



**Construction and Demolition (C&D) Waste Education Session
on better recovery, separation, sorting and transfer in the
South West Region**



Acknowledgement

We would like to express our appreciation and acknowledge Waste Authority for funding this project. In addition, special thanks go to Bunbury Harvey Regional Council, City of Bunbury, City of Busselton, Shire of Augusta-Margaret River, Shire of Bridgetown-Greenbushes, Hastiewaste and Peel Resources for their support in hosting and facilitating the toolbox sessions.

Disclaimer

This project has been produced through a grant project funded by the Waste Sorted Program and administered by the Waste Authority. The views expressed are those of the authors and do not necessarily reflect the position or policy of the Waste Authority or Government of Western Australia, which may not be held responsible for the accuracy of information provided, nor is it liable for any and all outcomes from the use of this information.



Contents

Construction and Demolition Waste (C&D waste)	4
C&D Waste in Western Australia	4
Background:	5
Issues and Concerns:.....	5
Guiding Concept:.....	6
C&D Toolkit Element 1:.....	7
How to Reduce Waste Tips from Smart Waste Guide	7
C&D Toolkit Element 2:.....	8
Opportunities for C&D Waste	8
C&D Toolkit Element 3:.....	11
Source Separation of C&D Material – Opportunity as Road Construction Material	11
C&D Toolkit Element 4:.....	12
Implement an Onsite Source Separation Recycling Program	12
C&D Toolkit Element 5:.....	13
Onsite Source Separation	13
C&D Toolkit Element 6:.....	14
Benefits of Source Separating C&D Materials:	14
C&D Toolkit Element 7:.....	15
C&D Waste Collection Process.....	15
C&D Toolkit Element 8:.....	16
C&D Waste Recyclers.....	16
C&D Toolkit Element 9:.....	18
Recommendations Moving Forward	18
Resources	19
Websites:	19
Relevant Documents:.....	19

Construction and Demolition Waste (C&D waste)

is defined as waste produced by demolition and building activities, including road and rail construction and maintenance, and land excavation associated with construction activities¹.

C&D waste materials include concrete, brick, rubble, asphalt, metals, timber, wallboard, glass, plastics, asbestos, soil and other building materials and products².

While crushed recycled concrete (CRC) is crushed construction and demolition waste that contains at least 90% crushed concrete and is largely free of deleterious contaminants

C&D Waste in Western Australia

In the Western Australia Waste Strategy 2030, C&D waste was quoted to make up around half of Western Australia's waste stream and represents around 45% of material recovered from recycling³.

C&D waste collected can be recovered and reused as value added material for civil applications such as road pavements or non-structural precast concrete products. Recycling waste provides economic and environmental solutions for WA developers, builders and contractors.

Currently, a large amount of C&D waste collected goes to landfill. One of the key reasons for this outcome is that there is a practice of co-mingling waste on C&D sites leading to contamination, storage and separation issues.



¹ National Waste Policy 2018

² Waste Authority Position Statement Construction and Demolition (C&D) Waste, June 2016

³ Waste Authority, Waste Avoidance Resource Recovery Strategy 2030

Background:

C&D waste accounts for a significant proportion (26.9%) of the solid waste collection and recycling services industry in Australia. This is a \$5.2billion industry in revenue that is driven by the construction and demolition activities, and population growth⁴. There is an indication that a 5% rise in the recycling rate can add \$1billion to Australia's gross domestic product⁵.

To encourage the construction industry to recycle C&D material, landfill disposal levies have been introduced by authorities in Australia. Currently in Western Australia, a levy applies to waste received at landfill in the metropolitan region and waste collected in the metropolitan region and received at landfill premise outside the metropolitan region. About 25% of Western Australians live outside of Perth metro. Encouraging resource recovery in regional areas may help achieve the Waste Strategy 2030 targets as shown below, which includes targets for Peel region and major regional centres in Western Australia.

Year	Perth and Peel	Major Regional Centres 6
2020	65%	50%
2025	67%	55%
2030	70%	60%

Table 1: Targets for municipal solid waste material recovery (Waste Strategy 2030)

There is a growing new market for recycled C&D materials that is driving it to be one of the largest waste resources by volume being diverted from landfill in Western Australia. However, there still remains an excess supply of unused C&D waste that is causing the stockpile to grow – currently at 1,000,000m³.⁷

Issues and Concerns:

Here are some of the issues identified in the South West region:

- Asbestos and heavy metal contamination in feedstock.
- Lack of knowledge on C&D source separation processes and benefits.
- Lack of knowledge and information on potential uses of recovered C&D waste.
- Lack of support for local demolition industry and recycling companies to develop systems and processes that will promote source separation of C&D to provide consistent feedstock to Material Recovery Facilities (MRF).

⁴ Shooshtarian S, Maysood T, Khalfan M, Wong P, Yang R, Construction and Demolition Waste Management Australia, CIB World Building Congress, 2019

⁵ Shooshtarian S, Maysood T, Khalfan M, Wong P, Yang R, Construction and Demolition Waste Management Australia, CIB World Building Congress, 2019

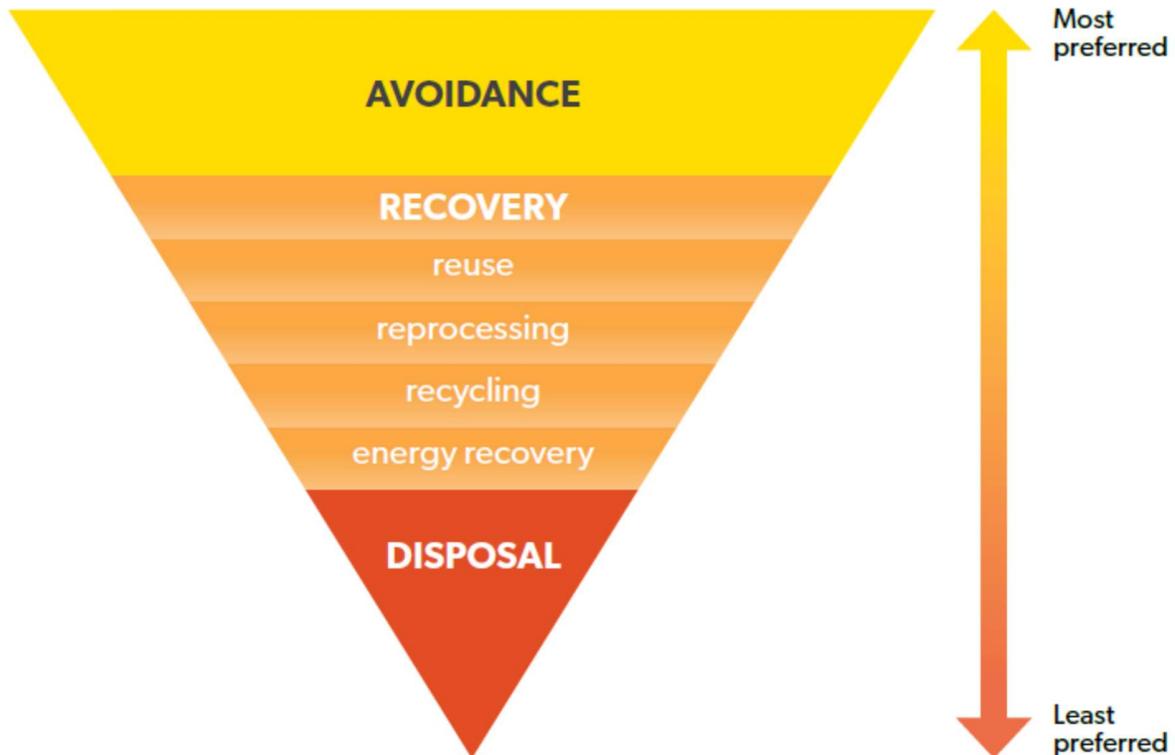
⁶ Waste Strategy 2030 lists Albany, Busselton, Bunbury, Greater Geraldton and Kalgoorlie-Boulder as major regional centres

⁷ Active Sustainability & Foundations Research, Recovered C&D Materials Resource Guide, Aug 2020

- The supply of source-separated inert C&D material for recycling in the South West is limited due to a lack of landfill levy.

Guiding Concept:

Waste Hierarchy and Source Separation



The Waste Authority produced a position statement, explaining the waste hierarchy and how it will be applied by the Waste Authority in its decision making to support the Waste Strategy⁸. The waste hierarchy ranks waste management options in order of their general environmental desirability. Waste avoidance is the most preferred option in the hierarchy.

Separating waste at source directly supports a more homogenous and higher value stream which is easier to recover. This is consistent with waste hierarchy's principles. Source separated waste streams are less contaminated by other materials, easier and less costly for recyclers to recover and represent a higher value to the recycling markets⁹.

⁸ Waste Authority Position Statement, Communications on the Waste Hierarchy, 2013

⁹ Waste Authority Position Statement, Source Separation of Waste, 2014



C&D Toolkit Element 1:

How to Reduce Waste Tips from Smart Waste Guide¹⁰

Builders or waste generators play a key role in reducing waste. Here are some tips on how to reduce waste:

As a builder or subcontractor, it is recommended that you follow these steps to reduce the amount of waste created on your project:

- | | |
|----------------|------------------|
| 1 AVOID | 2 REDUCE |
| 3 REUSE | 4 RECYCLE |

1 AVOID

waste by careful planning at the design, drawing and documentation stages. It is at this stage that the greatest reductions in waste can be achieved:

- Select building materials and systems with low waste rates. In particular, consider modular and prefabricated construction materials that minimise onsite waste.
- Choose a method of construction to minimise cut and fill.
- Design with life-cycle assessment in mind, considering end of life uses.
- Use dimensions that suit standard material sizes. Plan the use of materials better to reduce the volume of waste (especially off-cuts).
- Reduce waste allowance in the planning stage, eg. decrease concrete waste allowance from 5% to 3%.
- Appropriate storage and management of materials onsite will minimise damage from weather or machinery, or theft, and will eliminate the need for replacement and waste generation.
- Minimise the time between delivery and installation of materials, to reduce the risk of damage and subsequent waste.
- Check quantity, condition and quality of goods on delivery. Reject inferior goods if their quality will result in additional waste. Refuse over-supply as compensation for inferior quality or condition.

2 REDUCE

by limiting waste when purchasing. You can:

- Purchase materials with minimal packaging.
- Control purchasing to limit over ordering and to encourage buying of recycled or recyclable materials where appropriate.
- Improve site security to reduce theft of materials thus allowing the reduction in the over ordering margin.

3 REUSE

by finding available recycled materials from demolition works, civil works, suppliers or nearby locations, especially sand.

- Identify, source and specify recycled materials, or materials with a recycled content, to be used during construction.
- Materials that can be reused or used on future projects include surplus sand / soil (siteworks), PVC & plumbing fittings (pre-lay), formwork & accessories (slab), waterproof membrane (WPM), reinforcement & accessories, bricks, bags of cement / lime, brickwork hardware, windows, door frames, timber (treated & untreated), timber fixings & accessories, metal roof sheeting, roof tiles, fascia, gutters & downpipes, fibre cement sheeting, doors, plasterboard & accessories, paints, paving bricks and reticulation.

4 RECYCLE

by implementing a waste management plan, incorporating bins and any space on your site drawings.

- Determine whether you will separate your waste materials onsite, use a co-mingled recycling company and place all waste in one bin, or employ a combination of both methods.

¹⁰ Master Builders Smart Waste Guide, 2014

C&D Toolkit Element 2:

Opportunities for C&D Waste

There are multiple uses for recycled C&D products, for example:

- The Roads to Reuse (RtR) product specification authorized recycled road base to be used as sub-base or basecourse in road and pavement construction including hardstand areas such as footpaths, car parks, public open space and commercial industrial land uses¹¹.
- Recycled C&D material can be used as sub-base as it provides stiff underlying layer that will extend the life of pavements due to its self-cementing properties¹².
- The use of recycled C&D products in road base of local government roads as a more cost-effective structural fill. The following benefits have been observed from the RtR pilot project activities¹³:
 - The initial cost of using recycled C&D with geotextile seals in basecourse is offset by the longer life expectancy of recycled material
 - Cost savings in time and labour as recycled material is more consistent than virgin limestone, hence less mixing required
 - Water savings since less water is required for compaction when using recycled material
 - Higher durability
- The use of recycled C&D products in non-structural precast concrete products or for retaining walls, median barriers, footpaths and extruded kerbs.
- Figure 1 below shows the prospect of utilizing recycled materials such as C&D, food and garden organics (FOGO), glass, crumb rubber, recycled asphalt, plastic and wastewater, across a cross-section of a road project



City of Canning – Upgrade of Welshpool Road using C&D material as road base and sub base



¹¹ Waste Authority, Roads to Reuse (RtR) Product Specification, Mar 2021

¹² Roads to Reuse Pilot Project Case Study, <https://www.wasteauthority.wa.gov.au/publications/view/case-study/roads-to-reuse-pilot-project-case-study>

¹³ Roads to Reuse Pilot Project Case Study, <https://www.wasteauthority.wa.gov.au/publications/view/case-study/roads-to-reuse-pilot-project-case-study>

- There is a potential for an increase in the demand and supply for recycled products in the event of an introduction of landfill levy in the South West. Local recyclers and small business should start to prepare and be innovative with product solutions.
- Future specifications for recycled C&D products will also play a role in improving the cost competitiveness of material recovery efforts and product markets.

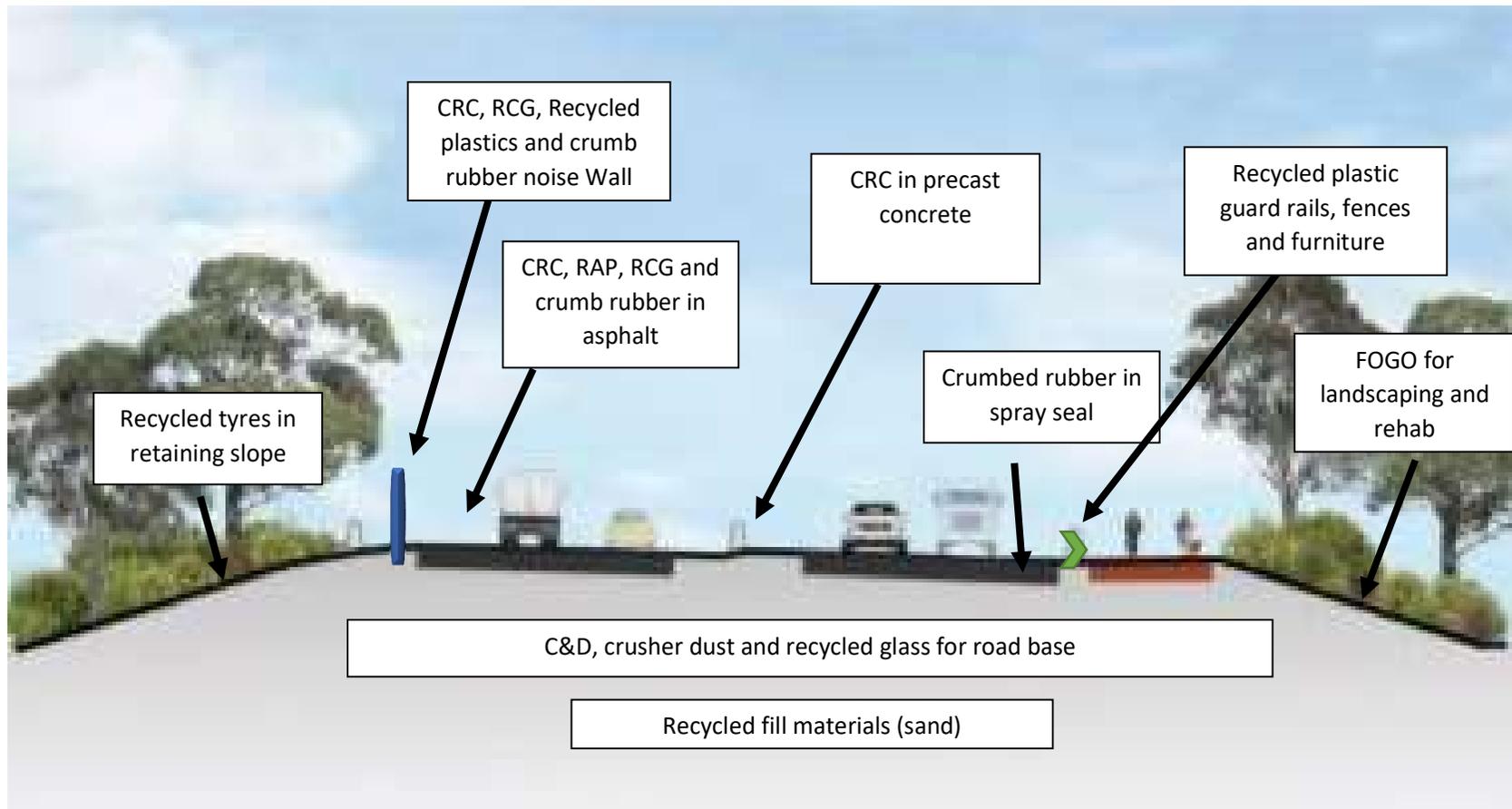


Figure 1: Futuristic cross section of a road - Opportunities for recycling

- Legend:**
- RCG Recycled crushed glass
 - RAP Reclaimed asphalt pavement
 - FOGO Food organics and garden organics
 - CRC Crushed recycled concrete

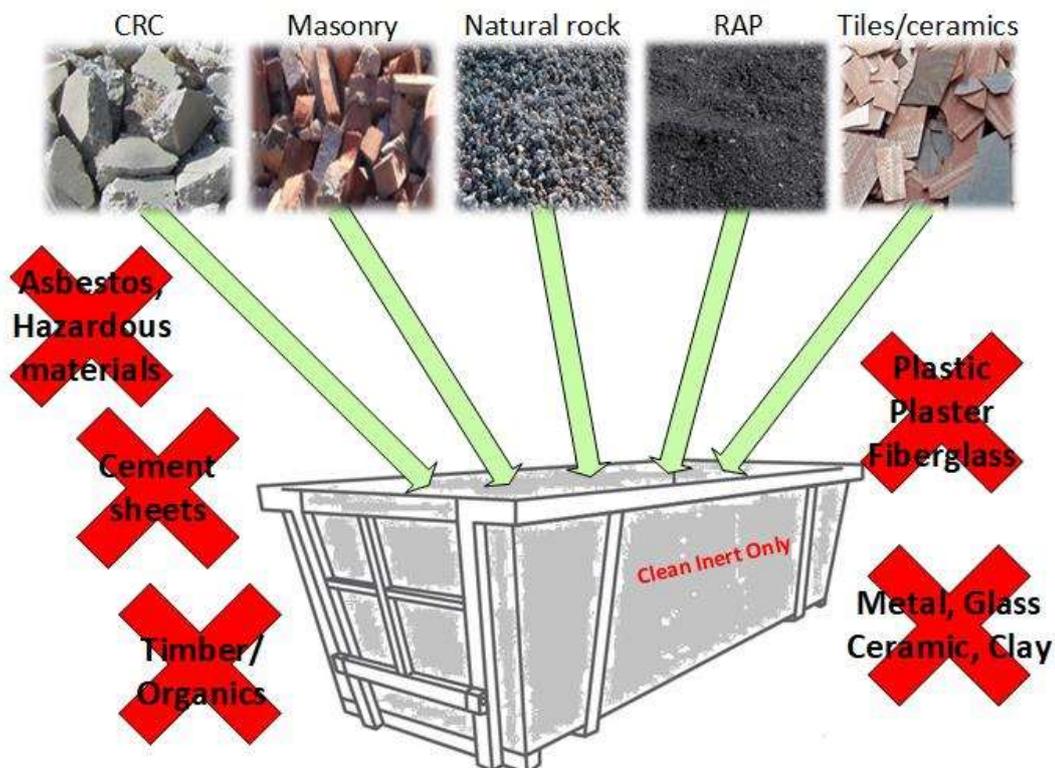
C&D Toolkit Element 3:

Source Separation of C&D Material – Opportunity as Road Construction Material

Road construction provides immense opportunities to accommodate recycled materials and may contain major quantities of inert C&D materials including clay bricks and tiles, provided the product used complies with the Roads to Reuse (RtR Product Specification)¹⁴.

Benefits are:

- cost savings from on-site recovery-reuse and recycling of existing RAP, masonry (concrete, bricks, pavers, tiles, etc.) and sand
- improves supply chain integrity
- provides higher quality recycled aggregates
- provides recycled road construction material as well as recycled aggregates replacing virgin resource
- reduced C&D material volumes going to landfill.



¹⁴ Waste Authority, Roads to Reuse Product Specification, Mar 2021

C&D Toolkit Element 4:

Implement an Onsite Source Separation Recycling Program

- ✓ Team approach, engaging the client, designer and contractor
- ✓ Prepare waste management plan
- ✓ Identify materials likely to be discarded and at what stage of the project
- ✓ Share costs of recycling with other builders on adjacent sites by sharing space and bins
- ✓ Estimate amount of waste that will be avoided, reduced, reused and recycled
- ✓ Evaluate options for recycling in the area of your site
- ✓ Allocate space on site for storage
- ✓ Provide recycling bins with clear signage. Colour code or label waste bins and protect them from contamination, rain and wind
- ✓ Work with suppliers, consultants, recycling companies to take or sell separated waste streams
- ✓ Decide what waste to be separated
- ✓ Implement processes to ensure the separation of chosen wastes by contractors



C&D Toolkit Element 5:

Onsite Source Separation

Waste is separated onsite and placed in separate bins which have been labeled clearly and correctly. It is then either deposited at recycling facilities or collected by recyclers or suppliers.

- ✓ Number and size of bin
 - requires multiple smaller bins
 - smaller bins allow more flexibility
- ✓ Onsite area
 - requires more planning to coordinate multiple bins, especially if space is a constraint
- ✓ Education
 - training required to educate in what materials are placed into each bin
- ✓ Public image
 - builder is seen by public to be recycling
- ✓ Payments
 - payment receive for some waste materials such as metals
 - some materials free to dispose under certain conditions
- ✓ Suppliers
 - separated waste streams can be recycled by suppliers
- ✓ Subcontractors
 - recovered waste streams are visible to individual trades
- ✓ Contamination and separation
 - multiple bins may increase scope for contamination
- ✓ Visibility
 - separated waste streams are visible



C&D Toolkit Element 6:

Benefits of Source Separating C&D Materials:

- ✓ Cost savings
 - Lower disposal costs (E.g. sorted C&D waste cost less than mixed waste at Dunsborough Waste Facility)
 - Reduce purchasing costs by understanding the materials you are ordering
 - Improve efficiency with a tidier site giving workers better access to workspace
- ✓ Meet regulatory requirements
 - Create safer workplace
 - Comply with planning approval requirements in some local government areas
 - Limit risks of littering and subsequent clean-up costs and fines
- ✓ Reduce onsite risks
 - Reduce risk of illegal dumping
- ✓ Reduce environmental footprint
 - Divert waste from landfill and protect land resources
 - Reduce pollution and carbon emissions
 - Help conserve natural resources (virgin materials) by allowing materials to be reused onsite
- ✓ Promote your business/ waste recovery successes
 - A 'clean' site provides existing and potential clients a good impression
 - Highlight waste recovery initiatives to existing and potential customers



C&D Toolkit Element 7:

C&D Waste Collection Process

The figure below sets out the operational control procedures that must be adopted by producers at sites producing recycled road base from C&D waste to qualify for the Roads to Reuse product specification¹⁵.

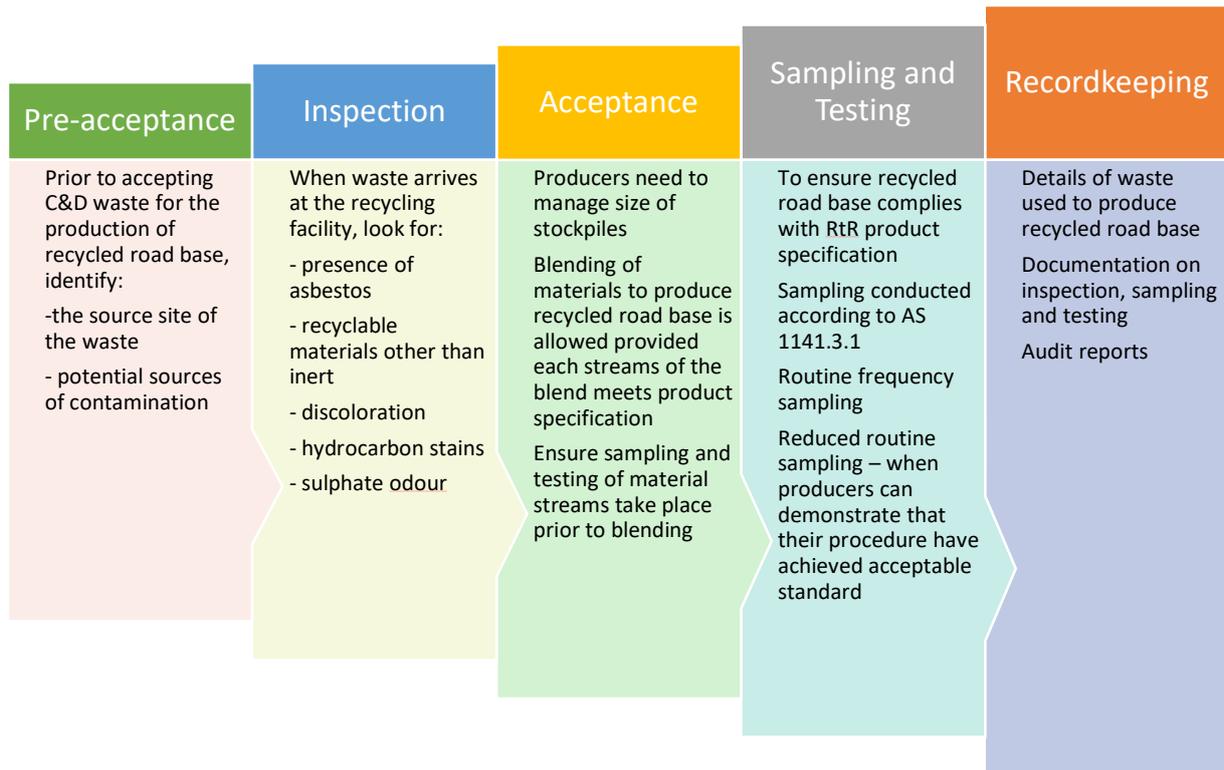


Figure 2: Operational control procedures (Roads to Reuse Specification)

¹⁵ Waste Authority, Roads to Reuse (RtR) Product Specification, Mar 2021

C&D Toolkit Element 8:

C&D Waste Recyclers¹⁶

There is a market distinction between reprocessors with preference to accept source separated loads and those that will take and sort mixed loads. The main driver is in the pricing mechanism which favour clean loads of materials with strong markets for associated reprocessed products. In other words, the demand for source separated material is based on the market demand for their reprocessed products. While the acceptance of mixed loads is to reduce disposal fee and levy costs. Efforts will be channeled to recovering high value materials with an established market outlet, or that could be diverted to other local reprocessors.

Source Separated Reprocessors

- Source separated loads are usually generated through commercial and civil activities particularly from demolition sector.
- Located close to the waste site and market outlets for their products
- In areas where landfills and quarries are more accessible, the supply of recovered materials and market outlets for reprocessors is more competitive
- In regional locations, some larger C&D projects support source separation through the use of dedicated bin systems for individual materials such as concrete, brick, plasterboard and other construction materials where there may be a local market
- In some jurisdictions, this is supported by resource recovery facilities and transfer stations that provide dedicated areas for separated C&D waste streams
- Mobile crushing and screening equipment is often employed in regional areas to reprocess source separated materials such as concrete and bricks for local market applications

Mixed Load Recyclers

- Processing charges are generally higher than source separated loads but generally slightly less than landfill gate fees for C&D waste disposal
- Mainly from projects where there is a space constraint or insufficient waste volume to justify investment in multiple container systems requiring source separated materials
- Mixed loads are common in regional areas.

¹⁶ Hyder Consulting, Encycle Consulting and Sustainable Resource Solutions, "Construction and Demolition Waste Status Report", October 2011

Mobile Processing

- Dedicated drop off areas for separated C&D waste are provided by some resource recovery facilities and transfer stations
- Often, mobile crushing and screening equipment may be employed at these sites to process batches of material. This is especially true in regional locations.



C&D Toolkit Element 9: Recommendations Moving Forward

Construction and building industry:

- ✓ Build good waste management into tender document
- ✓ Practice good building waste control and management
- ✓ Choose to use sustainable materials and reuse materials on building site where possible
- ✓ Repurposing demolished materials on existing site or pass it on to another project
- ✓ Use skip bins on site to collect waste such as steel which is valuable (where possible)
- ✓ Collaborate with materials recovery/ waste management company that will assist with sorting and recycling of building site waste
- ✓ Educate and train staff to build awareness on source separation and the benefits of recycling waste materials



Policy makers:

- ✓ Mandating the use of recycled C&D products
- ✓ Specifications and standards to encourage the use of C&D waste materials



Resources

Websites:

Bunbury Harvey Regional Council: <https://bhrc.wa.gov.au/>

City of Busselton www.busselton.wa.gov.au

City of Canning <https://www.canning.wa.gov.au/residents/living-here/roads-and-verges/sustainable-construction-materials>

Department of Environment and Conservation: www.dec.wa.gov.au

Department of Water and Environmental Regulation <https://dwer.wa.gov.au/>

Main Roads Western Australia <https://www.mainroads.wa.gov.au/>

Master Builders Western Australia <https://www.mbawa.com/>

Peel Resource Recovery Pty Ltd <https://www.peelresource.com.au/>

Waste Authority Western Australia <https://www.wasteauthority.wa.gov.au/>

Relevant Documents:

Active Sustainability & Foundations Research, 2020, 'Recovered Construction and Demolition Materials Resource Guide, (https://www.udiawa.com.au/wp-content/uploads/2020/08/WA-Recovered-CD-Resources-Reuse-Guide_August20.pdf)

ASK Waste Management, 2019, 'Recycling Activity in Western Australia 2017-2018'

Department of Water and Environmental Regulation Western Australia, 2019, 'Landfill Waste Classification and Waste Definitions 1996'

Department of Water and Environmental Regulation Western Australia, 2021, 'Guidelines for Managing Asbestos Recycling at Construction and Demolition Waste Recycling Facilities'

Hyder Consulting, Encycle Consulting and Sustainable Resource, 2011, 'Construction and Demolition Waste Status Report (for Department of Sustainability, Environment, Water, Population and Communities, and Queensland Department of Environment and Resource Management)

Master Builders Western Australia, Master Builders Smart Waste Guide, 2014

Waste Authority, 2021, 'Roads to Reuse Product Specification'

Waste Authority Position Statement, 2016, 'Construction Demolition (C&D) Waste'

Waste Authority Position Statement, 2014, 'Source Separation of Waste'

Waste Avoidance and Resource Recovery Strategy 2030

Western Australia Local Government Association (WALGA), 'Demolition Waste Management Plan Guidelines'