable and recyclable materials and ensure these areas are clearly marked.
- Contact waste recyclers and arrange containers for waste and suitable times for removing these from site.
- Negotiate recycling paybacks with local resource recovery firms.
- Provide separate bins, pallets or other containers for various materials and ensure these are clearly labelled.
- Use the RONZ symbols (downloadable from www.wasteminz.org.nz/pubs/ronz-symbols) or some other type of clear signage on containers.

- Provide and erect barriers and security devices around the site as required to protect the salvaged material from damage, mishandling, theft, vandalism and fire.
- If you undertake or contract for on-site processing of materials such as concrete or wood, see the REBRI resource recovery guidelines at www.rebri.org.nz. You will need to consider the opportunities for reuse on site, costs of removal, space for processing and availability of equipment.

Principles for deconstruction and dismantling

General principles for dismantling and deconstructing buildings

- Deconstruction is the reverse of construction – remove building parts in the reverse order to construction. Start with the soft strip of interior fittings, doors and linings, then remove the roofing, cladding, windows and finally framing and foundations.
- Multi-storey buildings are deconstructed floor by floor, beginning with the roof and upper floor.
- Undertake the soft strip manually with hand tools to minimise damage caused by large machinery.
- During the hard strip, preparation of materials may be required prior to removal, such as soaking wooden floors and fittings with water to avoid splitting.
- During the hard strip, dismantling of major components may be done in stages. Large scale removal of building parts such as flooring or roofing may be done initially, with excavators or cranes, followed by more detailed separation of components and contamination by hand (on-site or off-site).
- Photograph joinery and other building components in place prior to removal to indicate potential reuse and to give purchasers a better idea of how the joinery would look in place.
- Keep all hardware (hinges, screws, rollers, guides, keys etc.) together with the building component such as doors, windows, joinery, HVAC etc.
- Keep building components together for reuse, such as doors attached to frames.
- Label separated components as they are removed for easy reinstallation.
- Asbestos should only be removed by approved contractors.
- Storage and handling of recyclable and reusable materials should be done in a manner to reduce contamination and damage (see below).

Dismantling the Northern Roller Mills building, Auckland floor by floor (Ward Demolition).

After removing the roofing and bituminous and wire netting underlay from a 1970s commercial building in downtown Auckland, Ward Demolition then cut the 190 x 45 mm rafters into manageable lengths using a chainsaw (for speed), before stacking and transporting them to their used goods saleyard.

By soaking dry rimu strip flooring for 3 days, Ward Demolition were able to ensure that flooring from a 1970s house in Auckland could be removed intact and without splitting. The flooring was then cut into sections in preparation for hoisting by digger to a clear working space where the floor joists were then separated from the strip flooring manually, with both being salvaged.

On-site sorting and storage of materials

When sorting materials and components removed from buildings and preparing them for removal:

- obtain the specifications for materials from recycling operators or second-hand dealers prior to starting
- ensure different material types, sizes, grades, reusable and recyclable materials are kept separate
- sort materials according to dimensions and length
- do not mix treated and untreated wood
- sort directly into the containers that will be used for storage or removal to avoid rehandling
- remove contamination as you sort.

Stacking timber according to dimensions at Northern Roller Mills deconstruction.

Appropriate storage of salvaged items and materials will reduce damage and contamination that could preclude reuse or devalue the materials. In general, salvaged materials should be stored and handled in the same manner as for similar new materials.

- Store easily damaged materials indoors or under cover to protect from weather where possible, otherwise cover with canvas, plastic or other material to protect from sun and rain.
- Store materials to avoid cross-contamination and damage and to allow easy movement around the site.
- Stack and palletise masonry, roofing, cladding, tiles etc. for easy removal.
- Use clear signage for all storage areas and containers to avoid cross-contamination. Signage should include the type and grade of material and any instructions for product protection (for example, keep dry). Use the RONZ symbols (downloadable from www.wasteminz.org.nz/pubs/ronz-symbols).

Brick stacked for easy resale (Ward Demolition).

Refer to the specific REBRI guides for C&D resource recovery for more detailed information on how to best store concrete, timber and plasterboard.

Weatherboards and rafters removed from a house deconstructed by Ward Demolition were stacked according to type and size before being transported to their saleyard. At the saleyard, they were denailed and restacked ready for sale.

Residual waste disposal

Once you have followed up all possible avenues for reuse and recycling, you will need to ensure that residual waste is disposed of responsibly.

- Only use disposal facilities that are consented by the regional council or have met the 'permitted activity' status in regional plans. These records should be available from the disposal facilities or regional councils for you to view. Otherwise you risk fines or prosecution under the Resource Management Act (1991).
- Obtain waste acceptance criteria from disposal facilities and operate according to these criteria.
- Treated timber not separated for reuse should be disposed of to a municipal solid waste landfill.
- Asbestos should be disposed at a licensed municipal solid waste landfill.

When deconstruction is complete

Summarise the amount (volume, quantity, number) of materials reused and recycled or otherwise disposed of. Use the REBRI Waste Management Plan (downloadable from www.rebri.org.nz).

Evaluate the success of the deconstruction project by assessing:

- whether you recovered as much material as you expected (compare your estimates in the plan to the actual data from monitoring)
- how you could have recovered more
- whether deconstruction was more financially rewarding than demolition
- how much material was diverted from landfill and cleanfill
- ability to use the project for marketing purposes.

Marketing and external accreditation

Market your services and publicise your successes in deconstruction. The biggest barrier to salvage is a lack of knowledge in the design and building industry. Encourage the building industry to support the recycling market through your marketing.

- Emphasise your experience and success in deconstruction when marketing your services at www.nothrow.co.nz, buy recycled website (www.zerowaste.co.nz) and in the Yellow Pages (www.yellowpages.co.nz).
- Advertise in trade newspapers and websites, including www.trademe.co.nz and www.nothrow.co.nz.
- Provide information on your successes for articles in design and construction newsletters and magazines.
- Provide information to REBRI that can be used as case studies on the REBRI website (rebri@rebri.org.nz).
- Join the Enviro-Mark® NZ programme for external accreditation of your environmental management.
- Join industry organisations such as the Waste Management Institute of New Zealand, New Zealand Demolition and Asbestos Association or Sustainable Business Network to network with peers (see Links, resources and information).

Fletcher Construction and Hawkins Construction in Christchurch found that the Roof Shout, a monthly newsletter put out by the Canterbury Master Builders branch, was a good way to promote good waste reduction practice to construction companies.

Training staff and subcontractors

Training demolition staff and subcontractors is a key success factor for high recovery of building components. By understanding the process of transforming demolition materials into valuable products, workers take more care in recovering as much material as possible while ensuring minimal contamination. Most training in the industry is done on the job, so your training programme should reflect this.

- Ensure employees and subcontractors are aware of what they need to do and how they should do it. Consider providing documentation on resource recovery requirements, deconstruction techniques and sorting and storage requirements.
- Formalise the roles of senior staff as trainers and provide any training to enable them to be more effective on-the-job trainers.

- Emphasise the benefits of deconstruction and maximising resource recovery.
- Ensure accurate identification and planning for hazardous substances – the increased manual nature of deconstruction means that this is even more important. Occupational health and safety advisers may be able to assist.
- Consider using a formal job training programme through industry training organisations and/or apprenticeships.
- Consider the mix of staff experience on any project to ensure less experienced staff are mentored and managed by more experienced staff.
- Check documentation regularly and keep a record of training.

Links, resources and information

- ConsumerBuild – information about building and renovating homes in New Zealand www.consumerbuild.org.nz
- Enviro-Mark®NZ www.enviro-mark.co.nz
- New Zealand Demolition and Asbestos Association www.demolition-asbestos.co.nz
- New Zealand Waste Strategy www.mfe.govt.nz/publications/waste/waste-strategy
- Resource Efficiency in the Building and Related Industries (REBRI) www.rebri.org.nz
- Site Safe. www.sitesafe.org.nz
- Sustainable Business Network www.sustainable.org.nz
- The Waste Exchange www.nothrow.co.nz
- Waste Management Institute of New Zealand – WasteMINZ www.wasteminz.org.nz
- Yellow Pages www.yellowpages.co.nz
- Zero Waste Buy It Back Guide www.zerowaste.co.nz/resources-education/buy-it-back-guide

REBRI guidelines and tools

- Waste Reduction – Design and Planning
- Waste Reduction – Construction
- Waste Reduction – Demolition
- Waste Reduction – Building Products
- Waste Reduction – Home Renovation
- Easy Guide to Waste Reduction – Construction
- Easy Guide to Waste Reduction – Building Products
- Contract Specifications for Waste Management
- Waste Management Plan
- Waste Transfer Form

Glossary

- **C&D:** Construction and demolition – refers to the process of building or demolishing domestic or commercial buildings, excluding infrastructure.
- **Cleanfill:** Area for disposal of inert material that does not require the high containment standards of an engineered landfill. Also used to refer to such material. The material deposited in a cleanfill will typically be from construction and demolition activities and will generally comprise soil, rock, concrete, bricks and similar inert material so does not include compostable materials, hazardous or toxic materials.

- **Construction and demolition (C&D) waste:** Solid waste typically including building materials, packaging, metal, plasterboard, timber, concrete and rubble resulting from construction, renovation and demolition of buildings.
- **Demolition:** Rapid destruction of a building with little removal of salvageable items.
- **Deconstruction:** The process of taking a building apart, storing and handling materials in a manner that achieves maximum salvage and recycling of materials and safe removal and disposal of hazardous materials.
- **Dismantling:** Taking a building or building components apart in a manner that achieves maximum salvage and recycling of materials
- **Engineered wood products (EWP):** Timber products that have been manufactured from wood pulp, fibre or veneer, for example, fibreboard or plywood.
- **Hazardous:** Explosive, corrosive, toxic or reactive.
- **HVAC:** Heating, ventilation and air-conditioning.
- **Landfill:** A site for the disposal of waste materials by burial. Historically, landfills have been the most common methods of organised waste disposal and remain so in many places around the world.
- **Non-hazardous:** Exhibiting none of the characteristics of hazardous substances.
- **PPE:** Personal protective equipment.
- **Renovation:** Changes made to a building including structural alterations, additions and redecorating.
- **Reuse:** Repeated use of a product in the same form but not necessarily for the same purpose.
- **Recycle:** Any process by which waste and recyclable materials are transformed or collected for the purpose of being transferred into new products.
- **Salvage:** Removal of structural and non-structural building materials from residential, industrial, commercial and institutional buildings deconstruction projects for the purpose of reuse or recycling.
- **Source separation:** The act of keeping different types of waste materials separate from other wastes from the moment they become waste,
- **Triple bottom line:** An assessment method that incorporates financial, environmental and social factors rather than just economic factors to make a decision.
- **Waste:** Any product or material resulting from the construction or demolition process that is surplus to or not included in the finished building

What is REBRI?

The REBRI waste reduction guidelines have been developed to encourage and assist everyone involved in the construction and demolition industry to reduce waste. REBRI stands for Resource Efficiency in the Building and Related Industries and started in 1995 as a collaborative effort between Auckland councils and BRANZ to undertake research and raise awareness of the issues of waste and the efficient use of resources in C&D projects. A consortium of councils, BRANZ, Recycling Operators of New Zealand and the Ministry for the Environment, with assistance from Winstone Wallboards Limited and industry representatives, extended the initiative in 2003 to undertake more research and develop national waste reduction guidelines.

Our thanks goes to the numerous individuals and organisations in the building and resource recovery industry, research organisations and in local and central government that have helped to develop these guides through participation at workshops, review of drafts and otherwise providing advice and time to the project.