BRANZ

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BULLETIN

REDUCING CONSTRUCTION AND DEMOLITION WASTE

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- There are growing pressures to reduce construction and demolition waste, with the possibility that this may be a requirement imposed on the industry in the future.
- Construction and demolition produces around 30–50% of total waste sent to landfill, but on most building sites, waste can be cut by at least half, with considerable benefits.
- This bulletin updates and replaces Bulletin 523 *Reducing waste from building sites*. It focuses on houses and small buildings.

1 INTRODUCTION

1.0.1 Construction of a typical new house in Aotearoa New Zealand generates an average of 4 tonnes of waste, and most of this is trucked to landfills or cleanfills. One study found that only 28% of waste from construction sites is diverted from landfill. Construction and demolition waste makes up a third to a half of all waste going to landfills and cleanfills.

1.0.2 Most of Aotearoa New Zealand's construction waste comes from demolition materials, construction off-cuts, packaging, unwanted surplus materials, temporary structures such as concrete formwork, material used for protection and products damaged during transport, storage or rework. Considering individual materials, an Auckland study found that construction waste by weight is made up of timber (20%), plasterboard (13%), packaging (5%), metal (5%) and other (45%).

1.0.3 This high level of waste comes with considerable costs (with financial costs usually passed on to the client). Overall costs include:

- the purchase cost of the material that ends up going to landfill
- the costs of cartage and the waste disposal levy (which is increasing – see section 7)
- the cost of waste in terms of greenhouse gas emissions (see 1.0.5)
- loss of potentially salvageable/recyclable materials.

1.0.4 Many local authorities now have plans or strategies that aim to reduce waste going to landfill, including construction and demolition waste. For example, Auckland Council has a vision of zero waste by 2040 and has set a long-term target in its Waste Management and Minimisation Plan of reducing total waste to landfill by 30% by 2027. To achieve these goals, the half a million tonnes of construction and demolition waste produced in the city each year must be significantly reduced.

1.0.5 Minimising waste is a key part of the building industry's move to lower-carbon construction, contributing to Aotearoa New Zealand's commitment to a net-zero carbon economy by 2050. This happens through reduction in the emissions from material manufacture, as the volume of material going to waste is reduced. Reducing the volumes going to waste also reduces the emissions from landfills themselves, estimated to contribute 4% of New Zealand's total methane gas emissions. It is possible that reducing construction waste will become a requirement in future years under the Ministry for Business, Innovation and Employment's Building for Climate Change programme.

1.0.6 There are many initiatives under way around the country to reduce waste. These are not happening in isolation – they are part of a much wider change in the way the construction industry works. Traditionally, building has operated as a one-way, linear economy, starting off with the extraction of raw materials and ending up with large volumes of waste trucked to landfills. With climate change and other considerations in mind, there is a push towards bringing in a circular economy where waste is designed out as far as possible. Materials and products are designed for a long life and are able to be repaired and eventually disassembled and reused or recycled. The process has long-term financial and environmental advantages.

1.0.7 Effective waste reduction on an individual project requires development of a site-specific plan (see section 4), getting buy-in from staff, subcontractors, suppliers and the client, engaging with a reputable specialist waste/salvage contractor, following the plan and tracking progress throughout the project.

1.0.8 Reductions in waste are already required by many building owners. For example, Kāinga Ora has a target of diverting 80% of waste from landfill in its large development projects. It aims to reuse or recycle up to 80% of building materials (excluding contaminated materials). The target has been extended to include small to medium public housing developments in Auckland, with other regions to follow. Other public agencies have similar requirements.

1.0.9 Reducing waste has wider benefits beyond the environment. For example, reducing waste can make it easier for homeowners to get a Homestar rating for their home because construction waste is a consideration in Homestar, as it is for other rating schemes. All Green Star rating tools include a credit connected to construction and demolition waste.

1.0.10 Some regions have considerable resources and services available to support waste reduction and recycling, others less so.

1.0.11 This bulletin updates and replaces Bulletin 523 *Reducing waste from building sites*. It applies to housing and small buildings.

2 FOLLOWING THE 5 RS

2.0.1 A simple way of understanding the different processes involved in waste management is through the 5 Rs. There are many variations of this around, but the key elements can be summed up with the words reject, reduce, reuse, repair and recycle (Figure 1).

2.0.2 Reject: This is saying that you will not use certain wasteful products or materials at all, such as products that cannot be repaired, reused or recycled, when there are other options available. This also applies to unnecessary or excessive packaging, which is a significant source of construction waste.

2.0.3 Reduce: There are different elements to this. On a large scale, it means ensuring a building is no larger than it need be. On a smaller scale, it includes things like reducing off-cuts through designing to match standard product sizes or locating a bathroom next to a laundry so hot water pipe length can be reduced.

2.0.4 Reuse: This means, for example, keeping hold of off-cuts above a certain size and then using them when a small piece of material is required. This is more easily achieved in the clean factory conditions of off-site construction but is still possible to a certain extent on a building site. Reuse can also apply to whole buildings, relocating houses for reuse/refurbishment elsewhere.

2.0.5 Repair: Instead of throwing things away at the first sign of a fault and buying a new replacement, repair whenever possible. When buying new products, choose products that can be repaired rather than ones that can only be dumped.

2.0.6 Recycle: This is where materials are collected by a salvage company or taken back by a manufacturer to be reprocessed into new product. Materials such as glass, aluminium and steel are all recyclable. Around 85% of steel in New Zealand is recycled. In some cases, the cycle sees material transformed into a different product to the original one. For example, concrete may be crushed and used as aggregate in new concrete or used as a base for paving or roading.

2.0.7 Where none of the 5 Rs are possible, disposal at a landfill or waste facility is the last resort. This is the least preferred way to manage waste, as the explanation of a circular economy versus a linear economy (in 1.0.6 above) makes clear.

3 DESIGNING TO REDUCE WASTE

3.0.1 A large opportunity to reduce waste occurs at the design stage, starting from the very early days of a project.

3.0.2 These are some of the key considerations at the planning stage:

- Determine the needs of the client and design a building that fills the requirements without being larger than necessary.
- On sloping sites, look for a design that minimises the excavation required.
- Design the building to be flexible for future uses. In particular, use the principles of universal design to ensure that the building can be used without alteration or renovation by people of different ages and levels of mobility (see www.branz.co.nz/universal-design for helpful resources). Also think long term. For example, a house built on a suspended timber floor could be relocated if necessary at a future date.
- Where the building work is a renovation, avoid unnecessary changes to parts of the building in good condition. Determine whether the work can be done without structural changes that require demolition and waste removal. Consider how existing materials and components in the building can be reused. Repair/restore components rather than replacing them.

3.0.3 Consider off-site construction for at least part of the project beyond frame and truss. The fact that off-site work takes place in a clean, controlled environment rather than in all weathers on a building site means greater precision and less waste – a reduction in waste of three-quarters or more is possible compared to on-site construction. In some off-site construction today, just 2–3% of the materials that come in the door end up going to landfill.

Figure 1. The 5 Rs of waste reduction.

3.1 MATERIAL AND PRODUCT SELECTION

3.1.1 Identify the commercially available standard sizes for construction materials (plasterboard sheets, profiled metal sheets and so on) and then design to take account of these, minimising waste from off-cuts.

3.1.2 Specify products and materials that can be installed in a way that allows easy disassembly for reuse/recycling. For example, materials or products installed using screws, clips and bolts can more easily be taken apart than products fixed with adhesive. (Adhesives, protective or decorative coatings, spray foam insulation and other products also contribute to contamination of materials that prevents easy reuse/recycling.)

3.1.3 Consider the implications of materials that require frequent maintenance and must be replaced multiple times over the service life of the building. For example, carpets have a comparatively large carbon footprint over the service life of a house and create waste because they must be replaced periodically. Hardwood flooring from sustainably managed forests is one example of a flooring material with a much lower carbon footprint in comparison.

3.1.4 Where possible, give preference to manufacturers and suppliers who:

- offer a take-back service for surplus, off-cuts, scrap and packaging
- can tailor manufacturing to a client's specifications to reduce the need for resizing on site
- design their product range to suit standard sizes of other products in Aotearoa New Zealand
- have ways to update part of the product rather than the whole product during renovations – for example, interchangeable veneers or components
- supply guidance or materials to repair their products, extending their life
- provide information about recycling their products
- recycle their waste product back into new product
- use materials from other waste streams – for example, one wallboard manufacturer uses recycled packaging material from a drink manufacturer in their products
- have minimal packaging
- provide reusable or recyclable packaging
- provide environmental product declarations (EPDs) for their products – an EPD is an independently verified public declaration of environmental performance of a material or product
- have environmental credentials – for example, products carrying logos such as those of Environmental Choice New Zealand.

3.1.5 Where appropriate, look for opportunities to use recovered products, subject to them meeting specifications and Building Code requirements.

4 DEVELOP A SITE-SPECIFIC WASTE MANAGEMENT PLAN

4.0.1 A site-specific waste management plan should be developed by the main building contractor in conjunction with the waste/salvage contractor(s) being used for the project and agreed between the main contractor, designer, subcontractors, materials suppliers and client.

4.0.2 Subcontractors will usually follow the main contractor's plan. Subcontractors who have sole responsibility for their waste should complete their own waste management plan.

4.0.3 The REBRI resource on the BRANZ website (www.branz.co.nz/sustainable-building/reducing-building-waste/rebri) is a source of useful support, including:
- a waste management plan template
- guidance on assessing waste streams
- a New Zealand recycling directory
- a resource routing calculator to determine what materials will be recycled
- case studies and links to other useful sites.

4.0.4 A waste management plan should:
- identify who is responsible for ensuring the plan is carried out and for tracking progress
- identify who is in charge of managing waste on site
- identify the specific techniques that will be used to reduce/avoid waste – for example, careful handling and storage of materials and protection of products/materials already installed
- estimate the waste types and amounts involved
- set targets for reducing the amount of waste sent to landfill – work out who will keep track of this and what will be done if targets are not being achieved
- specify materials to be separated on site for reuse or recycling and those that will be co-mingled for separation off site
- identify the destination for different materials – for example, paint containers and insulation returned to the manufacturers
- specify how separation of waste materials will take place – for example, the bins/containers to be used
- specify where waste materials will be stored and taken from the site
- describe any special methods for using or handling materials, particularly for hazardous materials
- identify any incentives for recycling
- specify how progress will be tracked and when the plan will be reviewed.

4.0.5 The New Zealand Ecolabelling Trust (which administers Environmental Choice New Zealand) has developed a specification for construction and demolition waste management to help reduce the amount of waste going to landfills. You can find details at www.environmentalchoice.org.nz.

5 MANAGING WASTE ON SITE

5.0.1 Long before materials begin to arrive and construction starts on site, the salvage/waste contractor you will work with will have been identified and a site-specific waste management plan developed.

5.0.2 Work out exactly where, when and how the sorting of waste will be done. Lack of time and space is a key obstacle to sorting and storing materials for reuse/recycling, so early planning is important. Think about when waste materials will be generated – for example, concrete/rubble during site preparation and foundations, timber during framing, plasterboard during internal lining, packaging during fit-out. You may be able to have dedicated bins for materials at different stages, such as a smaller container in the garage for plasterboard off-cuts during lining. Work out how to maintain the quality (and therefore value) of unwanted materials – for example, plasterboard should be kept clean and under cover.

5.0.3 Work out where new construction materials are going to be stored so they will stay clean and dry. Choose storage locations where they will not have to be moved until they are used. Ensure that storage complies with material manufacturers' requirements.

5.0.4 When ordering building materials, take care to order correct sizes and quantities and arrange for delivery as required to minimise storage time on site.

5.0.5 Talk to suppliers about how waste from packaging can be reduced. For example, some suppliers offer reusable tarpaulins rather than plastic covers.

5.0.6 To help reduce material waste on site:
- centralise timber cutting at locations close to the timber waste skip, relocating if necessary as construction progresses
- store materials in sorted sizes where appropriate – make sure unused nails and fastenings are not left lying about
- only mix quantities of materials such as plaster and concrete that can be fully used
- form up accurately with reusable formwork
- only use concrete pumping for large pours to minimise wastage required to prime the pump and hopper – use a skip or barrow for small pours
- keep the site tidy.

5.0.7 A large proportion of materials from construction/demolition sites can be reused or recycled. The materials that are recyclable at any given time and location depend on the salvage facilities and market demand in an area and the quality and condition of materials. Materials and products that can potentially be diverted from landfill include:
- brick – clay pavers, flagstones, tiles, blocks, pipes
- timber
- concrete – overpour, temporary works, damaged units
- insulation materials – glasswool, polyester, polystyrene, polyisocyanurate, rockwool, macerated paper, sheep's wool
- steel – reinforcing, wire, containers, steel framing, strapping, damaged fixings
- copper, brass and aluminium
- paper and cardboard – packing and documentation
- plasterboard
- plastics – types 1 and 2 (PET and HDPE)
- cleanfill – rock, clay
- topsoil – what can't be reused on site can be sold.

6 DECONSTRUCTION RATHER THAN DEMOLITION

6.0.1 When a building is no longer required on a particular site, the first question to ask is whether the entire building has a potential use on another site. For example, the best option for many timber-framed houses on suspended floors will be to relocate them to other sites and then carry out renovations – taking this type of building apart should be a last resort.

6.0.2 Where an unwanted building cannot be moved, it should be deconstructed. Deconstruction aims to reuse and recycle as many construction materials as possible that may otherwise go to landfill. It is easier to achieve if it was part of the consideration in the original building design, but it can still be achieved even if this was not the case. Because deconstruction can take longer to carry out than demolition, planning should begin early. (Note that, while materials recovered from old buildings have some uses, they cannot automatically be used in new building work unless the building consent authority can be convinced that they comply with current Building Code requirements.)

6.0.3 A growing number of companies specialise in deconstruction, and some have targets of salvaging more than 90% of the material from the projects they work on. Supporting them are waste recovery companies that take a wide assortment of salvaged materials.

6.0.4 There are numerous examples of successful building deconstruction in Aotearoa New Zealand. As part of a pilot programme, Kāinga Ora deconstructed eight old houses in a Mount Albert development in 2020. Working with a deconstruction company, 85% of materials – 203 tonnes – were diverted from landfill. Materials recovered included 37 doors, native timber flooring and joists, timber weatherboards, bricks and iron sheets. The deconstruction came at a cost and within a timeframe similar to conventional demolition.

6.0.5 An Auckland Council report, *Cost benefit analysis of construction and demolition waste diversion from landfill,* found that deconstruction is a more labour-intensive approach to remove buildings compared to demolition. It found that, financially, deconstruction rather than demolition is breakeven for developers but financial gains will improve for developers as the waste disposal levy increases, which is happening at the moment. The report found that, looking beyond the cost/benefit for developers, deconstruction rather than demolition had considerable benefits for wider society.

7 THE WASTE DISPOSAL LEVY

7.0.1 A levy of $10 per tonne (excluding GST) was imposed on municipal landfill waste in 2009. This had little impact in the building industry because large quantities of waste from construction and demolition do not go to municipal landfills – they go to cleanfills and other sites – and were therefore never subject to the levy.

7.0.2 In July 2021, the government began increasing the levy and expanding its cover (Table 1). The levy for municipal landfills will be increased in stages until it reaches $60 per tonne in July 2024. Construction and demolition fill (class 2) will attract a levy of $20 per tonne from July 2022, rising to $30 per tonne in July 2024. Managed or controlled fill facilities (class 3 and 4) will have a levy of $10 per tonne introduced in July 2023.

7.0.3 The changes are likely to have an impact – some industry calculations have found that a $10 per tonne levy may double disposal costs.

8 MORE INFORMATION

BRANZ RESOURCES

Building Basics *Minimising waste*

Designing for maintenance

REBRI: Resource efficiency in the building and related industries – www.branz.co.nz/sustainable-building/reducing-building-waste/rebri

Table 1. Changes to the waste disposal levy.

Type of disposal facility	Type of waste	Levy rate (NZ$ per tonne of waste excluding GST)			
		1 July 2021 – 30 June 2022	1 July 2022 – 30 June 2023	1 July 2023 – 30 June 2024	From 1 July 2024 onwards
Municipal landfill (class 1)	Mixed waste from residential, commercial and industrial sources	$20	$30	$50	$60
Construction and demolition fill (class 2)	Solid construction and demolition waste (rubble, timber, plasterboard etc.)		$20	$20	$30
Managed or controlled fill facility (classes 3 and 4)	Soil and rubble (uncontaminated and non-hazardous contaminated)			$10	$10

Universal Design – www.branz.co.nz/universal-design

Level: The authority on sustainable building – www.level.org.nz

Other resources

New Zealand Green Building Council – New Zealand Green Star Construction & Demolition Waste Reporting Criteria – www.nzgbc.org.nz

New Zealand Ecolabelling Trust – Licence Criteria for Construction & Demolition Waste Services – www.environmentalchoice.org.nz

CivilShare is a marketplace for people in the construction industry to buy, sell, trade and share resources, thereby avoiding landfill. The service is free and has both web or smartphone app options. Launched in 1989, it has diverted thousands of tonnes away from landfill – www.civilshare.co.nz

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