

Construction waste

A reuse/recycling revolution

With perhaps 30% of waste in landfill coming from construction, what can a sustainably motivated architect or builder do? Robyn Deed and Emily Braham talk to a few about the practicalities of reducing waste.

IT SEEMS that the problem of construction waste is a difficult one, even for those builders and architects motivated to do something about it. Even when architects or designers avoid demolition where possible, size a home appropriately rather than excessively and use the least wasteful approach to materials, there will still be waste, albeit reduced.

Common building practice has been to use skips on-site to collect waste. Many companies will separate valuable waste, such as bricks or steel, and recycle some materials as well, but it can be difficult to manage, particularly on small sites and for small companies.

For larger companies, recyclers may be willing to pick up the larger quantities of recyclables their building sites produce, but a lot of waste still makes its way to landfill. The figures vary from year to year and state to state, but in 2010–11 waste from construction and demolition made up around 30% (by weight) of landfill in Australia*.

Interestingly, in 2010–11 the construction industry had the highest resource recovery rate, at around 66% nationally, compared to the other waste streams of household waste (51%) and commercial/industrial (59%). But it could be higher, with some suggesting that 96% or more could be reused or recycled.

In *ReNew 132*, The Green Swing noted that standard practice for a sustainably minded client is to build waste management into the build tender documents, but that this may mean very little in practice. The client is generally not on-site to control what actually happens. The Green Swing's approach was to instead choose a builder early on in the design process and work with them collaboratively



↑ Recycling facilities tend to be made for big trucks, so are often unsuitable or even dangerous for smaller users, that's if they let you use them.

to ensure sustainable material choices and good waste management.

But what does good waste management look like in practice? Below, two architects discuss the challenges and the effort involved in doing it well.

Case study 1: The realities of waste

Jeremy Spencer from Positive Footprints describes the approaches they've tried, and what's worked and what hasn't.

The first method we tried was to separate recycling as we went along using individual black bins on site. Although this worked to an extent, it was difficult to get tradespeople to adopt it consistently; you need a really good induction so that everyone understands what you are trying to achieve and why. As our company got bigger, this system became

harder to manage. And, once mess starts on-site, it often escalates and is hard to then control.

Even if you've inducted everyone on site and had the difficult conversations with those that haven't been doing it properly, you then have to physically manage the recycling. Recycling facilities tend to be made for really big trucks so it can be quite dangerous to use them with a trailer—if they let you in at all; sometimes they say you are too small. You end up spending a day going around different recycling facilities for specific materials. This represents significant cost and time expenditure when you have multiple jobs. Steel is really the only one which covers your time; you would get around \$150 for a steel roof, which makes it just worthwhile financially.

We now use a firm called Mobius Materials

- One of the systems tried by Positive Footprints to organise waste. It worked but got difficult to manage as the company got bigger.



- The sorting line at Mobius Materials Recovery, which claims to recycle up to 96% of waste it collects from building sites. The company does a lot of manual sorting as well as using purpose-built machinery to separate out items that can be recycled or reused, such as soil (for landscaping and infill), concrete, bricks and roof tiles (crushed and fed back into projects), plastic (separated into rigid and film and sent for recycling), polystyrene (taken to a recycling facility from where it's sent overseas), metal (taken to a recycling facility), timber (generally shredded and reused in flooring). Mobius is a new venture, set up two years ago with the aim of both providing a for-profit service to the construction industry and helping to educate about waste. They provide a report to building companies on the quantity of waste generated and recycled per project.



Image: Alistair McCaskill

Recovery which does the sorting and recycling of our building site waste. We still reuse materials on-site where we can, but all waste is put into a cage that Mobius provides, which they then collect for recycling and reuse.

The average building job would likely produce at least 20m³ of waste which would be taken to landfill. Using Mobius costs slightly more than a standard skip, but not a lot more. We've found that, as the cages are kept permanently on-site, it also keeps things clean and is really convenient. The only things that can't go in to the bins are liquids, asbestos, and other hazardous wastes.

For paint wash-up and disposal, we create a wet area away from drains: we dig a pit, line it with paper and then place the liquids in that—once it dries you can put it into the (landfill) bin.

Case study 2: Recycle what you can
Your Abode has found they can manage the recycling of some but not all materials. Darryn Parkinson describes their approach.

On every project we seek to recycle as much construction waste as possible and limit the amount of material going to landfill. It takes us a lot longer, but we do this because we

simply feel it's the right thing.

It's very project-specific, but typically we find 60% to 80% of waste materials can be recycled (by weight that is). Volume-wise it may be less because a lot of the non-recyclable waste, such as foam packaging, is bulky, but weighs very little.

The major issue is the space required. Rather than the old-school idea of having one pile of waste, or one skip with everything going into it, we need to manage up to five separate waste streams on a site, which takes up space.

We typically separate metal, clean timber, cardboard/paper, bricks/concrete and general plastic containers. There are a number of locations around Sydney where we can take these for recycling. The clean timber is chipped into garden mulch, the bricks and concrete are crushed into recycled roadbase, and metal is scrapped into a metal recycling stream.

Generally our trades respond well once they understand what we are doing and why we are doing it. Managing it is sometimes still an issue though, and we find ourselves having to carry out one final re-sort before the waste leaves the site.

Good building waste control and management is still a rare thing. A significant

reason for this is that there are so few locations that actually take and recycle waste. Plasterboard waste is fully recyclable but very few locations take it. Similarly with a lot of plastic waste, such as the drums that electrical cables are rolled onto, empty paint containers, offcuts of electrical cabling and plumbing pipework.

At the end of a project, I constantly despair at the waste from packaging. Appliances, fixtures and fittings are all wrapped in an excess of plastics and foam for protection, which should be recyclable but largely ends up in landfill.

One way to motivate more action in this area is to realise that building waste is essentially money being thrown away.

Money and regulation

To what extent can builders save money by reducing waste? There are several aspects to this: the cost of disposing of waste in landfill, the cost of paying for materials that aren't used, and the value of old materials able to be sold. A report by Hyder Consulting in 2011 on waste management in Australia identified that landfill levies on construction waste vary across jurisdictions (from \$42 to \$102 per

tonne in 2009 according to the Construction and Demolition Waste Guide, 2012**), and that the higher these are, the higher the motivation to find recycling and reuse opportunities. State-based waste recovery targets are also driving change with recovery rates improving dramatically over the last 10 years.

The Green Building Council of Australia (GBCA) has seen a reduction from an average of an 80% (by weight) waste recovery rate eight years ago to 95% now for Green Star certified projects (a voluntary scheme that applies to larger multi-residential and commercial projects). Jorge Chapa from GBCA says that building companies have certainly noticed that waste equals money lost, though for some a passion for environmental returns is also a key driver.

Jorge adds that recovery rates, while important, don't tell the full story: "A 90% recovery rate can sound great, but if that's 90% of a tonne/m², that's still 100 kg/m² going to landfill." Green Star now also requires a maximum of 15 kg/m² of waste be sent to landfill, along with a xx% target for resource recovery. Jorge says it's an achievable target, backed up by international data such as from the UK Smart Waste program that tracked construction waste and recovery rates over a number of years.

Reuse opportunities

To reduce waste, many sustainably minded architects embrace the idea of reuse of materials, both re-purposing demolished materials on a site or passing materials on to another project, rather than sending them for recycling or into landfill.

Reuse provides a lovely intersection between aesthetics and sustainability. Reused materials can add character and tie a building to its own, or another building's, story. They can also reduce the embodied energy of the build, particularly so when high embodied energy items such as bricks are reused, or concrete is made using crushed old concrete instead of virgin gravel.

However, there are challenges to reuse. It often costs more to reuse a material than to buy it new, because of the labour to make it fit-for-purpose (think removing nails from timber or mortar from bricks). And making it work in its new setting may be tricky—the size may not be quite right or the material may

→ This kitchen is Peter McArdle's own, a compilation of a couple of different but closely matched kitchens from an old unit complex where owners are progressively upgrading. Peter advises that reusing kitchens can be satisfying but tricky due to potential water damage, difficulty in sourcing parts for leaky taps, and fitting old units to new layouts. Image: Alex Hunt Photography



have warped. Plus, there can be issues around liability when using old materials that may not meet current building code requirements.

Jeremy from Positive Footprints says that timber usually costs more to reuse. "It can be heartbreaking to get rid of it, but when you factor in the labour to take all the nails out, as well as stripping and planing, it is usually much cheaper to buy new." Although Positive Footprints reuses materials wherever they can, they've found they need to be realistic about it, because not all clients are able to cover the extra costs and time involved.

However, Jeremy notes that sometimes building companies will reuse because it makes economic sense—floorboards, tiles in good condition and bricks, especially nice red bricks, have some value, so they will be taken away and reused.

Geoff Crosby from Crosby Architects makes the point that it's not always so simple as 'reuse is better'. "You have to consider more than just the material's embodied carbon," he says. You've got to consider the energy to transport it, store it and make it reusable."

Geoff is a fan of reuse when it makes sense though. In a current project to build four two-storey terraces in Castlemaine, Crosby Architects retained the original house on the site as part of the development, an example of reuse on a large scale! They did demolish a lean-to that was badly deteriorated, but

even then they found homes for most of the materials that came out of it.

"All the materials were separated and stacked and then given away. Practically nothing went to the tip," Geoff says.

Kitchen benches were reused, hardwood studs and flooring were incorporated into new kitchens and the external cladding became someone's garden shed.

Finding new homes for materials can take time, and it seems informal networks are often the most fruitful. "The site is on a corner near the centre of town, the person demolishing was affable and people stopped to talk to him," Geoff says.

Ptma Architects, based in Queensland, has taken a similarly strong reuse stance in a current project. They plan to build a new 'skin' around an old, termite-damaged home rather than knocking it down and starting again. They'll renovate, and retain and re-purpose as much of the original building as they can. For example, they hope to be able to use the old external cladding internally in place of plasterboard.

Peter McArdle from Ptma Architects credits the homeowners with embracing the unusual concept. "Rather than ending up with a large, new home (with all new materials), they'll end up with a comfortably sized home which feels new and well-designed, but is predominantly a 30-year-old building," he says.



↑ → Crosby Architects carefully pulled apart ('deconstructed') this old lean-to, attached to an old house on a site they were developing in Daylesford. They retained most of the house, but all the materials and fittings from the lean-to and renovation were sorted for recycling or reuse. Kitchen cupboards ended up in a kitchen over the road, hardwood studs were used in kitchen cupboard doors (top right), and, in another building, lath was used as strip hardwood along the roofline and corrugated iron added character to the side wall (right).



Consider the building's life

A final consideration is to design for a long life, but to consider the building's end of life. Geoff Crosby says: "When buildings do reach the end of their lives they should be able to be easily separated into the constituent parts. This means, for example, using construction techniques that allow this and avoiding composite materials with glues."

There are companies (including community organisations such as the Resource Work Cooperative in Hobart, Tasmania) that specialise in 'deconstruction', taking a building apart carefully so as to recover as many of the materials as possible for reuse or recycling. It will take longer than just knocking it down, but the end result can mean monetary return for the materials recovered, reduced landfill fees and a win for the environment when those materials are reused or recycled.

*2010–2011 waste figures sourced from www.environment.gov.au/topics/environment-protection/nwp/reporting/national-waste-stream

**Hyder Consulting report 2011 can be found at www.environment.gov.au/protection/national-waste-policy/publications/construction-and-demolition-waste-status-report, with the reuse and recycling guide at www.environment.gov.au/protection/national-waste-policy/publications/construction-and-demolition-waste-guide

Resources:
www.yourhome.gov.au/materials/waste-minimisation

Sustainability Victoria has guidelines on waste reduction: [www.sustainability.vic.gov.au/-/media/resources/documents/publications_and_research/publications/w - z/publications_guidelines_for_a_waste_reduction_strategy_for_const.pdf](http://www.sustainability.vic.gov.au/-/media/resources/documents/publications_and_research/publications/w-z/publications_guidelines_for_a_waste_reduction_strategy_for_const.pdf)

GBCA has produced a discussion paper on waste management: www.gbca.org.au/uploads/237/34797/C-and-D-Waste-management-in-Green-Star-Discussion-paper.pdf

Master Builders Green Living Builders accreditation covers waste management: www.masterbuilders.com.au/portfolios/training/green-living

Finders Keepers: the hows and whys of reuse in *ReNew 122*.

Typical breakdown of construction waste (%):

Paper/cardboard	1
Garden/vegetation	3
Wood/timber	10
Textiles/rags	1
Hard plastic	1
Ferrous	2
Soil rubble (<150mm)	34
Soil rubble (>150mm)	2
Concrete-based masonry	16
Clay-based (e.g. bricks, tiles)	16
Plasterboard	2
Other/unknown	11
Total	100

Source: Your Home, extrapolated from NSW EPA Waste Census Data 1997