

Resource Recovery – TIMBER – Processing into Mulch and Chip

This guide provides good-practice advice to maximise recovery rates for waste timber from construction and demolition (C&D) projects by improving shredding and screening processes. The guidelines cover the processing of pre-sorted waste timber into chip or mulch product and the stockpiling of the processed products.

The aim is to assist the operators of shredding and screening systems to adopt practices that:

- maximise operational efficiency and the amount of waste timber processed
- minimise contamination or damage of the mulch or chip product
- minimise the inappropriate burning or processing of treated timber
- avoid or minimise environmental and nuisance effects from processing.

This guideline covers:

- finding good markets for waste timber
- on-site versus centralised processing
- setting up a processing facility or mobile operation
- operating a timber-processing plant
- storing chip and mulch products
- environmental, health and safety hurdles
- resources and contacts
- other guidelines in this series.

C&D timber waste after the first shredding process
(Crusaders Landscaping, Christchurch)



Please refer to the particular specifications for operating your machinery for full details on how to maximise efficiency and performance. These REBRI guidelines do not replace the specific instructions of the manufacturer.

Finding good markets for waste timber

Waste timber includes treated and untreated timber, hardwood, native timber, demolition, off-cuts, cladding, interior fittings and linings, engineered wood products (EWP) (MDF, fibreboard, particle board etc.), joinery, panels, lengths, pallets and packaging.

You need to find good sustainable markets for waste timber and understand the requirements of your clients in terms of the quality and quantity of feedstock. Timber is a versatile material and can be reused, burnt for fuel or recycled into a variety of new products. However, treated timber (and EWP) can limit the options for recycling or fuel.

Timber products can be reused in the original or near original form.

EWP, treated and untreated lengths, beams, boards, panels, pallets and joinery can be salvaged from site for reuse.

As a guide, the following is in demand:

- Hardwood (lengths greater than 0.6 metres, architectural features, no borer or other damage, preferably nail-free).
- Native timbers (greater than 0.6 metres, architectural features, no borer or other damage, preferably nail-free).
- Lengths of untreated timber greater than 0.6 metres.
- Lengths of treated timber greater than 0.6 metres.
- Panels of EWP, trellis and other timber products greater than 0.5 square metres.

Confirm current demand with manufacturers, second-hand retailers and exporters.

Untreated softwood, native timber and hardwood timber can be chipped into:

- landscaping mulch
- boiler fuel
- EWP manufacture
- timber composite materials and domestic fire pellets.

Points to note:

- EWP may be acceptable for some uses.
- Timber should be chemical-free (paint, adhesives, treatment chemicals etc.) and free of foreign objects such as plastic and nails.
- Confirm feedstock specifications with the recycling operator or manufacturer.
- For a general indication of feedstock requirements, visit www.wrap.org.uk.

Treated timber may be acceptable for:

- timber composite materials (although the technology is still in development and research is required to confirm this)
- reuse (as discussed above).

Know your markets

You won't be in business long without securing a sustainable market for your waste timber. The waste timber market is constantly changing, so it pays to do your homework. Here are a few suggestions for starting your search.

- Use local waste-recycling directories ([www.branz.co.nz/REBRI Recycling Directory](http://www.branz.co.nz/REBRI_Recycling_Directory)), the Yellow Pages (www.yellowpages.co.nz), the Waste Exchange (www.nothrow.co.nz) and buy recycled directories (www.zerowaste.org.nz) to identify demand for waste timber products. These change often, so it pays to keep checking.
- Network with businesses and councils with an interest in sustainability. Join organisations such as the Sustainable Business Network (www.sustainable.org.nz) or the Waste Management Institute of New Zealand (www.wasteminz.org.nz).
- Do business with recycling operators, transport operators 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.

Crusader's Landscaping in Christchurch has found markets for ground cover that contains waste timber by talking to businesses in the market for conventional ground cover and discussing the differences and benefits of their product.

Understand the requirements of your clients

Each market will have its own feedstock specifications – it's best to confirm these before you start. Getting it wrong can cost you.

Obtain clear specifications from second-hand retailers, manufacturers, exporters and other clients. This may change over time as markets change. Things to check include:

- types of timber acceptable (treated, native, untreated etc.)
- minimum and maximum sizes of board and lengths of timber

- minimum and maximum quantities
- contamination tolerances (for nails, paint, concrete etc.)
- any pre-processing requirements such as sorting or grading
- how timber is to be received (for example, loose, stacked in containers or on pallets).

Use the REBRI Waste Transfer Form to confirm to clients the source and nature of the timber products provided.

Calculate the economics of recycling

- Before setting up business, you can use a simple cost model to estimate the economics of your recycling operation compared to disposing of concrete to cleanfill (or other alternatives):

$$I = Q[l_t + rI_s - C_p - (1-r)C_d]$$

where:

- I = gross income from waste timber (\$)
- Q = waste timber received (tonnes)
- l_t = income from receiving waste timber (\$/tonne)
- r = recovery rate of wood chip, from original timber waste received (%)
- I_s = income from wood chip sales (\$/tonne)
- C_p = cost of processing (\$/tonne)
- C_d = disposal cost for residual waste (\$/tonne).

On-site versus centralised processing

A key decision regarding the operation of a timber-processing plant is whether to set up in a centralised processing facility or provide a mobile service where the plant is taken to the source of the timber. There are plenty of reasons why you would choose one set-up over the other, most of which would come down to the ability to make a profit from the operation.

Some things to consider

Processing timber at the construction or demolition site makes sense when:

- there is enough waste timber to justify the mobile plant (use the economic calculation above to determine this)
- the plant is easy to mobilise – the time and labour required to move the plant from site to site may override any other benefit, but again this can be answered by using the calculation above
- there is enough room to set up the plant and stockpile the timber (approximately 4 cubic metres is required per tonne of chipped timber waste, according to the NSW Waste Board)
- transport costs can be saved by reducing the cartage of timber to a facility and/or the wood chip to the end market
- chipped, untreated timber product can be used for landscaping on site
- the surrounding neighbourhood is not sensitive to the environmental effects of the plant.

Centralised processing makes sense when:

- economies of scale mean it is more efficient to process long term at a centralised site, even when transportation costs are considered
- plant is not easy to mobilise (see the point above)
- there is not enough room on site
- it is easier to get resource consents and other regulatory approvals for a single site rather than for a mobile operation.

Setting up a processing facility or mobile plant

Good planning in the set-up phase will help you to develop a quality product – without the council on your back.

Factors that affect product quality and reduce the value of the product

- Contaminants such as glass, tiles, metal, concrete and soil can affect the grade of the final product.
- Mixing the wrong timber feedstock types can affect the final grade of the product (treated timber or EWP).
- Chip and mulch products absorb moisture, which affects the quality of the product.

Environmental considerations

- Processing equipment is noisy.
- Timber processing creates dust, and timber stockpiles produce dust during dry, windy conditions.
- Stormwater can be contaminated by low pH (acidic conditions) from timber tannins, and particles of sawdust and wood can discolour the water. Timber treatment chemicals can also leach into stormwater.
- If exposed to rainfall and poor drainage, timber piles start to decompose, which can result in odour.
- Stockpiling can be a visual nuisance in some neighbourhoods.
- You will need to consult your regional council, and your city or district council, before you start to identify potential

Guidelines for reducing the environmental effects of processing are included below – see Environmental, health and safety hurdles.

Design your processing facility to maximise efficiency

- Specific considerations include:
 - provide adequate access and manoeuvring for all vehicles
 - allow sufficient space and have the appropriate machinery for manoeuvring and stockpiling large volumes of processed and unprocessed timber (it is likely that at least several hectares will be required)
 - consider how you can reduce rain damage of your product by having storage areas inside buildings or under cover, and have good drainage around stockpiles that are outdoors
 - provide signage and directions for processed and unprocessed timber-storage areas
 - provide safe access for the public, if appropriate.
- For more tips, consult the *Guide to Best Practice at Resource Recovery and Waste Transfer Facilities* (www.zerowaste.sa.gov.au/upload/transfer-station-design-guidelines/guide_waste_transfer_resource_recovery_station.pdf).
- Check the the city, district and regional council requirements under environmental and building legislation (see Environmental, health and safety hurdles).

How to set up mobile plant on construction or demolition sites safely and to enable efficient processing

- Locate the plant to maximise efficiency on site:
 - Locate near the source of waste timber and/or where timber stockpiling is safe and convenient.
 - Avoid other machinery and accessways while allowing adequate access and manoeuvring around the plant for people and vehicles.
 - Remember that building sites are busy and constantly changing. What might be a good position one week could be in the middle of all the action the next. Check with the site manager.
 - Provide signage and directions for processed and unprocessed timber-storage areas.
- Check the city, district and regional council requirements under environmental and building legislation (see Environmental, health and safety hurdles).

Typical equipment includes:

- shredders or grinders to chip waste timber – various plant types and sizes are available
- screens at various sizes to sort chip sizes and remove grit
- magnetic separators to remove metal, nails etc.
- front-end loaders and excavators to move the timber waste and wood chip to and from the shredders or grinders.

Operating a timber-processing plant

Have clear operating systems and procedures

If you want a quality product, every stockpile, every shift, it makes sense to document your procedures and let everyone know what they need to do and how they should do it.

- Specific considerations include:
 - staff training (who trains, who needs to be trained, what information needs to be passed to which staff etc.)

- manuals for operating and maintaining equipment
 - emergency procedures, including spill responses
 - health and safety procedures
 - quality and environmental monitoring.
- Check documentation regularly and keep a record of training.
 - For details, consult the *Guide to Best Practice at Resource Recovery and Waste Transfer Facilities* (www.zerowaste.sa.gov.au/upload/transfer-station-design-guidelines/guide_waste_transfer_resource_recovery_station.pdf).

Make sure you get quality waste timber from C&D clients, waste transporters or sorting facilities

- Have a written contractual agreement with waste-timber suppliers to help them to understand your particular requirements and maximise resource recovery.
- Provide clear written instructions to your suppliers to ensure they can meet your specifications for such things as timber types and contamination tolerances.
- Consider preferring suppliers who are accredited to a nationally recognised environmental management programme such as ISO14001 or Enviro-Mark® NZ. You have greater assurance that they are working to good environmental standards and are doing what they say they do.
- Always clarify delivery arrangements, including site access locations (and any associated traffic issues), site access times, volumes that can be accepted, types of bins, skips etc. and handling procedures.
- Make sure your suppliers are clear about the charges, including penalties for contamination or damage of materials.
- Insist on the use of the REBRI Waste Transfer Form so that you can be sure of the source of timber.
- Consider a ‘three strikes you’re out’ policy for the delivery of heavily contaminated loads, after which penalties are issued or business with the supplier is stopped.

Get endorsement from your peers and give your clients confidence

- Use the audit sheet at the end of this guide to show clients that you are operating in accordance with the REBRI Guide to Resource Efficiency.
- Use the REBRI Waste Transfer Form to validate the source and destination of waste to your building and recycling clients.
- Join the Enviro-Mark® NZ programme for external accreditation of your environmental management.
- Consider an Environmental Choice certification for your product.
- Check with your local council that you meet any licensing requirements under the Local Government Act 2002 for the handling of waste.
- Be site safe – many construction sites require regular visitors to have a Site Safe passport, to help comply with OSH regulations (see www.sitesafe.org.nz for details).
- Join waste industry organisations such as the Waste Management Institute of New Zealand to network with peers (see Links, resources and contacts).

Receipt of waste timber for processing at a processing facility.

- Feedstock control is important.
- Weigh and inspect each load.
- Ensure you only accept materials that you have a market for and have the appropriate skills and facilities to process the materials.
- Ensure your supplier has met your specifications, in particular, for contamination, material type etc.
- Match the consignment with the description on the waste transfer documentation.
- Reject loads that do not meet your specifications.
- Keep records of incoming materials.
- Sort and store waste timber prior to processing.

A staged approach to processing to achieve better quality, more efficiently

- Product specifications will determine the amount of processing required.

- To protect the quality of the processed product, minimise the amount of processed product stockpiled on site and only process as orders are received. Keeping waste timber in the unprocessed form will reduce the amount of moisture damage because less surface area is exposed to rain.
- A staged approach can maximise machine throughput while minimising processing time and maintenance costs. Low-value products are not overly processed while high-value products can be quality controlled to achieve specification.
- A primary product of pieces up to 150 mm can be achieved by most shredding and grinding plant, which is likely to be suitable as feedstock for boiler plant (depending on the boiler infeed mechanism).
- The primary product can be reprocessed to a secondary mulch or chip product. Some plant may be able to do this in one step (from raw waste timber to secondary chip), while other plant will need to reprocess primary product to the smaller particle size. This secondary product may be used as low-grade mulch or boiler fuel.
- Secondary product can be screened to produce a more consistently sized mulch or chip product. Two or more screens can be used for simultaneous size grading.
- Grinding of secondary product can provide a high-grade feedstock for panel production, pellets, animal bedding, composting and landscaping product.
- Metal removal (using magnets) is easier following primary grinding because metals may be released from the timber as a result of the process.

Operating shredding and grinding plant to meet specifications and control contamination

- Always operate machinery according to the manufacturer's recommendations.
- Set up the plant to achieve the desired specification, including number and size of screens, and the magnetic metal separator.
- Position the plant where the stockpile of product will be located to avoid moving stockpiles unnecessarily. Plant will need to be moved periodically as the stockpiles reach the height of the conveyor. Some plant is self-propelling whereas other plant has to be moved manually.
- Use front-end loaders or excavators to feed waste timber into the plant.
- Follow the staged process above to meet the desired specifications of the client(s).
- Keep stockpiles of various grades separate (see tips on stockpiling below).
- Plant should be staffed during processing to check for blockages, spills, contamination in feedstock and other problems.
- Staff should do quality checks of the final product during processing to make any alterations to the process on the spot and to remove any further contamination from the final product.
- Metal from the magnet should be captured in a skip or bin for recycling.
- Recycle or otherwise dispose of all other contaminants.

Storing chip and mulch products

Good storage practices are required to ensure efficient materials handling and to protect product quality.

Efficient storage systems

- Check with clients regarding any particular specifications for storage and transportation.
- Large areas are generally needed to stockpile product – at least 4 cubic metres per tonne. Refer to Establishing a Wood Recycling Centre (<http://pandora.nla.gov.au/pan/37055/20030812-0000/woodrecycling.pdf>).
- Storage options for smaller volumes include hoppers, bins or skips.
- Store waste timber and wood chip products to avoid cross-contamination and damage and to allow easy movement around the site.
- Provide clear signage for all storage areas. Signage should include the grade of chip (the chip size and timber type) and the purpose for use (landscaping, boiler fuel etc.). Include any instructions for product protection (for example, "Keep dry").

Store chip and mulch product to minimise contamination or damage

Chip and mulch products absorb moisture, and if exposed to rainfall and poor drainage this can result in composting, discolouration and the promotion of fungi, bacteria and odour. This reduces the resale value of the product.

- Too much moisture in boiler fuel chips can affect your client's boiler productivity and its ability to meet resource consent conditions. This reduces the resale value of the product.
- Most clients will be unwilling to accept wet chip product because of the extra weight – and therefore extra cost – of the product.

C&D wood waste chip for ground cover material
(Crusaders Landscaping, Christchurch).



Some tips to reduce product damage during storage

- Minimise the amount of processed product stockpiled on site and only process as orders are received. Keeping waste timber in the unprocessed form will reduce the amount of moisture damage because less surface area is exposed to rain.
- Rotate stockpiles regularly.
- Do not expose stockpiles to rain for extended periods, and keep checking stockpiles for signs of deterioration.
- Providing adequate cover will reduce the potential for damage. Store inside or in covered areas. (This may be difficult because of the scale of most operations.)
- Store on free-draining hard-stand areas to prevent soil moisture and rainfall ponding damaging the product.
- Finally, timber stockpiles are a fire risk. Store timber products away from ignition or heat sources and away from plant, landscaping and other structures or vegetation that may spread fire.

Environmental, health and safety hurdles

Good practice wouldn't be complete without considering the effects of your operation on the neighbourhood, local environment and the health and safety of you and your workers. This is not a comprehensive guide but should give you enough information to start talking with your city, district or regional council or occupational safety and health adviser.

Before you set up a processing facility, check waste handling and environmental regulations.

- Check with your city or district council:
 - that you meet any waste management licensing requirements under the Local Government Act 2002
 - regarding resource consent requirements under the Resource Management Act 1991 to operate a processing plant, including (but not limited to) any noise and dust issues, operating hours, stockpiling, trade waste discharges, signage and traffic movements
 - regarding requirements to alter, demolish or construct sheds and other buildings under the Resource Management Act 1991 and the Building Act 2004.

Note that, for mobile operations, rules may be different for each project, depending on the type of construction or demolition site and the planning zone in which the site is located. You may need to check these things for each project.

- Check with your regional council regarding:
 - requirements for stormwater discharges and stormwater protection measures
 - requirements for discharges to air of dust and odour
 - requirements for storage of hazardous materials.

Note that, for mobile operations, rules may be different for each project, depending on the location of the site. You may need to check these things for each project.

- Seek professional help to obtain the relevant resource consents.
- Ensure all staff are aware of environmental obligations by documenting all procedures and providing regular training.

Avoid noise and dust disturbances

- Noise and dust are considered adverse environmental impacts under the Resource Management Act 1991 and must be managed to avoid impacts on people and wildlife. Noise and dust are also a health and safety in employment issue.
- Considerations for noise management include:
 - operate in typical business hours (check with your city or district council)
 - maintain plant to perform at the manufacturer's specification or use low-noise emissions plant
 - modify plant by enclosing it or adding noise mitigation parts
 - turn equipment off when not in use
 - provide protective equipment and reduce the time staff are exposed to noisy equipment (for example, by swapping tasks).
- Considerations for dust management include the following.
 - Minimise handling stockpiled material. The more you move materials around, the more the chance of releasing dust.
 - Spray stockpiles lightly with water to suppress dust during dry and windy weather or stop working in extreme conditions.
 - Moisten materials during loading or moving where dust may cause a nuisance.
 - Water should not be applied in a manner that causes run-off.
 - Have a speed restriction for vehicles to reduce dust disturbance.
 - Provide wheel and truck washes to prevent dust and dirt from migrating off site.
 - Provide protective equipment.

Manage run-off from the site to prevent contamination of soils and streams

- Stormwater can be contaminated by low pH (acidic conditions) from wood tannins, by treatment chemicals and by particles of sawdust and wood.
- A resource consent may be required for any discharge of stormwater to ground or waterway (check with your regional council).
- Cover stockpiles and plant from rain, where possible.
- Do not stockpile timber or wood chips within at least 10 metres of a natural waterway or stormwater drainage system nor in a manner where stormwater run-off may reach a natural waterway without settlement and treatment. Greater than 10 metres may be required in areas with high rainfall or sloping ground.
- Create earth or concrete bunds around the site (or stockpile area) to prevent untreated stormwater from flowing to streams.
- Where stormwater cannot be absorbed on site, provide ponding areas for stormwater run-off for settlement of fine particles prior to discharge to stormwater systems or natural waterways.
- Check the quality of stormwater before discharging water from the ponds. The pH can be checked using a pH meter and clarity can be checked using a clarity tube. Resource consents will have additional stormwater monitoring and management requirements. Ask an environmental professional or regional council officer about appropriate monitoring for your site.
- Consider a recycled water system, and use the stormwater for dust suppression. Ensure that the stormwater does not contain contaminants that might affect the end product.

Health and safety procedures

- Write a plan that has procedures for safe handling of timber waste and plant operation for you and staff to follow. Consider addressing:
 - a list of hazards on the property and methods to manage these
 - safety training
 - procedures for handling waste
 - procedures for operating machinery
 - personal protective equipment.
- Have the plan checked by WorkSafe New Zealand, your lawyer or a consultant to ensure you comply with the Health and Safety in Employment Act 1992.
- All staff and subcontractors should be regularly trained in the procedures.

Resources and contacts

Relevant legislation and regulations

- Health and Safety in Employment Act 1992
- Local Government Act 2002
- Building Act 2002
- Hazardous Substances and New Organisms Act 1996
- Resource Management Act 1991
- Regional and district plans
- District bylaws.

Links, resources and contacts

- Resource Efficiency in the Building and Related Industries (REBRI) www.rebri.org.nz
- Yellow Pages www.yellowpages.co.nz
- The Waste Exchange www.nothrow.co.nz
- Zero Waste www.zerowaste.org.nz
- Sustainable Business Network www.sustainable.org.nz
- Waste Management Institute of New Zealand (WasteMINZ) www.wasteminz.org.nz
- Enviro-Mark® NZ www.enviro-mark.co.nz
- Environmental Choice New Zealand www.enviro-choice.org.nz
- Buy Recycled directory www.zerowaste.org.nz
- UK Waste and Resources Action Programme www.wrap.org.uk
- *Guide to Best Practice at Resource Recovery and Waste Transfer Facilities* (www.zerowaste.sa.gov.au/upload/transfer-station-design-guidelines/guide_waste_transfer_resource_recovery_station.pdf)
- Establishing a Wood Recycling Centre (<http://pandora.nla.gov.au/pan/37055/20030812-0000/woodrecycling.pdf>).

Other guidelines in this series

All Waste Types

- Collection and Transportation
- Centralised Sorting and Storage

Timber

- Collection and Transportation
- **Processing into Mulch and Chip**

Plasterboard

- Collection and Transportation
- On-site Sorting, Storage and Processing
- Centralised Sorting, Storage and Processing

Concrete

- Collection and Transportation
- Processing and Storage

Metal

- Collection and Transportation

TIMBER – Processing into Mulch and Chip – Audit Sheet

Use this sheet to check the practice of your service provider against the good practice guidelines in this guide. If you are a timber processing facility, you can use this sheet to do your own checks of your performance against the guides. Just consider each point and put a tick for compliance, cross for non-compliance or NA for not applicable. Put any comments at the bottom of the sheet, then sign and date it. Keep these sheets for your records and any discussions between you and your clients or suppliers.

Processing

1. The REBRI Waste Transfer Form is used to validate the source and destination of timber to and from the sorting or processing facility.
2. Each consignment is inspected prior to processing and accepted or rejected based on:
 - meeting specifications
 - meeting the skills and operating capacity of the sorting or processing facility
 - matching the description on the REBRI Waste Transfer Form.
3. Records are kept of waste accepted, sorted and sold.
4. Timber for processing/recycling is stored inside or covered with canvas, plastic or other material where necessary to protect from weather.
5. Processing equipment is set up at the location where processed wood chip can be stored, to prevent double handling of materials.
6. Timber is processed on demand to reduce the exposure of chip to weather, which can damage the product.
7. Equipment is staffed while in operation, and contamination and quality checks are frequent.
8. Procedures for operating and maintaining equipment are documented and staff trained.

Internal procedures and compliance

In addition to the procedures above, consider whether the following apply to the operation:

9. Documented emergency procedures, including spill responses.
10. Documented health and safety procedures.
11. Documented quality and environmental monitoring.

- 12. Current resource consents or other approvals for land use and discharges to the environment.
- 13. External accreditation (for example, Enviro-Mark® NZ).
- 14. Prefer clients and supplier that work to good environmental standards by using the REBRI Guides and/or have external accreditation.
- 15. Licensed under district bylaw.

Comments

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Signed

Person, company and responsibility

Date

Signed

Person, company and responsibility

Date