



- Gypsum has moisture-absorbing characteristics and may be used for drying sludge from municipal and industrial wastewater treatment plants.
- Gypsum could be used to settle dirt and clay materials in turbid water.
- Gypsum could be used to absorb grease spills.

#### Know your markets

You won't be in business long without securing a sustainable market for your recycled plasterboard. The recycled plasterboard market is new in New Zealand, and 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](http://www.yellowpages.co.nz)), the Waste Exchange ([www.nothrow.co.nz](http://www.nothrow.co.nz)) and buy recycled directories ([www.zerowaste.org.nz](http://www.zerowaste.org.nz)) to identify demand for recycled plasterboard product. 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](http://www.sustainable.org.nz)) or the Waste Management Institute of New Zealand ([www.wasteminz.org.nz](http://www.wasteminz.org.nz)).
- Do business with recycling operators and manufacturers 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<sup>®</sup> 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

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

- Clients will have particular specifications for recycled gypsum, depending on their needs. Things to check include:
  - whether demolition board is acceptable
  - minimum and maximum sizes of chip or powder particles
  - contamination tolerances (screws, nails, paint, glues etc.)
  - moisture tolerances
  - minimum and maximum quantities
  - gypsum with or without paper
  - any quality checks, laboratory analysis or other verification of product quality
  - sorting and handling requirements, including transportation to the client.
- Use the REBRI Waste Transfer Form to confirm to clients the source and nature of the recycled plasterboard 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 waste plasterboard to landfill (or other alternatives):

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

where:

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

## On-site versus centralised processing

A key decision when operating a plasterboard processing plant is whether to set up a dedicated processing facility or provide a mobile service whereby the plant is taken to the source of plasterboard. 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 plasterboard at the construction or demolition site makes sense when:

- there is enough plasterboard on a site to justify setting up 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, and again this can be answered by using the calculation above
- there is enough room to set up the plant and to stockpile the plasterboard
- transport costs can be saved by reducing the cartage of plasterboard to a facility and/or recycled plasterboard to the end market
- crushed gypsum 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 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 mobile plant on site

Good planning will help you to develop a quality product and sustainable business – without the council on your back.

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

- Moisture turns dry plasterboard into a soggy product that cannot be crushed.
- Moisture makes crushed gypsum powder form into lumps, reducing the quality of the product.
- Paper is a contaminant in some recycling options and needs to be separated from the gypsum.
- Demolition plasterboard is of lower quality for recycling presently. In particular:
  - the ingredients in demolition plasterboard are difficult to identify and may not be suitable for some recycling options
  - demolition plasterboard is often contaminated with nails, screws, wallpaper, paint (including lead-based paint) and other materials, reducing product quality
  - crushed construction plasterboard material is more uniform and consistent in quality than demolition plasterboard.
- Different plasterboard products have different additives to the gypsum and/or paper. The various additives may not be appropriate for a particular recycling option depending on the quantities in the final blend.

### Environmental considerations

- Crushing equipment is noisy and can create a nuisance to neighbours.
- Plasterboard crushing creates dust, and stockpiles can create dust during windy, dry conditions.
- Plasterboard or gypsum can contaminate stormwater run-off by raising pH levels and contributing sediment to discolour the water.
- Stockpiling can be a visual nuisance in some neighbourhoods.
- Asbestos may be found with demolition plasterboard. This is a hazardous material and should only be handled by trained specialists.
- You will need to consult your regional council and your city or district council before you start to identify potential environmental effects of your operation and get them consented.

Guidelines for reducing the environmental effects of processing are included below – 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 the plant near the source of waste plasterboard and/or where plasterboard stockpiling is safe and convenient.
  - 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 plasterboard storage areas.
  - Locate plant and store plasterboard under cover or indoors to prevent moisture damage from rain.
  - If plant must be located outside, consider storing plasterboard in covered bins before and after processing to prevent moisture damage.
  - Locate and operate plant away from site boundaries, dwellings, places of work etc. to reduce noise and dust impacts.
  - Avoid other machinery on site and remain clear of accessways while allowing adequate access and manoeuvring around the plant for people and vehicles.
- Check the city, district and regional council requirements under environmental and building legislation (see Environmental, health and safety hurdles\_).

Where stockpiling of material is required, ensure there is enough area on site.



Typical equipment includes:

- grinders to crush plasterboard – various plant types are available (a hammer mill is often used)
- screens to sort particle sizes and paper from gypsum.

## Operating a mobile crushing 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
  - materials handling procedures
  - quality and environmental monitoring.
- Check documentation regularly and keep a record of training.

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.
- 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](http://www.sitesafe.org.nz) for details).
- 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.
- Join industry organisations such as the Waste Management Institute of New Zealand to network with peers (see Links, resources and contacts).

Good sorting and storage practices are necessary to ensure efficiency with materials handling and to protect product quality.

Sort and store plasterboard prior to crushing

- Feedstock control is important.
- Evaluate any plasterboard that is received for processing and ensure it meets your contract specifications (for example, for contamination, demolition and/or construction sourced etc.).
- Use excavators with grab attachments and/or manual methods to sort plasterboard into stockpiles for processing.
- Remove contamination during sorting. Likely contamination includes:
  - wood
  - nails, screws etc.
  - wallpaper
  - plastic wrap or strapping
  - paint
  - tape.

Note that joint compound is made primarily of limestone or gypsum so should not contaminate the product. If the structure was built before the mid-1970s, asbestos may be found in the joint compound. Ask the supplier for details on the source of the plasterboard.

- Removing contamination before crushing reduces equipment damage and is easier because the particle sizes are larger.
- Recycle or otherwise dispose of all contaminants.
- Store different grades of plasterboard separately. This may mean demolition board is kept separate from construction board.
- Stockpile plasterboard indoors or under cover or store in enclosed containers (such as skips with lids) to prevent moisture damage and to control dust.
- Provide clear signage for all storage areas.

Operating the crushing and screening plant

- 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 plasterboard in the unprocessed form will reduce the amount of moisture damage because less surface area is exposed to rain.
- Always operate machinery according to the manufacturer's recommendations and any resource consent conditions.
- Process different plasterboard grades separately.
- For larger plant with conveyors, locate the plant where the stockpile of processed product will be located to avoid moving stockpiles unnecessarily later on. Plant will need to be moved periodically as the stockpiles reach the height of the conveyor.
- Where skips or bins are used for product storage (rather than stockpiles), set these up at the end of the plant.
- Attach screens for paper separation, if required, and set up a separate bin for paper collection.
- Where installed, check dust collection systems are working.

- For larger plant, use front-end loaders or excavators to feed plasterboard into the plant. Otherwise, manually feed boards into smaller plant.
- Plant should be staffed to check for blockages, spills, contamination in feedstock and other problems during processing.
- 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.
- Keep stockpiles of various grades separate (see storage guidelines below).
- Recycle or otherwise dispose of all contaminants.

## Testing and storage of crushed plasterboard

Certifying batches for compliance with specifications

- Each batch of crushed gypsum (with or without paper) should be tested to show compliance with specifications.
- Stockpiles may be certified for later use but must have clear signage indicating the certification and results.
- It is the responsibility of the supplier to provide test certificates to clients before delivery. Maintain records of tests, and provide these to clients with other delivery documentation.

Storage management

Good storage practices are necessary to ensure efficiency with materials handling and to protect product quality.

- Where stockpiling is feasible:
  - large areas are generally needed to stockpile product
  - stockpiles should be stored on hard stand, under cover or indoors.
- When storing crushed gypsum and/or paper in skips or containers:
  - make sure they have lids or covers
  - containers can be stored indoors or outdoors but should be sheltered from wind.
- Different products and certified batches should be stored separately to avoid cross-contamination.
- Provide clear signage for all storage areas, including test results and product type.
- No further materials should be added to a stockpile or container of tested materials.



Stockpiles of crushed gypsum and paper and, contamination skip at Crusaders Landscaping, Christchurch.

## 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.

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.

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:
  - minimise handling stockpiled material – the more you move materials around, the more chance there is 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 migrating off site
  - provide protective equipment.

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

- Stormwater can be contaminated by high pH (basic conditions) from gypsum and by particles of gypsum and paper.
- A resource consent may be required for any discharge of stormwater to ground or waterway (check with your regional council). This is likely to be covered already by the property owner or site developer. However, you should note the following.
  - Cover stockpiles and plant from rain, where possible.
  - Do not stockpile product 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 bunds around the plant (or stockpile area) to prevent untreated stormwater from flowing to streams.

#### Health and safety procedures

- Comply with the procedures of the site manager.
- Write a plan that has procedures for the safe handling of plasterboard 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 2004
- 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](http://www.rebri.org.nz)
- Yellow Pages [www.yellowpages.co.nz](http://www.yellowpages.co.nz)
- The Waste Exchange [www.nothrow.co.nz](http://www.nothrow.co.nz)
- Zero Waste [www.zerowaste.org.nz](http://www.zerowaste.org.nz)
- Sustainable Business Network [www.sustainable.org.nz](http://www.sustainable.org.nz)
- Site Safe [www.sitesafe.org.nz](http://www.sitesafe.org.nz)
- Waste Management Institute of New Zealand (WasteMINZ) [www.wasteminz.org.nz](http://www.wasteminz.org.nz)
- Enviro-Mark® NZ [www.enviro-mark.co.nz](http://www.enviro-mark.co.nz)
- Environmental Choice New Zealand [www.enviro-choice.org.nz](http://www.enviro-choice.org.nz)
- Buy Recycled Directory [www.zerowaste.org.nz](http://www.zerowaste.org.nz)

## 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

# PLASTERBOARD – On-site Sorting, Storage and Processing – 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 plasterboard recycler, 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.

## Sorting and storage

1. A list of specifications is obtained from clients and provided to waste suppliers. This includes such things as: 
  - contamination tolerances
  - minimum and maximum quantities
  - whether demolition board is acceptable
  - moisture tolerances
  - sorting requirements.
2. Plasterboard is evaluated prior to crushing and ensure it meets specifications.
3. Plasterboard is sorted into grades if necessary and contamination (such as wood, nails, screws and wallpaper) is removed during the sorting process.
4. Plasterboard is stored inside or covered with canvas, plastic or other material where necessary to protect from weather.
5. Clear signage is provided for all storage areas, including information on grades of product, and any instructions for product protection (for example, keep dry).
6. Contaminants are recycled or otherwise disposed of to disposal facilities that are consented by the regional council or have met the permitted activity status in regional plans.

## Processing

7. Crushing equipment is set up at the location where processed gypsum and paper can be stored to prevent double handling of materials.
8. Plasterboard is processed on demand to reduce the exposure of crushed gypsum and paper to weather, which can damage the product.
9. Equipment is staffed while in operation and contamination and quality checks are frequent.
10. Procedures for operating and maintaining equipment are documented and staff are trained.

- 11. Each batch of crushed gypsum is tested to show compliance with specifications.
- 12. Plasterboard paper is recycled.
- 13. Records are kept of waste processed.

**Internal procedures and compliance**

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

- 14. Documented emergency procedures, including spill responses.
- 15. Documented health and safety procedures.
- 16. Documented quality and environmental monitoring.
- 17. Current resource consents or other approvals for land use and discharges to the environment.
- 18. External accreditation (for example, Enviro-Mark® NZ).
- 19. Prefer clients and suppliers that work to good environmental standards by using the REBRI guides and/or have external accreditation.
- 20. Licensed under district bylaw.

**Comments**

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Signed .....

Person, company and responsibility .....

Date .....

Signed .....

Person, company and responsibility .....

Date .....