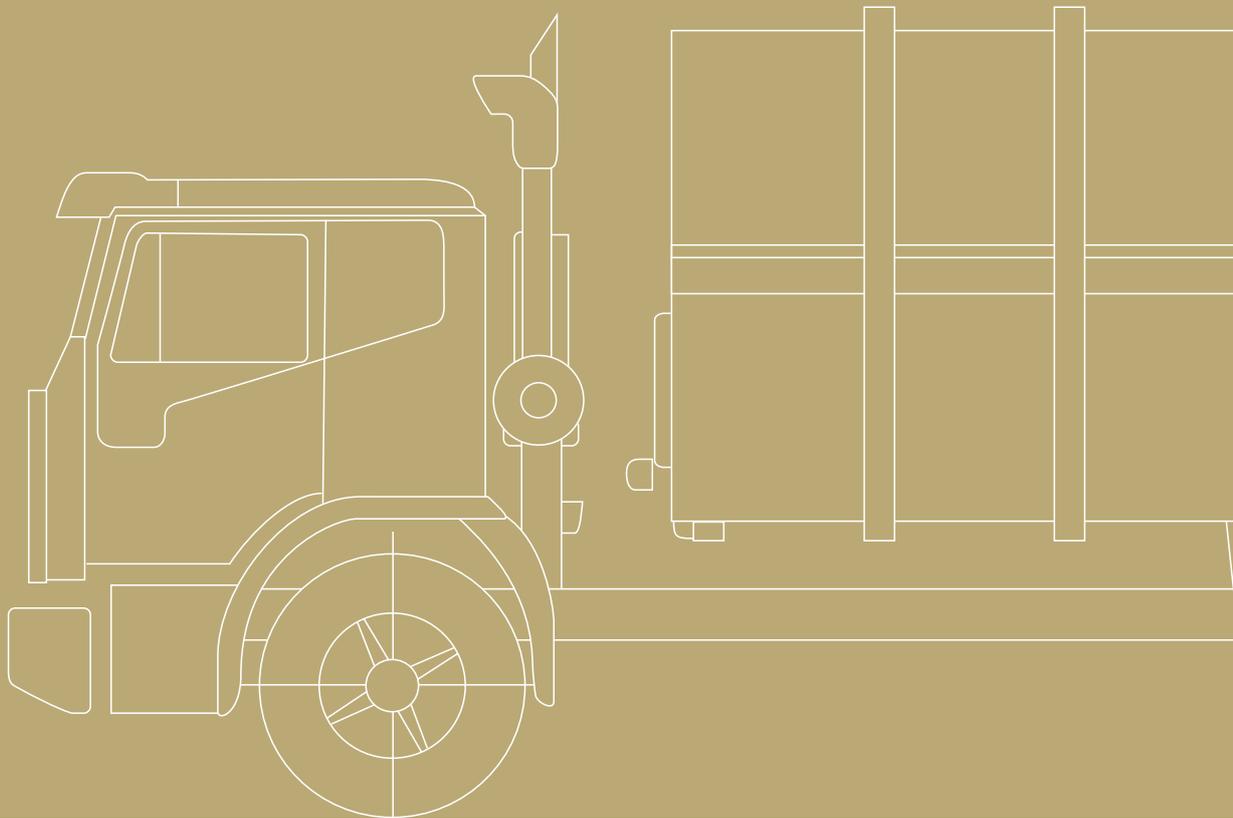


Better Practice  
Guidelines for  
Waste Management  
and Recycling  
in Commercial  
and Industrial  
Facilities

December 2012



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For technical information on the matters discussed in this guide contact Resource Recovery Unit on 02 8837 6000.

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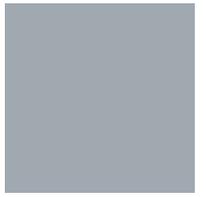
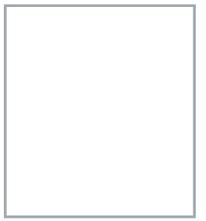
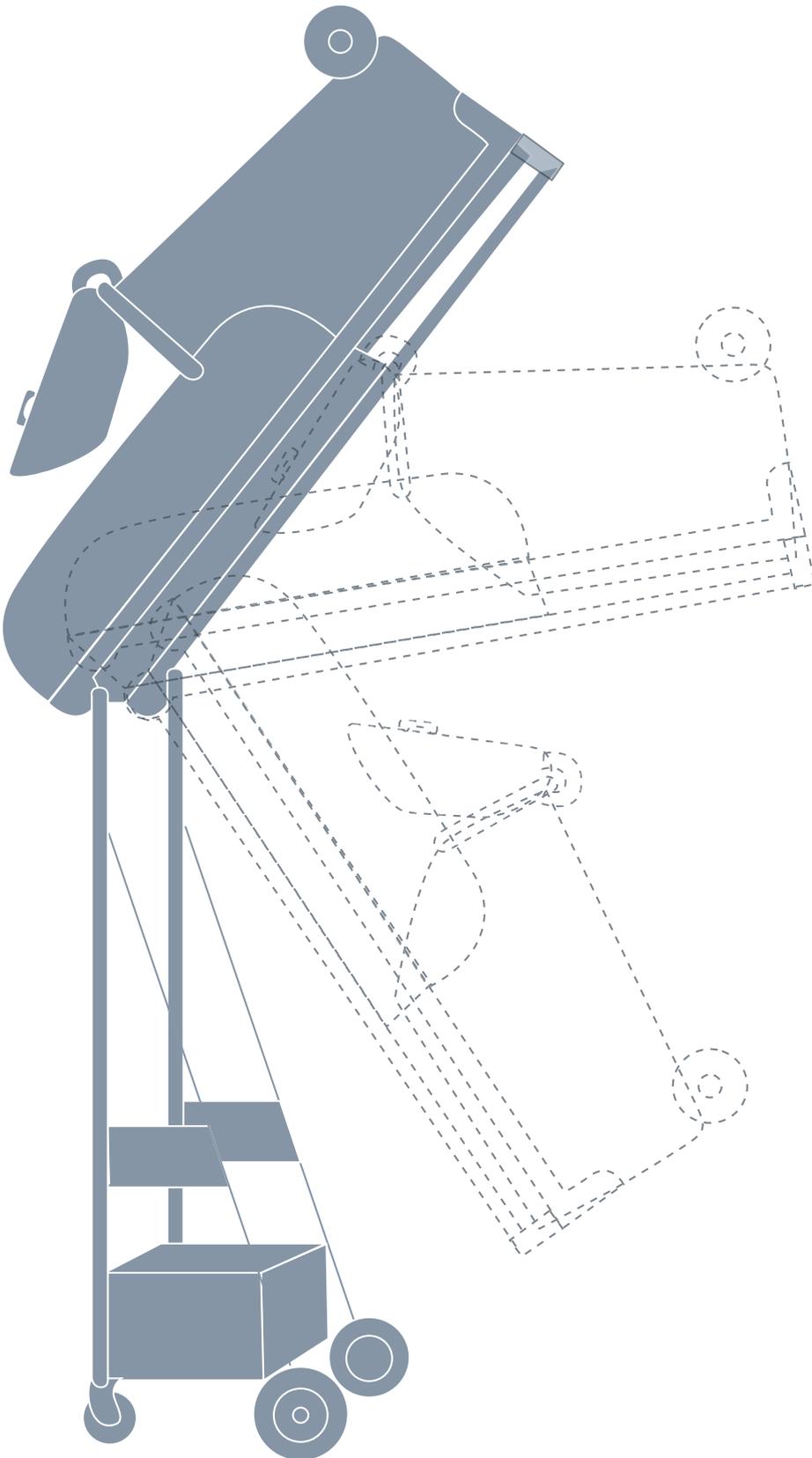
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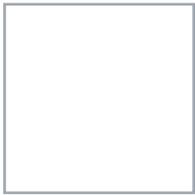
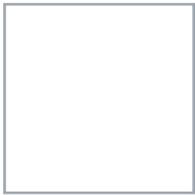
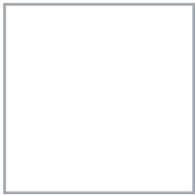
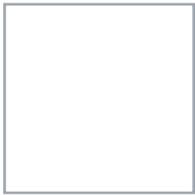
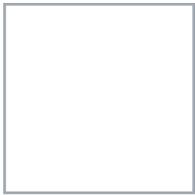
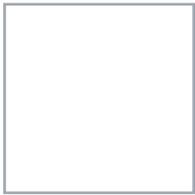
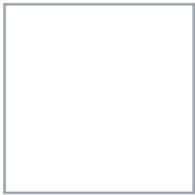
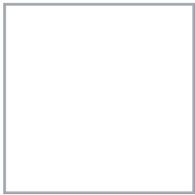
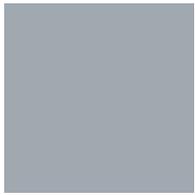




# 1.

## Introduction







## 1.1 Background

This guide provides advice to help architects, developers, council staff and building managers to incorporate better waste management practice into the design, establishment, operation and ongoing management of waste services in commercial and industrial developments. This guide covers the many different situations in which waste and recyclable materials are generated, stored and collected in and from commercial and industrial buildings.

The key objectives of this guide are to:

- increase the consideration of waste management early in the building design process
- make collection of recyclables more efficient and effective
- improve waste minimisation and collection
- increase convenience for occupants and building managers
- increase the yield and quality of recyclable material
- reduce contamination in recyclable material.

This guide outlines the main issues to be considered when designing a waste management system for five main types of commercial development, including:

- office buildings
- non-food retail outlets – hardware, variety stores, department stores
- food retail outlets – cafes, restaurants, clubs, takeaway stores
- group retail centres – shopping centres, malls, plazas
- hospitality and accommodation – hotels, motels.

Although these specific building types are covered, the information provided also applies to many other building types, including industrial buildings.

Better practice increases the amenity, ease of use and environmental performance of waste management facilities and encourages appropriate tenant and building management waste management behaviour. Better practice also improves the reputation of organisations with well-managed waste facilities.

It is essential to consult councils, planners and waste managers regarding specific requirements for waste services in your local area when developing better practice systems for existing and new facilities.

This guide takes into account input from the design, construction, building management and recycling industries and covers infrastructure and management systems for waste collection, on-site storage, recycling and disposal for commercial and industrial developments.

## 1.2 NSW waste situation

The *NSW Waste Avoidance and Resources Recovery Strategy 2007* provides the framework for waste management in NSW. It advocates reducing waste generation and improving the efficiency use of resources. It also sets resource recovery (diversion) targets for the three key waste streams of:

- municipal solid waste (MSW) - 66 per cent by 2014
- commercial and industrial waste (C&I) - 63 per cent by 2014
- construction and demolition waste (C&D) - 76 per cent by 2014.

With NSW's population projected to reach 10 million by 2051, programs need to be implemented to ensure the best possible resource recovery systems and practices are in place. Waste management better practice incorporates the waste management hierarchy - the concept that waste should be dealt with according to a structure of actions of decreasing priority.

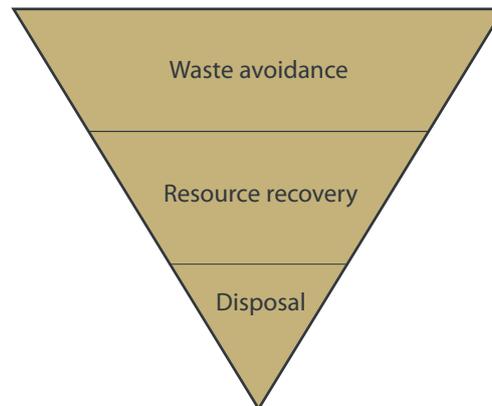


Figure 1 NSW waste management hierarchy

In NSW, the waste management hierarchy, established under the *Waste Avoidance and Resource Recovery Act 2001*, includes (Figure 1):

- waste avoidance, which covers reducing the amount of waste
- resource recovery, which covers not only reuse and recycling but also energy recovery
- disposal, which covers all environmentally responsible disposal options.

### 1.3 What is better practice?

The term 'better practice' indicates that the techniques, methods and advice provided are better than those that might have been previously proposed. The term 'best practice' has been avoided as it implies that no further improvement is possible, and this absoluteness is inappropriate.

It is likely that this guide will be regularly updated to account for changes in the waste management industry, business and community expectations and the commercial and retail environment.

Better practice waste management systems in commercial buildings may incorporate any, or all, of the following:

- garbage services to manage residual wastes (those not collected by a dedicated recycling or organics collection service)
- recycling services to manage dry recyclable materials. These materials may vary from building to building, but generally cover recyclable materials generated in a typical business, including office paper, cardboard, plastic film, metals and recyclable containers
- organics services to manage garden and food organics, which may include a bin-based collection system or on-site composting
- bulky waste services to manage bulky items, such as furniture and fit-out materials
- special waste services for items such as toner cartridges, batteries, fluorescent lights, mobile phones and chemicals.

Better practice means always looking for ways to improve infrastructure, systems and services as your knowledge and experience accumulates over time.

Better practice waste management systems are effective and safe. Tenants and cleaners can use them with ease and collection contractors can easily service them. The design, installation and ongoing management of better practice systems encourages tenants and cleaners to use the services appropriately. This increases participation in waste management which helps to minimise waste generation, increase resource recovery and reduce contamination of recyclables and organics.



## 1.4 Why incorporate better practice?

As a nation, we now consume more resources and generate more waste than at any time in history, mainly due to increases in our population and standard of living<sup>1</sup>. The environmental impacts of our consumption and disposal habits need to be reduced by decreasing waste generation and increasing resource recovery services (such as recycling and organics services).

Although resource recovery systems in commercial buildings can divert significant amounts of waste from landfill, recovery levels are low in many commercial buildings. With increasing commercial development, better practice waste management systems need to be incorporated into all new developments to improve resource recovery and overall environmental and social outcomes.

In addition to wider environmental and social issues, better practice waste management can help maintain the aesthetic appeal and efficient management of a development. Essential aspects of a building like facilities for garbage, recycling and organics are often overlooked or undervalued. If designed and managed properly, these aspects are virtually invisible to the occupants. If designed or managed poorly, they are a perpetual irritation, which can become worse as the building ages. A small amount of planning in the design stage can prevent a great deal of difficulty and inconvenience for tenants, cleaners, customers, building managers and collection contractors throughout the life of a building.

Better practice waste management can enhance the social and environmental reputation of an organisation. The community often expects larger corporations to at least cause no harm to the environment and at best establish better practice systems that improve environmental outcomes.

Perhaps the most tangible reason for incorporating better practice waste management is to reduce the cost of waste disposal. In NSW, every tonne of waste sent to landfill attracts a significant levy and this is scheduled to increase every year. The Commonwealth Government's carbon pricing mechanism may also increase the cost of disposing waste to landfill.

Better practice waste management will provide benefits for all stakeholders and the wider community (Table 1).

<sup>1</sup> Australian Bureau of Statistics (2003) *Australia's Environment: Issues and Trends*.

Table 1 Benefits of incorporating better practice waste management systems

Stakeholder	Building stage	Benefits
Architect/designer	Concept design to development approval	Recognition of good building design leading to environmental and design awards and other professional achievements No redesign required
Developers	Concept design to development approval	Increased satisfaction for buyers, building managers, state agencies and local councils leading to improved reputation
Council and private certifiers	Development approval	Easier to assess developments against recognised better practice principles where these form part of development consent conditions
Agent/building managers	First sale or lease of space through entire building life	Easier to maintain waste areas and equipment in an efficient and pleasing manner Happier tenants and business owners Reduced cost of maintenance and ongoing management costs Improved environmental credentials
Tenant	Period of lease or occupation	Improved satisfaction with services Increased ability and willingness to participate in recycling Improved amenity and safety Improved knowledge and awareness through standardisation of services Increased awareness or achievement of corporate environmental goals and targets
Cleaner	Entire building life	Reduced health and safety risks Easier to perform work tasks and maintain systems and equipment
	Contract period	Increased awareness or achievement of corporate environmental goals and targets
Waste collection service provider	Entire building life	Reduced health and safety risk Easier and more efficient collection Increased ability to offer more flexible services to meet tenant and building managers' needs
	Contract period	Increased awareness or achievement of corporate environmental goals and targets
Wider community	Entire building life	Improved aesthetics, amenity and public health and safety Increased recovery of recyclables and organic material Reduced contamination of the recyclables stream Greater contribution to state-wide targets for waste reduction and resource recovery



## 1.5 What is in this guide?

This guide provides a list of essential issues to consider when designing better practice waste management systems for new commercial developments as well as implementing or improving waste management systems in existing developments.

Some examples of system options, based on actual developments, have been provided as a guide to better practices. The main features, advantages and disadvantages of the better practice systems in this guide are provided to allow comparison with alternative systems - architects and building designers with good ideas should not feel constrained by these examples.

This guide specifically covers five different types of commercial buildings (Table 2). These building types were chosen after a review of numerous existing guidelines for commercial buildings and cover all large commercial developments. The building types have much in common, particularly in the area of food retail. For example, office buildings and group retail centres often have food retail areas and while hotels provide accommodation, they also have restaurants. Many non-food retail stores also have cafes. Hence, the strategies provided for food retail buildings may also apply to many other building types.

Although there is likely to be some overlap between the requirements of large commercial buildings and small to medium commercial buildings, there are specific issues that affect both types differently and this guide is aimed at larger commercial buildings.

This guide does not cover waste management requirements for residential developments although some developments include both residential and commercial components. In these mixed developments, the waste streams from the residential and commercial area are generally kept separate and handled using separate systems and techniques. The *Better Practice Guide to Recycling in Multi-Unit Dwellings* should be used to determine storage and collection requirements for the residential component of a mixed development.

Table 2 Building types and descriptions

Building Type	Description
Office building	Multi storey office buildings where cleaning contractors generally operate the waste and recycling system. Small single offices or offices as part of other business or industrial operations are not specifically covered.
Non-food-retail outlets	Large stand-alone retailers that are not part of a group retail centre. These generally include hardware, bulky goods, furniture, variety and department stores and retail barns.
Food-retail outlets	Large cafes, restaurants and clubs.
Group retail centres	Shopping centres, malls and plazas where an integrated waste management system is provided by a single building manager.
Hospitality and accommodation	Large hotels and motels that primarily provide accommodation but may also have bars and restaurants

### 1.5.1 Additional information

As well as providing specific information about waste management in the different types of commercial buildings listed above, a range of general information is also provided (Table 3).

For more information on recycling locations and choosing a recycling contractor go to <http://businessrecycling.com.au/> an initiative of Planet Ark, the NSW EPA, Queensland Government, Pitney Bowes, Zero Waste SA and Mobile Muster.

Additional tools and resources, including case studies for different development types, are available on the NSW EPA's website, [www.environment.nsw.gov.au](http://www.environment.nsw.gov.au).

Table 3 Additional information

Appendix	Description
Appendix A	Provides information on domestic and commercial garbage and recycling rates. This information should be used to estimate the likely garbage and recycling generation for your development.
Appendix A Waste generation rates	Also includes examples of how to calculate bin storage area requirements.
Appendix B Waste management equipment	Provides information on and dimensions for bins, balers, compactors and other equipment. An overview of the operation of chutes, balers, compactors and other garbage and recycling handling equipment is included in this appendix.
Appendix C Collection vehicles	Provides information on waste collection vehicles that are commonly used for commercial waste collections commercial buildings.
Appendix D Vehicle access/turning circles	Provides information on vehicle access requirements, including road and driveway construction and geometry and vehicle turning circles and manoeuvring requirements. Turning circle templates and reverse entry templates are provided. Templates can be used to check vehicle paths on intersection layout drawings. The templates are taken from standard <i>AS 2890.2-2002 Parking facilities – Off-street Commercial Vehicle Facilities</i> and can be sourced from SAI Global Limited ( <a href="http://www.saiglobal.com">www.saiglobal.com</a> ).
Appendix E Standard signage	Provides information on standard signs that should be displayed in waste rooms and on bins.
Appendix F Checklist	This can be used to check if proposed waste and recycling facilities have been designed in accordance with better practice principles and to highlight any issues of concern.
Appendix G Other tools and references	Lists sources of information used in the development of this guide and other sources that may provide further useful information.
Appendix H Sample contract clauses	Shows some examples of words and tables that could be used in collection and cleaning contracts.
Glossary	Defines words and terms using in this document and the meanings of measurement abbreviations.

## 1.6 How to use this guide

This guide has been designed to be a stand-alone information resource to assist:

- developers and architects to effectively plan and design appropriate garbage, recycling and organics management systems and facilities for new commercial developments (see 1.6.1 Design phase).
- facility owners, managers and tenants to develop and implement waste management systems in new and existing developments subject to major refurbishment/fitout (see 1.6.2 Operational phase and 1.6.3 Ongoing management phase).

### 1.6.1 Design phase

The flow chart in Figure 2 guides **developers, architects and builders** during the design phase.

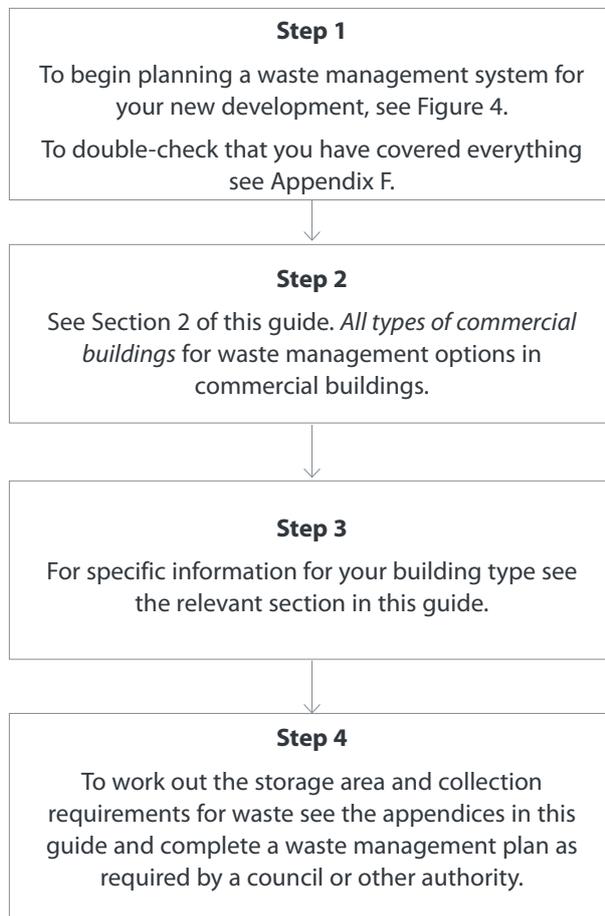


Figure 2 A flow chart to guide users during the design phase.

## 1.6.2 Operational phase

The flow chart in Figure 3 provides guidance to **facility owners, tenants and property managers**.

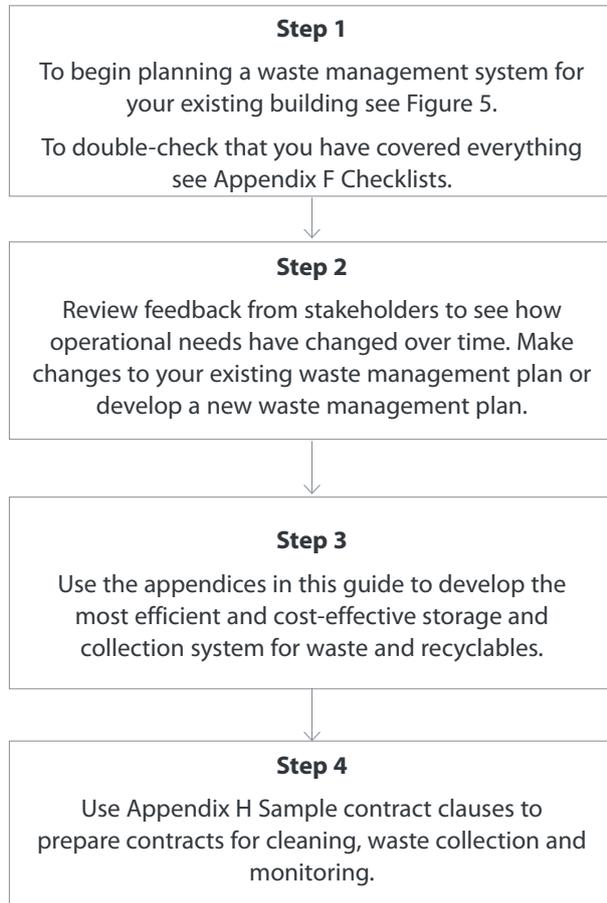


Figure 3 A flow chart to guide users during the operational phase

### 1.6.3 Ongoing management

The flow chart in Figure 4 provides guidance to **tenants and property managers** for the effective ongoing management of waste during the operational phase.



Figure 4 A flow chart to guide users during ongoing management

## 1.6.4 What is my role?

An overview of the process involved in developing a waste management system in the design phase is shown Figure 5. An overview of the waste management system commissioning and ongoing management process is shown in Figure 6. Both these figures show the various roles and responsibilities of key stakeholders.

It should be noted that Figure 5 is a simplified representation of the development application, approvals and construction process. Detailed information about each of these stages should be obtained by contacting individual councils or the NSW Department of Planning.

### Design phase

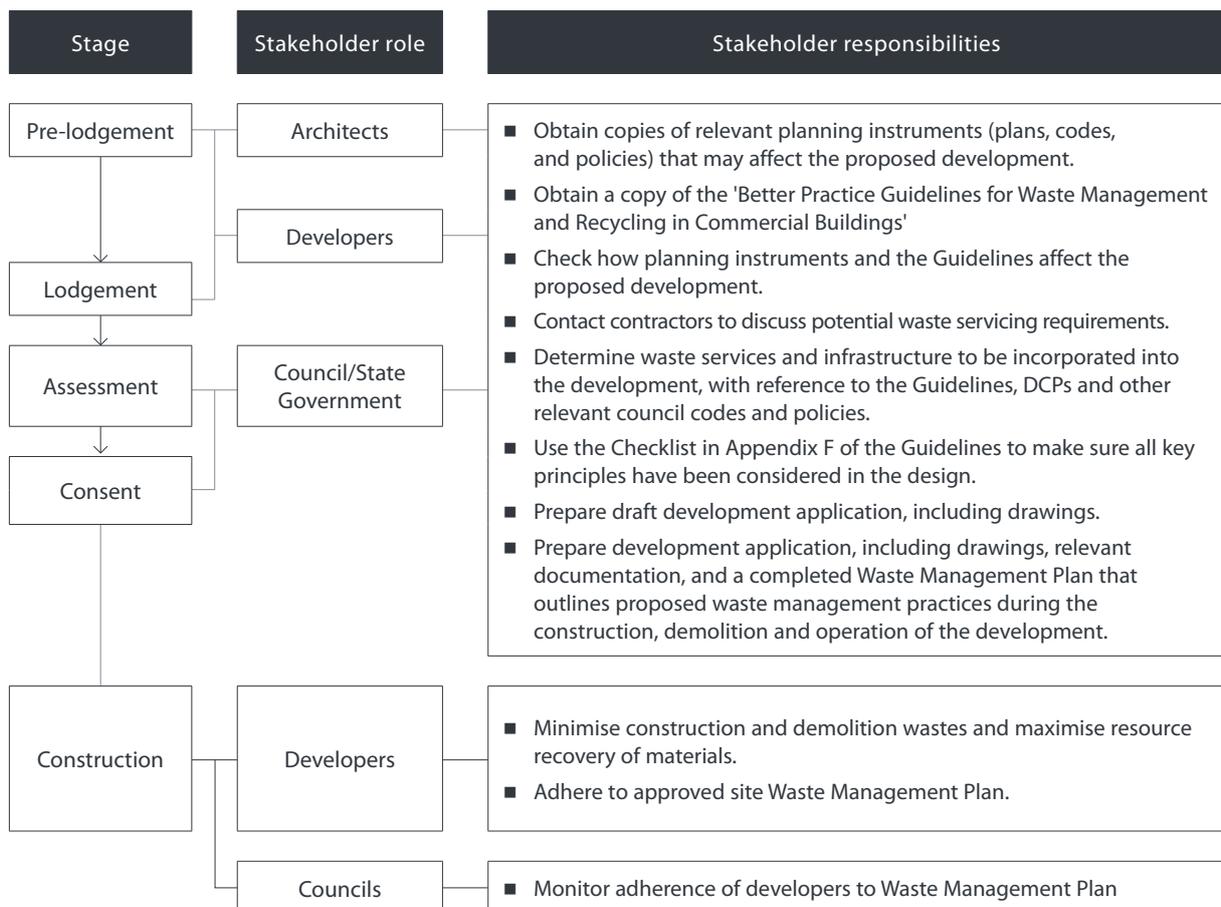
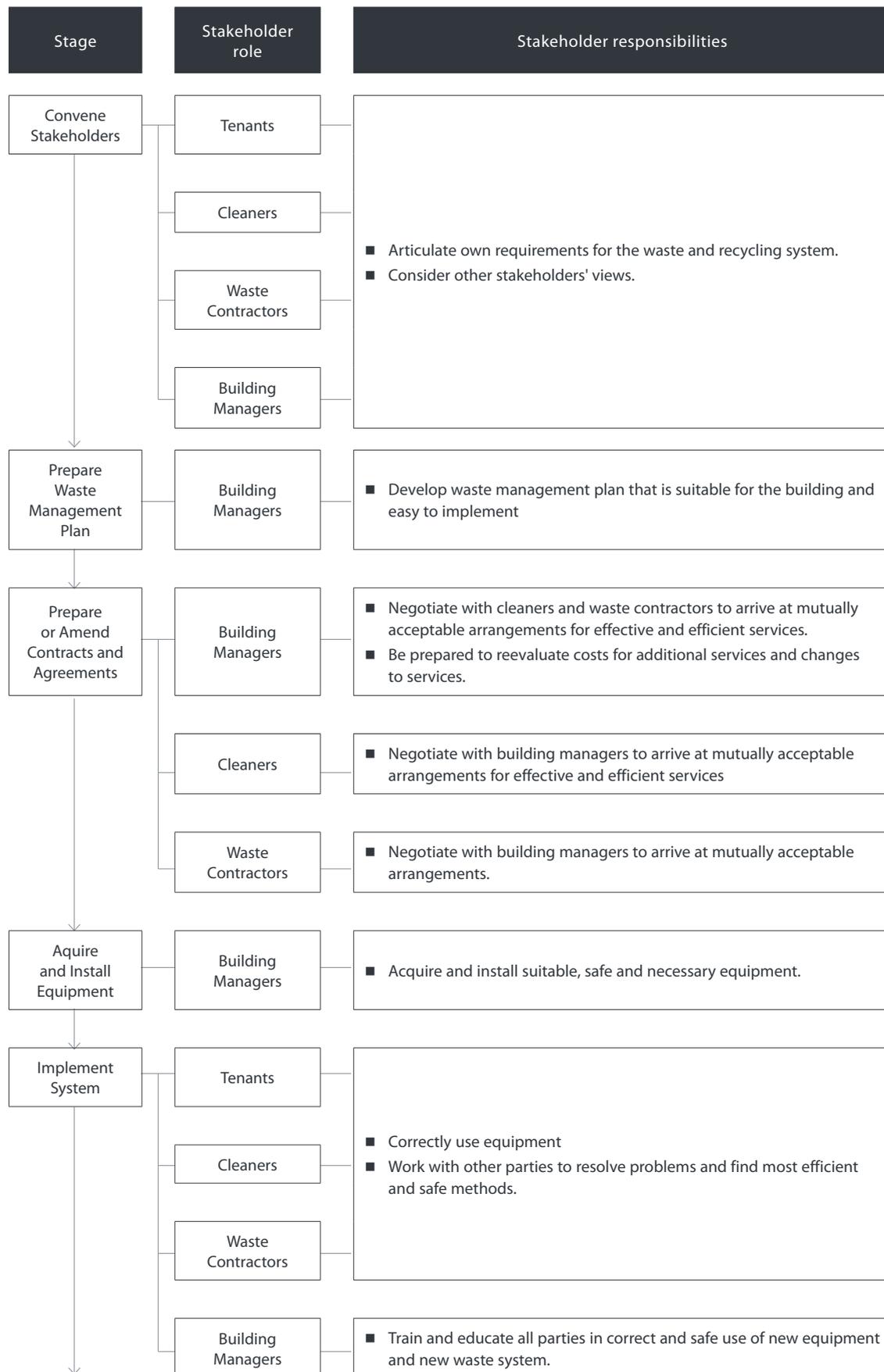


Figure 5 Waste management system design



## Operational phase



## Operational phase continued

Stage	Stakeholder role	Stakeholder responsibilities
<p>Operation</p>	<p>Building Managers</p>	<ul style="list-style-type: none"> <li>■ Provide tenants with information about the waste management system in place in their building at the time of initial occupancy.</li> <li>■ Ensure tenants are aware of the waste management systems in place, their correct use and their individual roles and responsibilities.</li> <li>■ Maintain waste areas and equipment so that they are safe, clean and well-signed.</li> </ul>
	<p>Council</p>	<ul style="list-style-type: none"> <li>■ Work with building managers to deliver services and systems that meet the particular needs of a development wherever possible.</li> <li>■ Support building managers in requests for waste education materials..</li> </ul>
	<p>Waste Contractors</p>	<ul style="list-style-type: none"> <li>■ Provide a reliable and appropriate waste collection service.</li> <li>■ Provide feedback to building mangers on recycling, quality and other relevant issues.</li> <li>■ Work with building managers to improve waste systems.</li> </ul>
	<p>Tenants</p>	<ul style="list-style-type: none"> <li>■ Use waste management system correctly.</li> </ul>
	<p>Cleaners</p>	<ul style="list-style-type: none"> <li>■ Provide a reliable and appropriate service.</li> <li>■ Use waste management system correctly.</li> <li>■ Provide feedback to building managers on system and tenant performance and issues.</li> <li>■ Work with building managers to customise and improve waste systems where possible.</li> </ul>
<p>Monitor and Evaluate</p>	<p>Building Managers</p>	<ul style="list-style-type: none"> <li>■ Manage and co-ordinate waste data and information collection.</li> <li>■ Commission and co-ordinate regular waste audit.</li> <li>■ Keep other stakeholders informed of data collection activities and results.</li> <li>■ Amend and upgrade data collection systems as required.</li> <li>■ Inform and educate new tenant, cleaners and contractors.</li> </ul>
	<p>Waste Contractors</p>	<ul style="list-style-type: none"> <li>■ Provide information and data as required.</li> <li>■ Correctly use any data and information recording systems.</li> <li>■ Co-operate with other stakeholders in waste audits or other waste data collection exercises.</li> </ul>
	<p>Tenants</p>	
<p>Cleaners</p>		

Figure 6 Operational phase – commissioning and ongoing management

## 1.7 How does this guide link in with other planning requirements and other codes and policies?

The principles and objectives of this guide should be considered alongside relevant state environmental planning policies, local environmental plans, local development control plans and other applicable codes and policies. Some councils may incorporate some or all of the principles in this guide in their local development control plans.

This guide does not supersede state and local planning control requirements. When designing a development you should consult with council staff, such as engineers, planners and waste managers, regarding particular specifications for facility design and placement in accordance with local requirements.

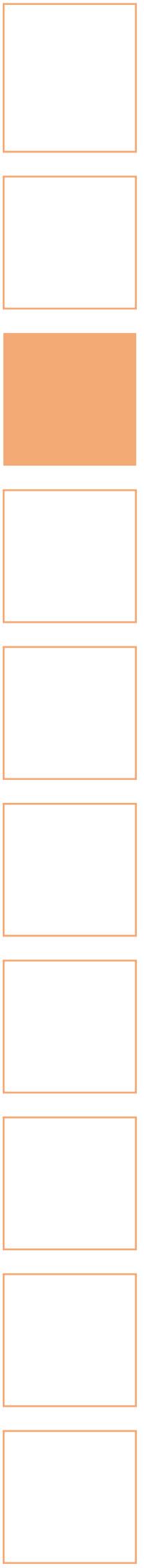
This guide is one of a set of three similar documents covering different waste generation sectors. The first of these, the *Better Practice Guide to Recycling in Multi-Unit Dwellings*, was initially published by the NSW EPA in 2003 and updated in 2008. *Guidelines for Recycling in Small and Medium Enterprises (SMEs)* is being prepared in parallel to this guide. These documents can be accessed at [www.epa.nsw.gov.au](http://www.epa.nsw.gov.au). Additional tools and references are provided in Appendix G.

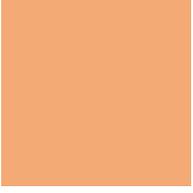




# 2.

All types of commercial buildings







This section of the guide discusses essential issues that apply to all commercial building types and should be considered when designing garbage and recycling management systems.

This guide does not supersede state and local planning control requirements. You should consult with council engineers, planners and waste managers regarding specific requirements for facility design and placement in accordance with local requirements.

The checklist in Appendix F Checklist has been developed to help confirm that these key building design issues have been considered and make sure that the proposed garbage and recycling facilities have been designed in accordance with better practice principles.

## 2.2 Waste and recycling collection services

Building managers in large commercial buildings will need to arrange a commercial waste collection service through a commercial waste contractor or service provider.

Local government in NSW is required to provide a domestic waste management service. Some councils extend this service to small businesses. A few councils operate full scale waste services as separate business units that compete with private waste contractors. Some councils provide recycling services to small businesses. Many councils require separate storage and collection of domestic and commercial waste where residential and commercial premises exist in the same building complex.

## 2.3 Work health and safety

*Disclaimer: This section deals briefly with some issues related to work health and safety in the commercial waste handling environment. The advice in this section is general in nature and should not be relied upon as expert advice. Readers of this document should always obtain their own professional work health and safety advice that applies to their own particular situation.*

Waste management systems and services should be designed and operated in a manner that prevents the potential risk of injury or illness associated with the collection, disposal or recycling of material. This includes risk to:

- tenants and their staff using the service, bins and equipment
- building management and cleaning staff that maintain the service
- collection staff providing the service
- others engaged in or affected by the waste management system.

Once the development is operational, others may be responsible for waste collection services. However, the designer, developer and operator need to consider how building design will impact on the ability of others to collection waste and provide services in a safe manner.

Collection methods and systems used for waste management in commercial buildings must comply with the *Work Health and Safety Act 2011* and any associated regulations. The *Code of Practice for Collection of Domestic Waste* (NSW WorkCover)<sup>2</sup> may also provide some guidance when waste facilities for commercial buildings are designed.

Regardless of the size and type of commercial building, all waste services must comply with Occupational Health and Safety (OH&S) requirements.

The underlying principles used to develop this guide are:

- systems should prioritise hygiene, safety and cleanliness
- systems should be as intuitive and simple to use as possible
- systems should maximise source separation and recovery of recyclables.

A preliminary risk and hazard analysis should be undertaken during the design phase to identify potential risks to health and safety. Identifying risks early will enable the proposed design to be modified to eliminate or minimise the likelihood of human injury or damage to property and equipment. Some examples of risks that should be eliminated or controlled through appropriate system design are shown in Table 4. Further hazards, risks and appropriate management strategies should be identified through a risk assessment process and consideration

<sup>2</sup>WorkCover NSW (2005) *Code of Practice: Collection of Domestic Waste* (<http://www.workcover.nsw.gov.au/Pages/default.aspx>)



should be given to the recommended design standards included in this guide. Professional work safety consultants should be employed where suitable expertise is not available in-house.

Table 4 Risks and control measures to consider during building design

Risk	Examples of control measures to be considered in design
Manual handling injury from moving bins.	<p>Ensure adequate storage space is available for easy manoeuvring of bins within the property and from the storage area to the collection point.</p> <p>Keep bins and equipment in good condition. Any damaged, split or incomplete bins should be repaired or disposed of.</p> <p>Use the correct size and type of bins and equipment and only use them for the purposes for which they were designed or intended.</p> <p>Where smaller bins are to be emptied into larger bins, ensure proper lifting equipment is installed and used.</p> <p>Do not lift mobile and wheelie bins by hand as they are designed for mechanical lifting.</p> <p>Identify an appropriate collection point that is free from obstacles and traffic hazards.</p> <p>Make sure that bins do not become overloaded or overcrowded (Figure 7) by including sufficient space and disposal capacity (Figure 8).</p> <p>Keep the paths for bin movement free from steps and inappropriate grades.</p> <p>Collection points should enable the mechanical collection of bins.</p> <p>Do not overload bins (Figure 9)</p>
Damage to buildings, structures and equipment.	<p>Ensure collection points are easily accessible for the collection vehicle and have appropriate overhead clearances, strength, width and geometric design.</p>
Cuts and lacerations, or contact with unknown hazardous substances.	<p>Maintain areas so that all garbage and recycling is contained within appropriate bins.</p> <p>Provide appropriate personal protective equipment (PPE) for all people handling waste or bins. Appropriate gloves and other PPE should be used at all times.</p> <p>Make sure education programs are in place to address the safe and appropriate disposal of garbage.</p> <p>Avoid the need to carry bags of waste any distance. Bags can be used for lining bins but should be placed immediately into another appropriate container when removed from bins.</p>
Potential conflict between building design and collection vehicles.	<p>Provide adequate turning space for vehicles.</p> <p>Ensure vehicle access and turning areas are free from obstacles that may impair driver visibility.</p>
Injury arising from motor vehicle use.	<p>Assess the risk associated with the use of tow motors, forklifts and other mobile plant and equipment by cleaners and facilities managers.</p> <p>Undertake appropriate training for motor vehicle use and implement suitable controls and risk mitigation measures.</p>
Injury from using stored bins and equipment.	<p>Store waste bins and equipment securely and safely when not in use.</p> <p>Remove any damaged or faulty bins and equipment, especially those located in public areas or for public use.</p>
Injury from using compaction equipment.	<p>Do not bypass or disable any of the safety mechanisms installed on balers, compactors or other equipment.</p> <p>Repair or replace all faulty equipment immediately. Do not allow faulty equipment to be used.</p> <p>Implement appropriate training programs for all staff who use compaction equipment.</p> <p>Ensure all equipment has appropriate safety and instructional signage.</p>
Injury from using bags.	<p>Do not use plastic bags where safer options are available.</p> <p>Bags should be used as bin liners only and not for transporting waste.</p> <p>Once removed from bins, bags should be placed directly into a wheeled bin, trolley or other container for transport.</p>



## 2.4 Access to garbage and recycling services

In each commercial development, garbage and recyclables disposal should be equally convenient for tenants and cleaners. Recycling facilities should never stand-alone, they should be located near garbage facilities but in a separate storage area suitably sign-posted.

Waste systems should be convenient, simple to use and as intuitive as possible to maximise recycling and minimise contamination. The mode of operation is obvious to novice users in intuitive systems.

To encourage efficient use of waste facilities, increase diversion and minimise contamination:

- provide adequate space inside each tenancy or retail unit for temporary storage of at least one days' worth of waste and recycling
- provide suitable containers to tenants to allow them to store separated garbage and recycling within tenancies or retail units and transport it to the storage area when they are expected to take their own waste to storage facilities
- display signs in back-of-house areas that clearly identify garbage and recycling bins and storage areas
- provide signs, in community languages if necessary, with instructions on how to use the garbage and recycling facilities, including identifying what is and what is not recyclable
- supply bins and signage using colour coding according to *AS4123.7-2006 Mobile Waste Containers – Part 7: colours, markings and designation requirements*
- provide directional signage and other techniques, such as lines on the ground, to show the location of, and routes to, waste storage facilities.

## 2.5 Bins, containers and waste handling equipment

All garbage and recycling generated by a commercial building needs to be stored in appropriate bins or containers with permanent well-fitting lids. Waste bins and containers should conform to *AS 4123 Mobile Waste Containers* if the standard is applicable for the selected bin or container type. Waste bins and containers greater than the capacity covered in the Standard (1700 L) should be designed to appropriate safety levels.

Coloured and labelled bin lids are a crucial means of correctly identifying bins – replacing or repairing damaged and missing lids should be a priority. Bins should always be in a clean and presentable condition and free of any grime, dirt, accumulated waste or dried liquids whether the bins are situated indoors or outdoors. Bins should also be subject to a condition monitoring program and dirty or damaged bins cleaned or repaired. Further detail about waste bin and container types and their use is provided in Appendix B Waste management equipment.

Waste handling equipment, including balers and compactors, should conform to the relevant design and safety standards. Volume reductions achieved by such equipment offers cost savings. Further information about waste handling equipment can be found in Appendix B Waste management equipment or on the NSW EPA website, [www.environment.nsw.gov.au](http://www.environment.nsw.gov.au).

## 2.6 Storage

Sufficient space needs to be provided within tenancies and retail units for the interim storage of at least one days' worth of garbage and recycling. The location of this space will differ depending on the building type and is covered in more detail in each building type section within this guide. Placement of containers outside tenances could potentially give rise to public safety, amenity and liability issues.

Space inside tenancies and retail units should allow for separate storage of recyclables from the garbage stream. If a system is available for the collection or processing of food organics then sufficient space should also be allocated for the segregation of food organics in a separate waste container.

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Figure 7 Inappropriate and unsafe storage of bins



Figure 8 Appropriate storage of bins



Figure 9 Don't let bins overflow



## 2.6.1 Storage areas

Building designs need to incorporate sufficient space to store, in separate bins or containers, the volume of garbage and recycling (and garden organics where appropriate) likely to be generated during the period between waste collections. Space should also be allowed to locate signs (Figure 10) and educational materials adjacent to bins and equipment.



Figure 10 Bin room signage

When calculating the likely storage space requirements, consider:

- waste and recycling generation rates (see Appendix A Waste generation rates)
- suitable waste and recycling storage equipment (see Appendix B Waste management equipment)
- the likely collection service type.

It is essential to provide an adequate area to enable garbage and recycling (and organics if relevant) bins to be kept separate within the storage area. However, bin storage areas that are too large may encourage bulky items to be dumped.

The storage area should be designed for easy access and manoeuvring of bins to allow trouble-free cleaning. It is also important to consider the access requirements for maintenance and servicing.

Other services and appliances, such as electrical meter boards, gas meters or conduits, should not be located in bin storage areas as they may be damaged during collection or cleaning.

The most difficult part of calculating space allocation is predicting the collection service that will be needed in the future. Service requirements should be discussed with waste contractors or consultants, but some flexibility needs to be built into the design to provide for future needs. The design of the building can incorporate flexibility by:

- identifying suitable waste storage and collection points that would enable onsite collection in the future
- keeping waste storage areas clear of potential obstacles that would limit bin size. For example, fixed structures to separate individual bins or bays should be avoided as bin sizes and/or configurations may change



- designing access paths and doorways greater than the minimum width requirements to allow for potential changes in bin size. For example, installing double doors on a waste storage area would allow easy movement of either wheelie bins or bulk bins should either system be installed
- sizing bin storage areas to allow for a potential increase in waste generation from the development, for example, if the building is expanded or its use is changed.

Refer to Appendix B Waste management equipment for example layouts for a bin storage area.

## 2.6.2 Location of storage areas

Garbage and recycling storage facilities should be located in places that:

- permit easy, direct and convenient access for tenants, cleaners and other the users of the facility
- permit easy transfer of bins to the collection point if required
- permit easy, direct and convenient access for collection service providers
- are well screened, enclosed or hidden so that visual amenity is not reduced for the public, customers, visitors or others
- are secure and provide protection against potential vandalism.

Identifying the best location for waste storage areas can be difficult and requires a balance between convenience for tenants, cleaners and service providers and space, access, noise, security, planning requirements and architectural integration (Table 5).

Table 5 Better practice location of bin storage areas

Risk	Examples of control measures to be considered in design
Location of the bins should be convenient to tenants and cleaners.	Conveniently located bins are more likely to be used appropriately by tenants and cleaners.
Bins should be near other facilities and services.	Locating bins near other facilities and services, like loading docks, encourages good housekeeping and keeps bins visible. It makes it easier and more convenient for tenants and cleaners, as garbage and recyclable disposal can be done as part of a daily routine.  Bins located out of the way or in hard to get to places will be used less, tend to attract dumped rubbish and encourage poor practices.
The storage areas should be as close to the collection point as possible, where bin collection takes place outside the waste storage area.	Manually moving bins from storage areas to the collection point should be minimised to reduce potential health and safety risks. A well-located storage area reduces the time required to move bins before and after collection.
Storage areas should be out of sight or well screened from public view.	Bin storage areas should not affect the aesthetics of a development and should blend in with the surrounding buildings and landscape.  Locating storage areas out of sight from the public also improves safety. Bin storage areas that are visible and accessible can be subject to vandalism.  Locating bin bays and collection points away from tenants and public areas will reduce the impact of noise and odour.



## 2.6.3 Bin storage area specifications

Some councils may require detailed specifications for the construction of waste storage areas in their development control plans (DCP) and as required under other planning policies and codes of practices. In general, better practice waste storage facilities should have:

- adequate storage, based on calculated waste and recycled material generation rates for the particular retail or commercial mix and building size
- been constructed in accordance with the requirements of the Building Code of Australia
- a separate ventilation system to comply with *AS 1668 – The use of mechanical ventilation and air-conditioning in buildings*
- bin wash facilities, including a hose cock and floor graded to a 100 mm diameter floor drain outlet. The hose cock must be protected from the waste containers and be located where it can easily be accessed even when the area is filled with waste containers
- smooth, cleanable and durable floor and wall surfaces that extend up the wall to a height equivalent to any containers held within the area
- doors, gates or roller doors that are durable, self-closing, lockable and are able to be opened from both inside and outside the storage area
- facilities that are integrated into the design of the overall development. Materials and finishes that are visible from outside should be similar in style and quality to the external materials used in the rest of the development
- door and access wide and high enough to allow easy maneuvering of any stored bin
- been suitably enclosed, covered and maintained to prevent polluted wastewater runoff from entering the storm water system
- refrigerated storage areas in hotels where large amounts of food waste are generated
- air conditioning in warm climates.

## 2.6.4 Collection points

If a collection point is difficult for contractors to access collection charges may be higher. Ideally the collection point and storage area should be in the same place, avoiding the need to move bins to the collection point in time for servicing. If this is not possible, the collection point should be as close to the storage area as possible. If the storage area is not suitable as a collection point, your contractor will nominate a collection point where they can gain safe and easy access.

There are some general guidelines for collection points. They should:

- not be near intersections, ramps, roundabouts, pedestrian crossings, on busy roads or in narrow lanes
- not be near awnings, overhead wires, trees or other overhead structures
- be clear of air-conditioning and other service ducts and pipes, sprinklers, CCTV cameras, movement sensors, smoke detectors and other ceiling fixtures if located inside a building
- be on level surfaces rated for heavy vehicles
- have plenty of room for trucks to manoeuvre and reverse if necessary
- have enough room for bins to be manoeuvred by the driver for servicing
- be away from public areas;
- be well clear of vehicle, pedestrian, public, staff and visitor traffic areas
- not be restricted by parked cars or vehicle loading or unloading
- not be restricted by bollards, signs, plants, bins, seats or other street furniture
- not require vehicles to reverse

- not block the normal operations of the building
- be accessible at the times the collections are scheduled to take place and not behind locked gates.

All collections should take place in accordance with all the relevant acts, regulations, guidelines and codes administered by Austroads, the NSW Roads and Traffic Authority, NSW WorkCover and any local traffic requirements.

If the storage area and collection point are in separate locations, bins will have to be moved by staff or cleaners from the storage area to the collection point.

Where bins smaller than 660 L in capacity are to be moved by hand:

- the distance between the storage area and collection point over which the bins are to be transported should not exceed 75 m in all circumstances
- the grades between the storage area and collection point should not exceed 1:14
- there should be no steps or kerbs anywhere on the route.

Bins greater than 660 L and less than 1.5 m<sup>3</sup> should not be moved more than five metres from the storage area to the collection point.

Manual movement of bins greater than 1.5 m<sup>3</sup> in capacity should be avoided wherever possible. If movement cannot be avoided, these bins should not be moved more than three metres from the storage area to the collection point. No grade on the route should exceed 1:30<sup>3</sup>.

## 2.7 Contracts

The structure of service contracts is important to make sure commercial buildings are efficiently serviced. Some examples of clauses that could be inserted into contracts are provided in Appendix H Sample contract clauses.

### 2.7.1 Contract types

There are generally two contracts needed in better practice management systems to cover a cleaning service and a waste collection service. Usually these contracts are held in parallel with building manager, but in some cases, the contracts are in series i.e. a contract between a building manager and a cleaner and then another contract between the cleaner and a waste collector.

The advantages and disadvantages of parallel and series contracts are shown in Table 6.

<sup>3</sup> NSW Department of Environment and Climate Change 2008. Distance and grade figures in this section are sourced from the *Better Practice Guide to Waste Management in Multi-unit Dwellings*



Table 6 Advantages and disadvantages of parallel and series contracts

Contract	Advantages	Disadvantages
Parallel	<p>Building managers have direct control over both service providers.</p> <p>Each contract can be independently developed, tendered and awarded and at different times.</p> <p>Individual reporting requirements can be specified</p>	<p>Additional management time and resources are required.</p>
Series	<p>Reduced management time and resources are required.</p> <p>Cleaning staff have a greater incentive to practice good waste management (e.g. reporting contamination, educating tenants and keeping recycling separate).</p>	<p>Building managers have little or no control over waste collection from the building or contractor engagement.</p> <p>All instructions for, and changes to, the waste collection service must go through the cleaners.</p> <p>Cleaners may not be very experienced or skilled at managing waste contractors.</p> <p>Difficult to enforce waste collection data recording requirements and difficult to verify waste collection data.</p>

## 2.7.2 Contract length

Like any business owner or operator, waste contractors like certainty – it helps plan future income and resourcing. Entering into a contract with a waste collection contractor may be cheaper than utilising the same service without a contract. In some cases, where expensive equipment is required or where equipment needs to be installed, contractors may insist on a contract in order to ensure that they recover the cost of supplying and installing the equipment. Contracts are not normally required for simple, smaller scale services like those that use only wheelie bins.

Companies or organisations that have multiple outlets in different locations across a city, state or even nationally, may be able to negotiate a lower price by arranging a contract that covers all sites. However, these contracts may not have the flexibility provided by individual locally-arranged contracts. They may also reduce the choice of contractors available – generally only larger contractors can provide the same service at multiple sites.

## 2.7.3 Resource management contracts

Under a traditional disposal contract, the client pays the contractor according to the amount of waste disposed. A resource management contracts caps disposal costs. This encourages the contractor to work with the client to improve resource efficiency through source reduction, recycling and materials recovery.

Resource management contracts provide financial incentives for the contractor to find cost-effective waste reduction and recycling opportunities. Incentives are linked to services that encourage avoidance, reuse and recycling before disposal. For example, the savings are shared if the contractor helps identify a cost-effective recycling market for material that would otherwise be disposed of to landfill.

In traditional transport and disposal contracts, the scope of the services includes bin and equipment rental, maintenance, collection and transport as well as disposal or processing. The contractor's responsibilities begin at the bin and end at the landfill or processing facility. The contractor is rewarded with prices based on waste volume or number of collections and therefore has an incentive to maximise the number of services and the volume of waste collected. There is usually minimal contact between the waste generator and the contractor.

In a resource management contract, the same services are provided as in transport and disposal contracts but there is also scope for additional services to be provided that influence waste generation, such as product and process design, material purchase, internal storage, material use, material handling and reporting. The contractor's fees for waste transport and disposal are capped and performance bonuses are calculated on resource efficiency



savings. This drives the contractor to seek more profitable resource efficiency and innovation and as a result, the waste generator and contractor work together closely to improve resource use efficiency.

The benefits of resource management contracts include:

- streamlined services from a single contractor
- reduced waste disposal costs
- increased recovery and recycling
- increased waste prevention opportunities
- improved contractor data tracking and reporting.

Contracts of this type are uncommon. The amount of waste generated in buildings can vary greatly due to changing occupancy levels, seasons, business productivity and many other factors. This increases the risk for contractors under a resource management contract. Collection and disposal of some waste streams are more expensive and every additional truck that is required to collect a separate stream has an associated cost.

## 2.7.4 Legal obligations

When a waste management contract is administered in a building, it is the responsibility of the cleaner (series contract) or building manager or owner (parallel contract) to complete due diligence checks to make sure that waste and recyclables are being deposited at a lawful, licenced facility.

The cleaners or building management should have a system in place for checking that waste and recyclables are being taken to an appropriate disposal or recycling facility. This could include asking contractors to submit disposal and weighbridge dockets and then checking the disposal locations.

## 2.8 Cleaners

Cleaners are the critical element in a successful waste management system. In the past, large businesses and buildings employed their own cleaners. Most cleaning is now performed under contract by professional cleaning contractors, who may have contracts to clean many different buildings and who recruit and employ their own staff.

Cleaners have direct access to tenants and are often better placed to educate them and monitor their waste performance and behaviour. Therefore it is important to make sure that cleaners understand the waste management program used in the building – the system will fail if tenants separate waste but the cleaners end up remixing it.

Cleaners often work after hours when most people in the building are absent. As a result, building management does not have the opportunity to regularly meet cleaners in person. It is recommended that the cleaning services are closely monitored and action taken to ensure compliance with the contract.

When cleaning contractors are calculating the fee for cleaning a particular building, they consider the number of -hours it will take to complete the required tasks. Systems that increase the time cleaners need to complete the job, or that increase the number of cleaners required, may be more expensive.

Elements that increase cleaning time include:

- a greater number of bins
- a greater range of bins
- a larger area to cover
- a greater distance to transport waste and bins
- bins that are more difficult or time consuming to empty.

Time is a priority for cleaners, so implementing a system that increases, or even appears to increase, the amount of time and effort required to complete their tasks is unlikely to result in their cooperation.

Cleaning contractors will generally want to negotiate a variation to their contract fees if there are changes to

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the type or amount of work their employees are required to undertake. Therefore, changing waste systems mid-contract may not be feasible. It may better to wait until the start of a new contract so the new requirements can be clearly stated.

The cleaning contract, whether specified at the tender stage or proposed by the contractor, should specify:

- tasks the cleaners will perform
- bins to be emptied
- other cleaning that is to be done
- how many cleaners will be involved
- how many hours they will work, including start and finish times
- which parts of the building they will have access to
- where waste will be taken and how it will be stored
- what waste will be collected when it is not placed in bins
- what materials that will be collected and separated.





## 2.9 Waste contractors

Waste collection contractors are another critical element in a successful waste management system. Success can depend on the range of services provided by the contractor and their ability to adapt to changing needs.

Key questions to ask a potential waste contractor are outlined in Table 7.

Table 7 Selecting a contractor

Key question	Factors to consider
Is the contractor licensed to transport the particular material type(s) and is the material delivered to a lawful facility?	The licence requirements for transport and drop-off of a range of materials is covered under Section 143 of the NSW Government's <i>Protection of the Environment and Operations Act 1997</i> . This can be accessed at <a href="http://www.environment.nsw.gov.au/waste/coverload.htm">http://www.environment.nsw.gov.au/waste/coverload.htm</a>
What recyclable materials can be collected?	Some waste contractors engage other collection contractors for services they may not be able to provide themselves, such as secure paper destruction. Even if the contractor provides these services, a subcontractor may be used if it is cheaper than using the head contractor's own staff and vehicle. A waste contractor's tender and contract should specify what subcontractors are to be used and what tasks they will perform.
What contamination levels in recyclable material will you accept?	A very large range of bins and equipment is available for waste collection. The contractor should be able to explain what different types of bins and equipment are available and why the equipment it is proposing is best for your situation. See Appendix B Waste management equipment.
Where will waste and recycling be taken?	Collected materials should be delivered to lawful, licenced waste facilities. Contractors should be able to provide weighbridge records for all loads of waste and recycling.
Will a subcontractor will be used?	Some waste contractors engage other collection contractors for services they may not be able to provide themselves, such as secure paper destruction. Even if the contractor provides these services, a subcontractor may be used if it is cheaper than using the head contractor's own staff and vehicle. A waste contractor's tender and contract should specify what subcontractors are to be used and what tasks they will perform.
What types of equipment might be suitable?	A very large range of bins and equipment is available for waste collection. The contractor should be able to explain what different types of bins and equipment are available and why the equipment it is proposing is best for your situation. See Appendix B Waste management equipment.
How do I make contact, especially after hours?	Waste collection often takes place during the night when most businesses are closed. Customers may need to contact the contractor outside of normal business hours if an additional serviced is required or if there are other sudden changes to the nature of the collection.
How do you respond to missed services?	Waste collection often takes place at night, so missed collections or other problems may only become apparent well after the contractor has visited the site, or even the next day. The contractor should be able to guarantee that missed collections will be collected within a certain time period.
Fees and charges	Contractors charge for both the collection service and the hire of bins. Some recyclable materials may generate income, but this is usually only the case if there is a significant amount of materials and if the market is favourable.

For more information on recycling locations and choosing a recycling contractor go to <http://businessrecycling.com.au/>, an initiative of the Planet Ark, NSW EPA, Queensland Government, Pitney Bowes, Zero Waste SA and Mobile Muster.



## 2.9.1 Charges and pricing

There is no set price for a waste collection service. Depending on where you are located, the waste collection industry can be very competitive and quotes are negotiable. It is worth talking to a number of different contractors to get a feel for the services they provide and what charges might apply.

Waste contractors determine their charges based on a number of criteria. In general, contractors will quote lower prices where the service is easy and efficient for them over a long period.

### Location

Waste collection services are likely to be cheaper if your building is near a disposal or recycling facility or one of the contractor's existing customers or collection runs. If their vehicles already frequent the area, they can easily add your building to their route. Services may also be cheaper if you are near a main road, town or in a suburban or city centre. If your building is remote or not close to a contractor's existing customers you can expect to be quoted a higher price.

### Access

Contractors will generally conduct a site inspection before quoting. This is generally conducted to establish:

- how access would be gained to the collection point
- the ease and safety of access
- whether the driver needs to go inside the building to get any bins
- how far the driver might need to push bins
- whether there are any low clearance issues such as ceilings, awnings or overhead wires
- what bins and equipment might be required.

Quick and easy collections are favoured by contractors and they will charge more for collections that require more time on site. Contractors may need to spend more time on sites where collection points (or access to them):

- are narrow
- are on a steep gradient
- require gates or roller doors to be opened
- require security staff to provide access
- may be restricted by parked cars or traffic
- have limited turning circles
- can only be accessed at certain times of day.

### Equipment

In general, contractor's costs will be higher if unusual or sophisticated equipment is required. More information about bins and equipment can be found in Appendix B Waste management equipment.

The simplest and cheapest services are those that only require common bins, like 240 litre wheelie bins or front-lift bins. Services that require expensive and complex equipment, like compactors, will cost more. This equipment costs more to manufacture and deliver and it also requires more maintenance. In some cases, certain types of compactors require elements to be installed permanently to your collection point or loading dock, which is an additional cost. Some equipment may also require connection to your power supply.

However, equipment that appears more expensive might actually be cheaper per tonne to use when you consider the amount of waste or recycling to be collected.



## Regularity of service

Waste collection services can be 'on-call' or 'scheduled'. On-call services require the customer to contact the contractor when a service is required and this would generally be when bins are full.

A scheduled service is one that takes place on the same day(s) and at the same time(s) each week. In these cases the contractor does not need to be contacted in advance and they will arrive at the scheduled time to perform the service.

Scheduled services are generally cheaper per service, as the contractor is more certain of their likely income. On-call services may be quite infrequent and the contractor offsets this uncertainty by charging more per service.

Scheduled services work best in buildings where the same amount and types of waste are generated regularly. On-call services work best in buildings where only small amounts of certain types of waste are generated or where waste is generated infrequently (e.g. at peak times).

There are several advantages and disadvantages of each service type (Table 8).

Table 8 Advantages and disadvantages of on-call and scheduled waste collection services

Contract	Advantages	Disadvantages
On-call	<p>Bins only emptied when full.</p> <p>Overall cost may be lower.</p>	<p>Service may not be provided immediately.</p> <p>Requires management time and resources to monitor bins and contact the contractor.</p> <p>Generally higher cost per service.</p>
Scheduled	<p>Requires little management time or resources to monitor bins or contact contractor.</p> <p>Generally lower cost per service.</p>	<p>Bins may be emptied even if not full.</p> <p>Less flexibility in collection schedule.</p> <p>Could be serious problems if a service is missed or is late.</p> <p>Overall cost may be higher.</p>

## Waste quantity

More waste generally means more services and/or bigger bins, which results in more charges by the waste contractor. The exact combination of bins and services that may suit your building will depend on some of the other factors discussed in this section. Work together with your contractor to decide whether it is better for you to have small amounts collected daily or larger amounts collected weekly.

## Waste type

Waste type can also influence contractor's fees, with dense materials often costing more. Some contractors will collect waste from bins and tip it into a compactor truck along with the waste from many other customers. This is typical of front-lift and rear-lift services. When waste is collected in this manner, contractors will charge more for dense material such as food waste. Customers are charged by volume for these services i.e. a certain amount per litre or cubic metre of waste, but the contractor pays disposal fees by weight i.e. a certain amount per tonne. When the waste from many customers is collected in one truck, the contractor does not have the opportunity to pass the disposal cost directly on to the customer. The extra cost to dispose of dense waste must be recovered by charging those customers a different rate.

Many waste collection vehicles are fitted with load cells that measure the weight of the whole load before and after each bin is collected. Although these systems that allow customers to be charged directly by weight are not yet approved for use in Australia, contractors use the weight information to help them provide differential pricing for customers based on waste type.



## Strategic or competitive influences

Waste contractors may have other reasons for discounting collection costs. If a contractor is trying to generate a critical mass of customers in a new area it may offer low prices. A contractor may also offer lower prices for strategic reasons, for example when taking on a competitor in a particular area.

## Pricing regimes

Once the contractor has taken all the factors that affect their costs into account, there is still some flexibility in the way that costs are charged.

Where a service is provided to empty bins into a collection vehicle, contractors will often charge 'rent' on the bins and a service charge every time a bin is emptied. There is no separate charge for disposal because the waste from all the customers is mixed together in the truck. The cost of disposal is included in the service charge.

Where a service involves collecting a bin or compactor and disposing of it directly, contractors charge 'rent' for the bin or compactor plus a service fee every time the bin is emptied. the contractor passes on the disposal fee that they pay on behalf of the customer at the disposal facility.

## 2.10 Food waste

The recovery of food waste is generally problematic in most commercial buildings. It can be handled in two ways; separated and processed on site in a small-scale in-vessel composting unit, or separated and collected for processing at an external facility (Figure 11).



Figure 11 Food waste collection bin

The quality and quantity of food waste generated will determine whether recovery is viable and which methods might be suitable. Food waste that is free from contamination, especially plastic and glass, is high quality and most suited for recovery. On site, small-scale processing systems are available for high quality food waste and they can handle most quantities.

On-site systems present a number of challenges, including:

- keeping feedstock free of contamination
- generating odour, leachate and run-off
- availability of space
- possibility of attracting vermin and insects
- psychological barriers – the 'yuck' factor
- operation and maintenance of the organics processing system
- regular monitoring and management of the whole system.



All of these challenges can be dealt with by good management. Details of some on-site organics processing systems can be found in Appendix B Waste management equipment.

Some tenants within specific types of commercial buildings produce significant quantities of food waste. Strategies for reducing and recovering food waste are covered in the individual building type sections of this guide.

## 2.11 Food donation

Depending on the type of food waste generated, it may be possible to donate food to charities that specialise in this activity (Table 9).

Food donors are protected by the *Civil Liability Amendment (Food Donations) Act 2005*. This Act absolves anyone who donates food from civil liability if someone dies or is injured as a result of the food being contaminated – provided the food was donated in good faith for a charitable or benevolent purpose, was not to be sold and was safe to consume at the time it left the donor.

More information can be found in the NSW EPA's Food Donation Tool Kit, <http://www.lovefoodhatewaste.nsw.gov.au/business/resources/food-donation-toolkit.aspx>.

The NSW EPA also manages the Love Food Hate Waste program ([www.lovefoodhatewaste.nsw.gov.au](http://www.lovefoodhatewaste.nsw.gov.au)) which is run in partnership with retailers, food manufacturers, local government authorities and community groups. The program helps avoid food waste, save time, save money and reduce environmental impact through better planning, smarter shopping and more effective food storage.

Table 9 Food donation organisations

Name	Details	Phone	Website
OzHarvest	Non-denominational charity that rescues excess food which would otherwise be discarded. Excess food is distributed to charities supporting the disadvantaged and people at risk in Sydney.	02 9516 3877	<a href="http://www.ozharvest.org.au">www.ozharvest.org.au</a>
FoodBank NSW	Not-for-profit, non-denominational organisation which collects surplus, salvaged and donated food and grocery products from food manufacturers, distributors and retailers. This is distributed by charitable welfare agencies to people in need.	02 9756 3099	<a href="http://www.foodbank.com.au">www.foodbank.com.au</a>
Second Bite	Redistributes surplus fresh food donated by farmers, wholesalers, markets, supermarkets, caterers and events to community food programs around Australia. These programs support people who are homeless, women and families in crisis, youth at risk, indigenous communities, asylum seekers and new arrivals..	1800 263 283	<a href="http://secondbite.org/">http://secondbite.org/</a>
Exodus Foundation	Provides 400 meals per day to the needy through donations of food or money.	02 8752 4628	<a href="http://www.exodusfoundation.net">www.exodusfoundation.net</a>

## 2.12 Other types of waste

A range of waste types are often only generated in small quantities, regardless of the building type. These materials can often be recycled (Table 10).



Table 10 Less common types of waste and options for recycling

Waste type	Recycling information
<p>Printers, copiers and toner cartridges</p>  <p>Toner cartridge collection boxes</p>	<p>As with IT equipment, large organisations often have systems in place for the return or recycling of printers and copiers. Some printer and copier manufacturers provide services that include the supply, maintenance and return of equipment for businesses of all sizes.</p> <p>Some copier and printer suppliers have take-back schemes to recycle toner cartridges. A number of organisations provide cardboard bins for cartridge collection.</p>
<p>Batteries</p>  <p>Battery collection boxes</p>	<p>Contact the Australian Battery Recycling Initiative<sup>4</sup> as the first step in implementing a battery recycling program. This initiative is run by a non-profit organisation made up of battery manufacturers, consumer electronics suppliers, recyclers, government agencies and environmental organisations. Some waste contractors will also provide boxes to collect small dry cell batteries (not car batteries). Other recyclers can also arrange for recycling of specialist batteries, such as lead acid, NiCad, lithium ion, lithium, alkaline and Ni-MH batteries.</p>
<p>Mobile phones</p> 	<p>Mobile phones, accessories and batteries should be recycled through MobileMuster<sup>5</sup>, the official product stewardship program of the Australian mobile phone industry, organised by the Australian Mobile Telecommunications Association.</p>
<p>Computers and Information Technology (IT) equipment</p>  <p>Temporary storage of ewaste ready for collection</p>	<p>Building managers in a commercial building do not generally organise the collection and recycling of computers and other IT equipment (e-waste). Tenants and occupants normally arrange their own recycling. Large organisations often have systems in place to recover IT equipment across all their sites, not just at one site.</p> <p>Building managers could offer an IT equipment collection service to smaller tenants and provide IT waste storage space in the building until there is enough waste for a viable collection by a recycling company. A list of companies that offer this service can be found at <a href="http://www.businessrecycling.com.au">www.businessrecycling.com.au</a>.</p>
<p>Furniture</p> 	<p>Furniture and other bulky waste items, such as partitions and flooring, are normally only generated during fit outs and refurbishments. This often coincides with a change in tenant. Building managers should make sure that new tenants and their building contractors manage the waste produced from fit outs and refurbishments correctly.</p> <p>When small amounts of furniture or bulky waste are generated, the tenant or occupier who generates the waste should be responsible for it. Additional storage space should be provided for these materials.</p>
<p>Fluorescent lights</p> 	<p>FluoroCycle is a voluntary program established by the Commonwealth Government and the Australian Lighting Council to help reduce the amount of fluorescent lights going to landfill. Many buildings have a large number of fluorescent lights and when these fail, building management usually arranges replacement by a contractor. These lights contain mercury and must not be disposed of to landfill. Building managers should include fluorescent light recycling in its arrangements with the contractor. More information, including how and where fluorescent lights can be recycled, can be found at <a href="http://www.fluorocycle.org.au/">http://www.fluorocycle.org.au/</a> or <a href="http://www.environment.gov.au/settlements/waste/lamp-mercury.html">http://www.environment.gov.au/settlements/waste/lamp-mercury.html</a>.</p>

<sup>4</sup> <http://www.batteryrecycling.org.au>

<sup>5</sup> <http://www.mobilemuster.com.au/>



<p>Pallets</p> 	<p>Plastic and timber pallets can be reused and/or recycled., while most mattress components can also be recycled – mattresses are one of the most common items sent to landfill. Mattresses in good condition can also be donated to charity.</p> <p>More information on recycling pallets and mattresses can be found at the Business Recycling website <a href="http://businessrecycling.com.au/search/">http://businessrecycling.com.au/search/</a></p>
<p>Mattresses</p> 	<p>Mattresses are one of the most common items sent to landfill but most mattress components can be recycled. Mattresses in good condition can also be donated to charity.</p> <p>More information on recycling mattresses can be found at the Business Recycling website <a href="http://businessrecycling.com.au/search/">http://businessrecycling.com.au/search/</a></p>

## 2.13 Noise

The main noise issues associated with waste collection occur when bins are emptied into the collection vehicle and when reversing alarms sound on collection vehicles.

Better practice noise management strategies include:

- locate bin bays and collection points far enough away from neighbours, tenants and public areas to reduce the impact of noise during bin use and collection
- eliminate the need for collection vehicles to reverse
- use road, driveway and pathway surfacing materials that minimise noise
- consider how materials will be transferred into bins or static compactors at storage points
- addressing collection times to ensure least disturbance to occupants particularly in commercial development mixed with residential.

## 2.14 Odour

Regularly cleaning bins and storage areas will help to minimise odour problems and it is also important that waste storage areas are well-ventilated.

In enclosed storage and service areas, the air flowing from interim storage areas and central garbage rooms should not exit close to public areas. Ventilation openings should be located as close to the ceiling and floor as possible and protected against flies and vermin.

If a forced ventilation or air conditioning system is used for enclosed storage areas:

- it should be in accordance with the ventilation requirements of the Building Code of Australia and Australian Standard 1668.2 The use of Ventilation and Air Conditioning in Buildings
- it should not be connected to the same ventilation system supplying air to public or tenanted areas of the building.

Some council codes may require mechanical ventilation systems to be installed.



## 2.15 Hygiene and vermin

Bin storage areas should be easy to clean, have hot and cold running water (including a hose) and correct drainage to the sewer. Water from washing bins and/or waste storage areas should not be allowed to flow into a stormwater drain.

Wall to floor junctions should be sealed to help with cleaning and avoid the build-up of dirt and spilt waste.

Waste which is not sealed in containers is unhygienic and can attract vermin. Where possible, prevent vermin from accessing waste collection and storage areas.

To maintain hygiene:

- assign responsibility for keeping bin storage areas and collection points clean
- do not allow bins to sit open for extended periods of time
- keep waste collection and storage areas free of clutter and dumped rubbish
- regularly wash the bins, floors and walls of bin storage areas.

## 2.16 Signage and education

Regardless of the type of building, signage and education are critical to ensure the waste and recycling system at your building works well.

The importance of signage and education is two-fold:

1. to inform cleaners, tenants and other users of the system why it is important to recycle (raise awareness and perceived importance of resource recovery and the environment)
2. to provide clear instructions on how to recycle using the services provided.

People's attitudes to recycling will be influenced by both of these factors.

Education and communication must be regular and ongoing to overcome the transient nature of cleaning contractors and the commercial rental market. The main signage aspects to consider are:

- garbage and recycling bins must be clearly and correctly labelled at all times (Figure 12)
- waste storage areas must have clear signage instructing cleaners and tenants how to correctly separate garbage, recycling and organic (if required) materials. Community languages should be used if necessary
- the location of, and directions to, waste storage areas must be well signposted, with directional signs, arrows or lines on the floor showing the most direct routes for cleaners and tenants
- all hazards or potential dangers associated with the waste facilities should be clearly identified, especially those linked to compaction or other waste handling equipment
- emergency contact information should be displayed in case there are any issues with the waste and recycling systems/services in the building.

All signage should conform to the relevant Australian Standard and the NSW EPA's standard recycling signs<sup>6</sup>. Appendix E Standard signage provides further information about standard signs that can be used to support waste facilities and services.



Figure 12 NSW Government standard waste and recycling labels on a kitchen bin

## 2.17 Public place waste management

The term 'public place' covers public and dedicated staff eating areas. All public places should be kept clean and tidy for several reasons, including:

- visual amenity – customers are not attracted to untidy eating areas or messy food halls
- hygiene – waste food on tables can attract insects, birds and other vermin which can carry disease
- litter – untidy and littered areas can attract more litter and discourage the public from using, or correctly using, bins.

Cleaning staff should be designated to clear tables and separate waste for recycling and/or composting. Public place bin systems should be provided. An example diagram of an ideal public place bin unit can be seen in Figure 53 in Appendix B Waste management equipment. Allowing the public to use public place bin systems will reduce management's control over waste separation and correct use of facilities. The negative effects of this can be mitigated depending on the type of waste collection system in use. Several different public waste collection systems are detailed below with advantages and disadvantages summarised in Table 11.

Public place waste management facilities should be designed to encourage members of the public to separate their waste when placing it in bins, in situations where it is difficult to control what food ware and containers can be used and public seating is provided.



Table 11 Advantages and disadvantages of different public place waste management systems

System	Advantages	Disadvantages
Reusable washable food ware.	<p>Amounts of public place waste reduced.</p> <p>Better amenity for customers.</p> <p>Sellers do not need to continually buy new serving containers.</p> <p>Standard serving sizes can be used across different food outlets.</p> <p>Opportunity for centralised branding.</p>	<p>Cutlery and crockery require collection and washing.</p> <p>Greater initial capital investment.</p> <p>Potential for breakage and theft.</p> <p>Terms need to be included in lease agreements.</p> <p>Use of food ware by sellers may need to be policed.</p>
Closed loop.	<p>Almost all public place waste generated is recovered.</p> <p>Opportunity for centralised branding.</p> <p>Opportunity to buy food ware in bulk.</p> <p>No washing of food ware required.</p>	<p>Need to specify food ware to be used – this may not suit all sellers.</p> <p>Terms need to be included in lease agreements.</p> <p>Use of food ware by sellers may need to be policed.</p>
Public place recycling system.	<p>No need to specify what food ware to use.</p> <p>No washing of food ware required.</p>	<p>Lower recovery of recyclables.</p> <p>Greater quantities of waste generated.</p>

## 2.17.1 Washable, reusable food ware systems

Public eating areas are often isolated and self-contained which can make controlling waste generation easier. Waste can be avoided by serving food on reusable, washable crockery and providing washable and reusable cutlery. This is standard practice in many food halls where customers are often asked if they are buying to eat in or takeaway and then provided with the appropriate food ware. In washable, reusable food ware systems, terms need to be included in the lease agreement to specify that no unapproved food ware is to be used.

## 2.17.2 'Closed loop' systems

A 'closed loop' system can be implemented if reusable crockery and cutlery is not feasible, but a significant level of control can still be exercised over the materials that are used for serving and selling food. Under this system, food outlets are required to only distribute food in approved recyclable or compostable containers/utensils, such as:

- aluminium cans
- PET bottles
- cardboard containers
- plant starch containers
- plant starch cutlery
- wooden cutlery.

In a food hall, almost all of the waste generated in public areas will be either recyclable or compostable. Recyclable and compostable food ware products are provided by companies in conjunction with the waste collection service. As most of the waste generated is likely to be recyclable or compostable, service providers can collect all of the waste together for later separation into recyclable and compostable streams. In closed loop systems, terms need to be included in the lease agreement to specify that no unapproved food ware is to be used.



## 2.17.3 Public place recycling systems

Much research has been conducted into the most effective public place waste systems and several key rules have been identified:

- recycling should be collected co-mingled
- bins should feature different shaped openings for garbage and recycling
- openings allowing material to be placed into bins should be on all accessible sides of the unit
- overhead signage should be installed, particularly where bins maybe obscured in a crowd
- bins and bin stations should be colour coded according to Australian Standard AS4123.7-2006 *Mobile Waste Containers - Part 7: Colours, markings and designation requirement*
- standard colour coded signage should be used that conforms to Australian Standards and also conform to the NSW EPA's standard recycling signs<sup>7</sup>
- garbage and recycling bins should always be located together, with two garbage bins either side of a central recycling bin.

Full details and strategies for public place recycling can be found in the NSW Government's *Better Practice Guide for Public Place Recycling*<sup>8</sup>.

## 2.18 Ongoing management

Specialist building management firms look after a range of services, including waste management, in most commercial buildings, particularly those with multiple tenants or occupants. Good waste management is imperative to:

- maintain amenity
- maximise safety for cleaners, tenants, collectors and other users
- maximise resource recovery
- enable efficient servicing of the building.

Ongoing management is required to monitor tenant and cleaner behaviour and to identify requirements for further education and/or signage.

Building managers must also quickly address any negative behaviour, such as dumped waste or misuse of bins and equipment. This will help to prevent these practices from escalating and maintain the amenity, access and convenience of the waste service for all users.

Building managers are also responsible for maintaining bins and equipment, ensuring waste streams are correctly separated and monitoring and evaluating cleaners and waste contractors.

It is important to establish and delegate responsibility for the tasks involved in ongoing waste management, including:

- moving bins to the collection point (if required) in time for collection
- washing bins and maintaining storage areas
- arranging for the prompt removal of dumped rubbish
- displaying and maintaining consistent signs on all bins, in all storage areas
- managing on-site composting recycling systems (if applicable)
- ensuring all tenants and cleaners are informed of the garbage, recycling, organics and bulky waste arrangements.

<sup>7</sup> <http://www.environment.nsw.gov.au/warr/recyclingsigns.htm>

<sup>8</sup> Department of Environment and Conservation (NSW) (2005) *Better Practice Guide for Public Place Recycling*



## 2.19 Service monitoring and reporting

Successful waste management systems are not set and forget. A waste management system may be best practice when it's new, but it will soon start to malfunction if it's not maintained. Action must be taken to rectify issues identified by monitoring.

Monitoring and measuring waste management performance need not be onerous or complicated. At the very least, the number, size, type and capacity of bins for waste and recycling that are emptied each day or week should be recorded. A simple table system for cleaners to complete can work well. This system should be audited from time to time to ensure it is accurate and complete.

Commercial buildings and shopping centres are often owned by banks and investment firms — many of Australia's largest companies are tenants or occupants. Many companies are now required to monitor and report their environmental performance for a variety of reasons, including measuring and reporting on carbon emissions and to comply with:

- environmental management systems
- quality management systems
- shareholder and corporate expectations
- state of the environment reporting.

### 2.19.1 Waste audits

Regular monitoring and recording will give a good idea of the amount of waste generated but regular waste audits should be conducted to establish the typical waste composition. Waste audits generally involve collecting samples from all waste streams over a set period and then physically separating and weighing the components.

Waste audits can be expensive and do not need to be conducted very often, but they will provide a high level of detail not captured by general waste monitoring. Waste audit data, combined with regular monitoring and recording, can show trends over time that will allow building management to respond accordingly and maintain good performance.

## 2.20 Building ratings tools

In Australia there are two main building ratings tools; National Built Environment Rating Scheme (NABERS) and Green Star.

### 2.20.1 NABERS

NABERS is a voluntary scheme that rates and accredits the sustainable performance of an existing building using a star system. Building types covered by the scheme include offices, homes, hotels and retail, while tools are being developed for schools and hospitals. Energy and water performance are the only elements that are rated for all building types. Of all the building types covered by this guide, only office buildings have a rating for waste. More details about NABERS requirements can be found in Section 3 Office buildings.

### 2.20.2 Green Star

Green Star is a rating system for new buildings administered by the Green Building Council of Australia. Microsoft® Excel®-based calculators are provided for several different building types including offices, educational institutions and retail centres. These calculators rate a range of environmental elements, such as indoor environment quality, energy, water and transport. Points are awarded for compliance with certain criteria and up to six stars can be awarded depending on the total number of points accrued.

Waste is rated in two ways. Firstly, by considering the levels of reuse of existing building materials and use of recycled building materials during construction and secondly, through considering the provision of storage areas for recycling materials generated during ongoing use and the accessibility of these areas. More details about the Green Star rating requirements are available for office buildings (Section 3 Office buildings) and retail centres (Section 6 Group retail centres).



## 2.21 Waste management strategies

### 2.21.1 General strategies

An effective waste management strategy is made up of waste avoidance, reuse and recycling systems. These include:

- waste avoidance
  - set photocopiers and printers to print on both sides by default
  - make computer files rather than paper files when possible
  - provide ceramic cups, mugs, crockery and cutlery rather than disposable items
  - arrange with local coffee shops to fill staff provided cups and mugs at a discount rather than provide disposable cups
  - proof read documents on screen as much as possible before printing
  - train all staff in the use of all office equipment to reduce paper waste
  - present all waste reduction initiatives to staff as part of their induction program
  - streamline large distribution mailings – removing duplicate names and out-of-date entries from mailing lists
  - return unsolicited mail to sender
  - investigate the use of retractable cotton hand towels as an alternative to paper towels in toilets
  - use e-mail and intranet to distribute documents
  - consider leasing office equipment so that you can upgrade and not be responsible for disposal of old equipment
  - use computerised and e-business systems rather than paper and hard copies
  - use smaller fonts and text layouts
  - use rechargeable batteries
- reuse
  - reuse envelopes for internal mail
  - use paper printed on one side as note pad
  - donate unwanted items to local schools or charities
  - provide shared newspapers and magazines
  - save cardboard boxes for future packaging and transport needs
  - return cardboard cartons to suppliers for reuse
  - reuse items such as manila folders rather than disposing of them after one use
  - favour products which can be reused in other applications such as sports drinks containers
- recycle
  - flatten cardboard boxes in bins to take up less space
  - buy beverages in containers which can be recycled by your contractor.



## 2.21.2 'Buy recycled' strategies

General 'buy recycled' strategies can include:

- buying only what will be used
- buying products made of recycled material
- buying items in bulk. Avoid purchasing multipacks and single serve containers
- buying products packed in recyclable packaging
- limiting the variety of stationery lines used.

To develop a 'buy recycled' purchasing policy:

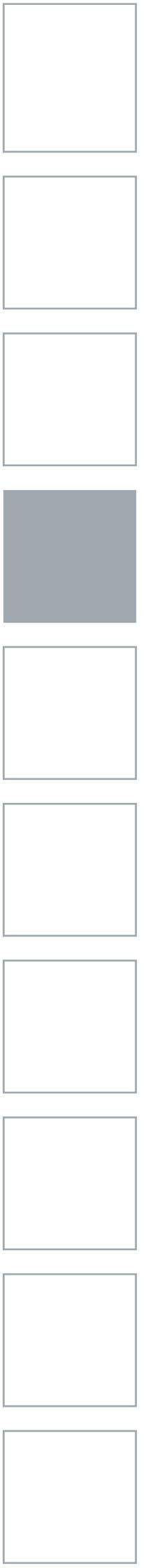
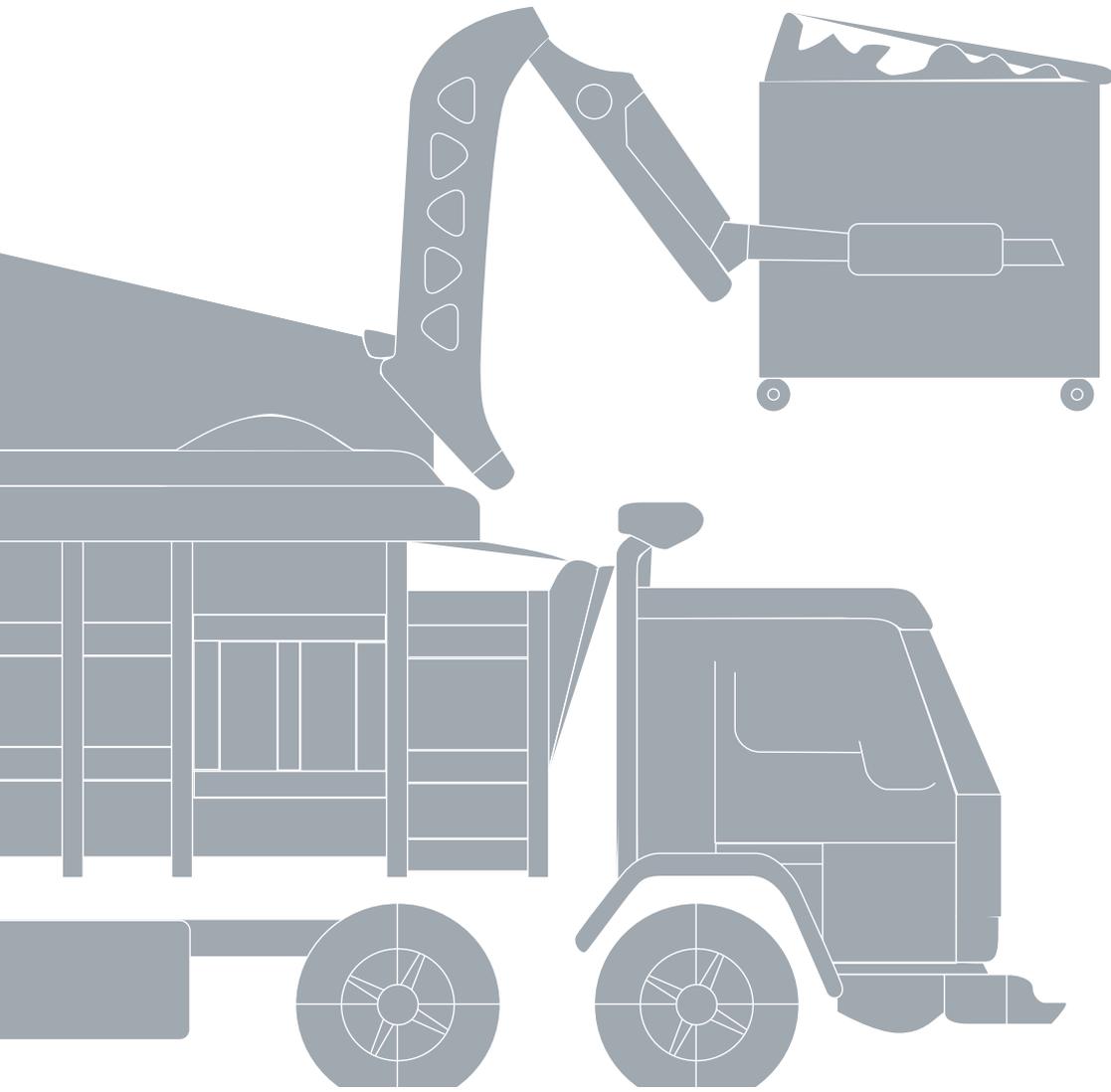
- audit purchased materials to identify recycled content
- research the recycled content products that are available and their specifications, performance and cost
- inform suppliers of your requirements for recycled content
- amend clauses in supply contracts to favour recycled content products
- avoid over-specification, such as requiring high brightness paper for publications
- educate staff on the principles of buying recycled content products
- collect data to measure progress
- review success of recycled content products to ensure they are performing to required standards.

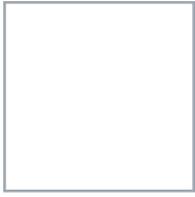
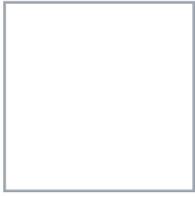
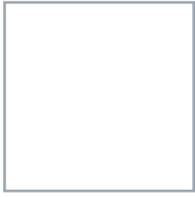
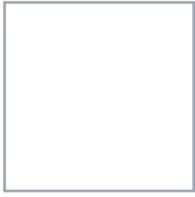
For more information on recycling locations and choosing a recycling contractor go to <http://businessrecycling.com.au/> an initiative of Planet Ark, the NSW EPA, Queensland Government, Pitney Bowes, Zero Waste SA and Mobile Muster.



# 3.

## Office buildings





The office buildings covered by this guide are multi-storey places of employment where the majority of work is chiefly commercial or professional in nature and is conducted at desks in a room or groups of rooms.

These office buildings are typically large enough to require professional building management and cleaning contractors to operate the waste and recycling system. Small single offices, or offices that form part of other business or industrial operations, are not discussed in this guide but the following concepts may be adopted as appropriate.

### 3.1 Typical office waste systems

Waste management systems in larger Australian offices consist of variations to a common system. Typically, one or more bins for paper and/or general waste are positioned next to each worker's desk or work station. One or both of these bins are emptied by contract cleaners. The cleaners circulate around the workplace after normal office hours and also perform other cleaning tasks, such as wiping and dusting surfaces, cleaning toilets and vacuuming floors. Bins for general waste and recyclables are also located centrally in each office, generally in kitchen areas and printer rooms.

Cleaners empty the bins into bags which they transport around the office in a cart (Figure 13). This cart is also used to store and transport cleaning products, spare bags, PPE and consumables.

Depending on the layout of the building, the bags of waste and/or recycling are placed in a central location, often outside the goods lift, and collected and transported to collection bins by another cleaner (Figure 14). The use of different coloured bags for the waste and recyclables is encouraged. The collection bins may be wheelie bins, bulk bins or compactors and they are often located in a basement, car park or loading dock.

There are many variations to this system, depending on office layout and configuration, but this system fits most tower office.



Figure 13 A cleaner's cart



Figure 14 Bags of waste left next to a goods lift (left) and a cleaner collecting bags (right)

## 3.2 Office building rating schemes

In Australia there are two main building ratings tools; Green Star and the National Built Environment Rating Scheme (NABERS).

### 3.2.1 Green Star

Green Star is a rating system administered by the Green Building Council of Australia for new buildings. Office waste is assessed using two tools; *Green Star – Office Design v3 & Office As Built v3* and *Green Star – Office Interiors*. These assess the environmental attributes of new and refurbished office buildings.

Under the *Office Design v3 & Office As Built v3* tool, points are awarded for the reuse of materials during construction but also for providing storage areas for the recycling materials generated during ongoing use. Points are also awarded for the accessibility of these storage areas.

In this tool, Mat-1 specifies that:

- 'Two points are awarded where a dedicated storage area for the separation and collection of office recyclables is provided and it:
  - is adequately sized in accordance with 'Sizing the waste storage area' table (Table Mat-1.1)
  - meets the access requirements of 'Policy for Waste Minimisation in New Developments' (NSW, 2004): Section A, points A-12 through A-17, and Section C, points C6 and C7
  - is located in the same level as the loading dock with clearly marked, sign-posted, convenient, guaranteed access route within one of the following walking distances:
    - 20 m of the exit used for recycling pick up, or
    - 20 m of the lift core serving all floors, or
    - 3 m of the shortest route connecting the lift core serving all floors and the exit used for recycling pick-up.'

Under the Office Interiors tool, Mat-9 specifies that:

- Two points are awarded where it is demonstrated that waste management and recycling systems for typical office waste are included in the tenancy fit out, as follows:
  - 1 m<sup>2</sup> of designated recycling storage space per six work settings with monthly collections
  - 1 m<sup>2</sup> of designated recycling storage space per 24 work settings with weekly collections.'

### 3.2.2 NABERS

NABERS is a voluntary scheme that rates and accredits the sustainable performance of an existing building using a star system. Offices are one of the building types covered by the scheme and the only building type included in this guide that has a rating for waste. An audit protocol allows for an accredited rating to be applied to the:

- tenancy
- base building
- whole building.

Buildings receive stars for the:

- per cent of material recycled – zero stars for less than 25 per cent and up to five stars for more than 90 per cent
- quantity of waste produced – zero stars for more than 550 grams per person per day and up to five stars for less than 149 grams per person per day.

The auditing protocol requires detailed auditing over several days. An accredited NABERS assessor is required to verify the correct compliance or reported result of an audited building.

More information and associated documentation can be obtained at <http://www.nabers.com.au/>.

## 3.3 Better practice systems

This section covers the main types of waste generated within office buildings – offices can also generate other waste types in small amounts and/or occasionally. Better practice systems covering these materials can be found in Section 2.12. Many office buildings may also have public places or public eating areas. Better practice systems for public place waste management are outlined in Section 2.17.

### 3.3.1 Office paper

Waste audits have shown that by quantity, office paper is the largest waste stream generated from offices by far. This paper is generally white, A4-size and 80 grams per square metre (gsm, g/m<sup>2</sup>), although many other combinations of colour, size and grade are also generated. Office paper is a higher grade paper and as it is usually generated in large quantities it is generally collected separately and recycled. With one easily identifiable and easily recoverable material forming such a large proportion of the waste stream, office buildings typically have very high paper recovery rates and overall diversion rates.

#### Paper bins

Paper is dense and its weight makes it difficult to handle in large quantities. Most offices use wheelie bins for collecting paper on each floor, transporting it to the collection point and collection by a contractor. Typically workers have a small bin or cardboard box for the collection of paper beside their desks. In some offices, workers empty their own desk-side paper bins into centrally located bins, while in other offices the desk-side paper bins are emptied by the cleaners. Further information on different desk-side bin combinations can be found in Section 3.3.6.

Wheelie bins for paper are usually located in rooms that contain printers and copiers, as this is where most paper waste is generated, but they can also be located at other strategic positions. Wheelie bins of 240 L capacity are by far the most commonly used bin type and size.

Wheelie bins are a very practical way of collecting paper. In many ways they are ideal, as once paper is deposited in them, it does not need to be removed until collection. The design of wheelie bins also allows for easy containment and transport of large amounts of paper by hand.

In some offices, wheelie bins are considered unsightly and alternative bins become the primary method of containing paper. Usually these bins have smaller capacities and therefore more are required. Wheelie bins are then only used by cleaners to empty the contents of the smaller bins.

#### Contamination and other paper waste types

Offices also generate other, lower grade types of paper waste, for example newspapers or magazines. Office paper is a higher grade paper to others and is generally collected separately because of its sheer quantity and there may be a financial advantage to separate collection due to the market and price for this type of paper. Where large amounts of lower grade paper are generated, systems should be put in place to collect and recycle these separately from office paper to maintain and protect the higher quality paper waste stream.

Non-paper contamination, such as plastic, should be avoided, although small proportions of other paper types, such as manila folders and newspaper, may be acceptable.

#### Secure paper destruction

Some documents cannot be recycled through the normal waste paper stream because they contain sensitive information. This paper can be disposed of either by shredding on site or by using a secure destruction service.

Shredding on site involves passing one or more pages at a time through a shredding machine (Figure 15). This machine cuts the document into thin strips, or particles and makes it very difficult, if not impossible, to reassemble. Shredded paper can then be placed into the normal paper bin.

A secure paper destruction service provides wheelie bins with locked lids that prevent anyone without a key from accessing the contents. A narrow slit in the lid allows documents to be safely inserted into the bin for disposal (Figure 16). Operators from the secure destruction service collect the bins according to an arranged schedule. The bins are not normally handled by cleaners or building management — in many cases tenants have to arrange this service directly. The bins are emptied into a compactor truck with a secure tipping mechanism that prevents

paper blowing or falling out of the bins or the truck. The trucks deliver to paper recycling facilities where the loads are also tipped under secure conditions.

Customers pay significantly more for a secure destruction service than normal recyclable paper collection. The advantages and disadvantages of shredding on-site and secure paper destruction is outlined in Table 12. For this reason, only secure paper should be placed in the secure bin and any paper that does not need secure destruction should be placed in the normal paper recycling stream.



Figure 15 Paper shredders



Figure 16 Secure paper bins

Table 12 Advantages and disadvantages of shredding on site and secure paper destruction

	On-site Shredding	Secure Paper Destruction
Advantages	<p>Cheaper to shred paper and dispose of it in the normal recycling stream.</p> <p>Documents are rendered secure immediately.</p>	<p>Large amounts of paper and documentation can be disposed of securely.</p> <p>Unshredded paper occupies less space than shredded paper.</p>
Disadvantages	<p>Usually only small amounts can be shredded at once.</p> <p>Shredding large amounts of documentation can be time consuming.</p> <p>Requires purchase of shredding equipment.</p> <p>Shredding equipment uses electricity.</p> <p>There is a tendency to use shredders for all documentation whether sensitive or not.</p> <p>Shredded paper is very bulky and takes up more room in normal paper bins than unshredded paper.</p> <p>Shredding shortens fibres and makes paper less suitable for recycling.</p>	<p>More expensive than a normal paper recycling service.</p> <p>Still a small risk that secure paper may be accessible due to a flaw in the collection system.</p>

### 3.3.2 Cardboard

Only small quantities of cardboard waste are generally generated in offices and often only in specific areas such as mail rooms and despatch and delivery areas. As cardboard is bulky and quantities are usually small, bins large enough to contain cardboard are not normally viable in an office situation. Normally cardboard is placed in a designated area for removal by cleaners. Tenants and cleaners should flatten cardboard boxes as much as possible to save space.

### 3.3.3 Garbage

Collection systems for garbage in the office are similar to systems used for paper. Traditionally workers have had bins beside their desks which cleaners empty. Increasingly, other combinations of office bins are used – more about these systems can be found later in Section 3.3.6.

In addition to desk-side bins, and in some cases instead of, most offices also have a number of centrally located, dedicated bins for garbage and recyclable containers (Figure 17). Often these are positioned in kitchen areas, but they can also be located elsewhere in offices.

### 3.3.4 Recyclables

Office workers frequently consume beverages packaged in recyclable containers, such as aluminium cans and polyethylene terephthalate (PET) bottles and milk is often provided by organisations in liquid paperboard or high density polyethylene (HDPE) containers. These materials can form a significant proportion of the office waste stream. Occasional office functions can also generate irregular but significant quantities of glass and other containers.

Where these materials are generated in sufficient quantities bins for co-mingled recyclables may be justified.



Figure 17 Bins for separation of recyclables

### 3.3.5 Food waste

Some office buildings have food retail and other retail outlets in some areas. Issues and strategies relating to food generation and recovery are covered in Section 2.10 of this guide.

People in offices do not normally generate significant quantities of food waste. Food waste generally only comprises the remains of staff lunches and other small meals. As quantities of food waste are generally low it can be recycled reasonably easily on site with some commitment — a level of expertise is required. Building management and cleaners are not normally involved and staff generally arrange and maintain any on-site food recovery system.

#### Composting

A composting system could be established with building management's permission where a building has gardens or grounds. Composting requires little effort other than regularly turning and aerating the compost. Information on composting techniques is widely available — many local councils provide brochures, training and sell compost bins.

#### Worm farms

In some buildings without gardens or grounds, worm farms have been used to dispose of food waste. Although well-managed worm farms do not emit odour, the possibility of odours is enough to discourage some office management from using these systems. There are some types of food waste that worms will not eat, such as meat, and the castings and liquid produced from worm farms also has to be managed. Worm farms in offices require significant staff expertise and commitment and are still quite uncommon. Details of some proprietary small-scale food processing systems can be found in Appendix B Waste management equipment.

### 3.3.6 Desk-side bin systems

In the past, all desks in an office had one desk-side bin for waste. During the 1990s, desk-side or desk-top containers for paper waste became more common, with a bin for general waste and a bin for paper at each desk or work station (Figure 18).

More recently, some offices have removed general waste bins from beside desks and workstations, leaving only bins or boxes for paper. This means that general waste must be disposed of in centrally located bins.

Some organisations have now rationalised office waste systems so that smaller individual desk-side bins are removed and larger bins for general waste, paper and co-mingled recyclables are installed for groups of work stations. One bin of each type is provided for groups of four, five or six workstations, depending on the office layout (Figure 19). Each bin system has advantages and disadvantages (Table 13).



Figure 18 Desk-side bins for paper and garbage



Figure 19 One bin for several workstations

Table 13 Advantages and disadvantages of different office bin systems

System	Advantages	Disadvantages
One desk-side garbage bin emptied by cleaners. Central paper bin for staff to place waste paper.	Easy and quick for cleaners to empty garbage bins.	Lower paper recovery rate with more paper likely to be disposed of in garbage.
One desk-side garbage bin emptied by cleaners. One desk-side paper bin emptied into central paper bins by staff.	Easy and quick for cleaners to empty garbage bins. Easy for staff to separate paper at their desks.	Staff have to take desk-side paper to central bin so paper recovery rate still lower than potential.
One desk-side garbage bin and one desk-side paper bin – both emptied by cleaners.	Easy for staff to separate paper at their desks. Staff do not have to take desk-side paper bin to central bin so paper recovery rate likely to be higher.	More time consuming for cleaners. More bins and boxes required.
One garbage bin, one paper bin and one co-mingled bin per group of desks emptied by cleaners.	Less time required for cleaners to empty bins. Greater separation of co-mingled recyclables likely with bin located closer to staff. Fewer bins required.	Not quite as easy for staff to separate waste. Larger capacity bins required.
No desk-side bins. Central bins for paper, co-mingled recyclables and garbage.	Less time required for cleaners to empty bins.	Larger capacity bins required. A challenge to implement where staff are used to having their own bins or bins nearby. Staff may establish own informal desk side bin systems. Staff are required to leave desk to place waste or recycling in bins.
One desk-side paper bin only –emptied by cleaner. Central secure paper, co-mingled recyclables and garbage bins.	Less time required for cleaners to empty bins. Easier and quicker for cleaners to empty one desk-side bin than two bins.	Some larger capacity bins required. Higher contamination rates likely with some staff using one paper bin for all waste.

Whatever bin configuration is implemented, arrangements need to be made with the cleaner. Changes to the cleaners cost structure may be required if changes are made to the bin configuration during the term of a cleaning contract. If changes can be coordinated with the start of a new collection contract then they can be included within the new contract.

## 3.4 Tenants

Many office buildings have one or more 'anchor' tenants that occupy large proportions of the office space. These are often supplemented by any number of smaller tenants occupying smaller spaces. Tenants normally pay for waste collection service as part of their rent. Therefore, any cost benefits that might result from reducing the amount of waste generated are not easily passed on to tenants – a major barrier to further waste reduction in offices.

Waste reduction efforts implemented by tenants can reduce disposal costs by:

- increasing the amount of recyclables diverted and disposed of at a lower cost
- decreasing the number of services required for waste collection, reducing collection costs.

Waste reduction activity by tenants can provide a financial windfall for the building managers and/or owners. However, waste decreases are likely to be comparatively small and are generally only measurable for large tenants. Large tenants generate the most waste, so savings should be passed on to them to reward and encourage further waste reduction activities.

Savings could be passed directly to tenants if waste collection charges were separated from rental charges, in a similar way that municipal waste charges are separate items on household rate notices in NSW. Tenants could then see the benefits of reducing the amount of waste sent to landfill.

Alternatively the windfall amount could be linked to other incentives, such as:

- catering for a function with drinks and food for tenant staff
- donating the amount to a charity
- putting the amount towards a credit system on an annual review of rent
- staff satisfaction gained as a result of achieving better sustainable outcomes .

## 3.5 Access and storage

Office buildings typically have limited space in basements and car parks for loading docks and waste storage areas. Offices usually do not receive large deliveries and most loading docks only need to cater for couriers and small trade vehicles. Ceiling clearance is often low which restricts the size of waste collection vehicles that can gain access (Figure 20). In addition, basement driveways are often narrow with steep entrances and located in narrow rear laneways.

During the design stage of a new development, a dedicated waste storage area should be included with enough space to contain all the bins and equipment required for the building. This would include bins of suitable sizes and could include a cardboard baler and small-scale food processing unit. Sufficient clearance should be provided to enable typical collection vehicles to access the bin storage area. Details of collection vehicle specifications can be found in Appendix C Collection vehicles.

In an existing building, it is not possible to make many changes to storage areas where access is difficult. Often the only options are to choose a collection contractor with vehicles small enough (Figure 21) to gain access or find staff who are willing to push bins from the storage area to a safe collection point. The cost of collection may increase in both instances.



Figure 20 Typical narrow office car park and dock access



Figure 21 Small vehicle for access to areas with low clearance

## 3.6 Public place waste management

Refer to Section 2.17 for information relating to public place waste management.

## 3.7 Ongoing management

Unlike other commercial operations covered in this guide, the success and operation of the waste system in an office building relies on almost all of the people in the building. In other commercial building types, waste management often only relies on a small number of people.

Ongoing monitoring of an office waste system is more challenging with a large number of people involved – the behaviour of many people needs to be observed and in some cases amended.

Waste system monitoring in offices can be as simple as regular bin checks. The recycling coordinator or champion should regularly inspect bins after work hours, but before the cleaners arrive, to check whether they are being correctly used. Correct use is indicated by garbage bins that are free of recyclables and recycling bins that are not contaminated. Staff that are using bins correctly can be rewarded in some way (a green star or a chocolate for example), while those that are not are penalised (a red star or a black balloon).

## 3.8 Waste management strategies

Section 2.21 of this guide lists a range of widely used waste avoidance and reduction strategies. Strategies that are particular to office buildings include:

- waste avoidance
  - set photocopiers and printers to print on both sides by default
  - provide ceramic cups, mugs, crockery and cutlery rather than disposable
  - arrange with local coffee shops to fill staff provided cups and mugs at a discount rather than provide disposable cups
  - proof read documents on screen as much as possible before printing
  - train all staff in the use of all office equipment to reduce paper waste
  - present all waste reduction initiatives to staff as part of their induction program
  - streamline large distribution mailings – remove duplicate names and out-of-date entries from mailing lists
  - return unsolicited mail to sender
  - use e-mail and intranet to distribute documents
  - consider leasing office equipment so that you can upgrade and not be responsible for equipment disposal
- reuse
  - reuse envelopes for internal mail
  - use paper printed on one side as a note pad
  - provide shared newspapers and magazines
  - use items such as manila folders more than once
- recycle
  - develop a 'buy recycled' purchasing policy
  - only purchase paper that is recyclable and/or contains recycled content.

For more information on recycling locations and choosing a recycling contractor go to <http://businessrecycling.com.au/>, an initiative of the Planet Ark, NSW EPA, Queensland Government, Pitney Bowes, Zero Waste SA and Mobile Muster.

## 3.9 Better practice case study

### 3.9.1 Increased recycling activity in the Commonwealth Property Office Fund's (CPA) property portfolio

Location: 16 Commercial Properties across Australia

In July 2010 Colonial First State Global Asset Management (CFSGAM) established a new waste and recycling contract for the commercial office portfolio. Working with Waste Audit & Consultancy Services (WACS), the new contract was designed to ensure achievement of CFSGAM's Resource Recovery Strategy and environmental objectives, specifically primary resource recovery and waste reduction. The project cost was \$178,044 and we have been able to achieve savings estimated at \$240,000 per annum, this represents a payback of less than 1 year.

#### The Situation

A key point of difference with the new waste contract was the integration into a comprehensive recycling program that included all key stakeholders, from the actual tenants and building management team (James Lang LaSalle, Australia) to the waste and cleaning contractors. The program was facilitated and co-ordinated through WACS.

Understanding the importance of good, reliable reporting, a detailed monthly waste report was established which provides details of each stream for each individual site. This reporting process enables buildings to be benchmarked against each other, assisting to identify high and low performers and to monitor progress against established targets. This report also provides CFSGAM

#### Key Initiatives

- Program specific waste contract with specific recycling KPIs
- Recycling KPIs included in cleaning contract
- Support and mentoring provided by industry specialists
- Verifiable waste data with site specific monthly waste reports
- Monthly site meetings with all key stakeholders
- Consistent system rolled out throughout all buildings
  - Colour coding
  - Signage
  - Waste room setup
- Cleaner toolbox sessions to engage and educate
- Tenant engagement activities
- Ongoing monitoring and innovation



Quote:

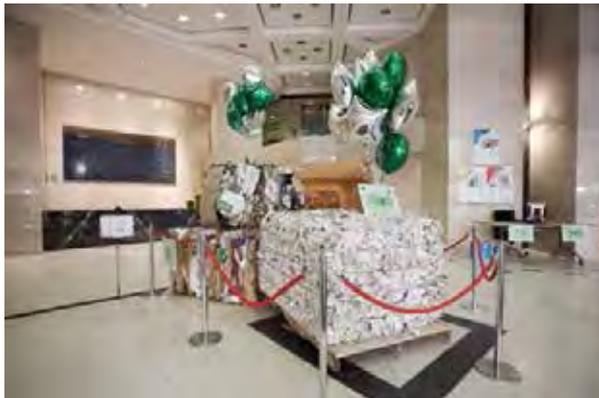
*'The success of the program was dependent on all stakeholders maintaining an interest in the system and ensuring ongoing monitoring'*



## Key Challenges and Outcomes

"Everyone Has A Role to Play" - the mantra for the program was established.

- The Single Bin System was introduced as a minimum in all sites. Some sites have now moved to the Zero Bin System.
- Engagement of tenants
  - An innovative video was developed for tenant awareness and cleaner education
  - Short educational videos played in lifts
  - Foyer displays annually in all buildings
  - Tenant newsletters
  - Direct tenant education sessions



*Foyer Display for Valentine's Day 2011 – "Love Your Planet"*

### The Outcome

To date, overall recycling performance of the managed CPA portfolio has increased from 31% to 63%, on-site recycling, with some properties achieving 80% on-site recycling. The improvements represent a savings of in excess of \$20,000 per month.

### Program Analytics

Project Costs:  
\$ 178,044

Payback Period:  
Approximately 9 Months

Cost Savings:  
\$240,000 per annum

Environmental Savings  
2,800 Tonnes of materials  
recycled per annum

CO<sub>2</sub> Abated:  
100 tonnes per annum  
(based on the benefit  
of recycling Paper/  
Cardboard)

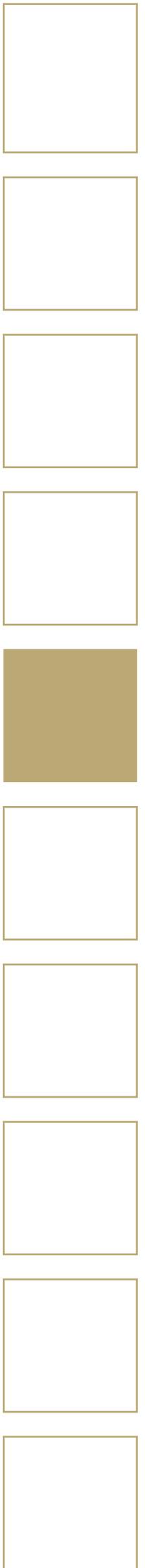
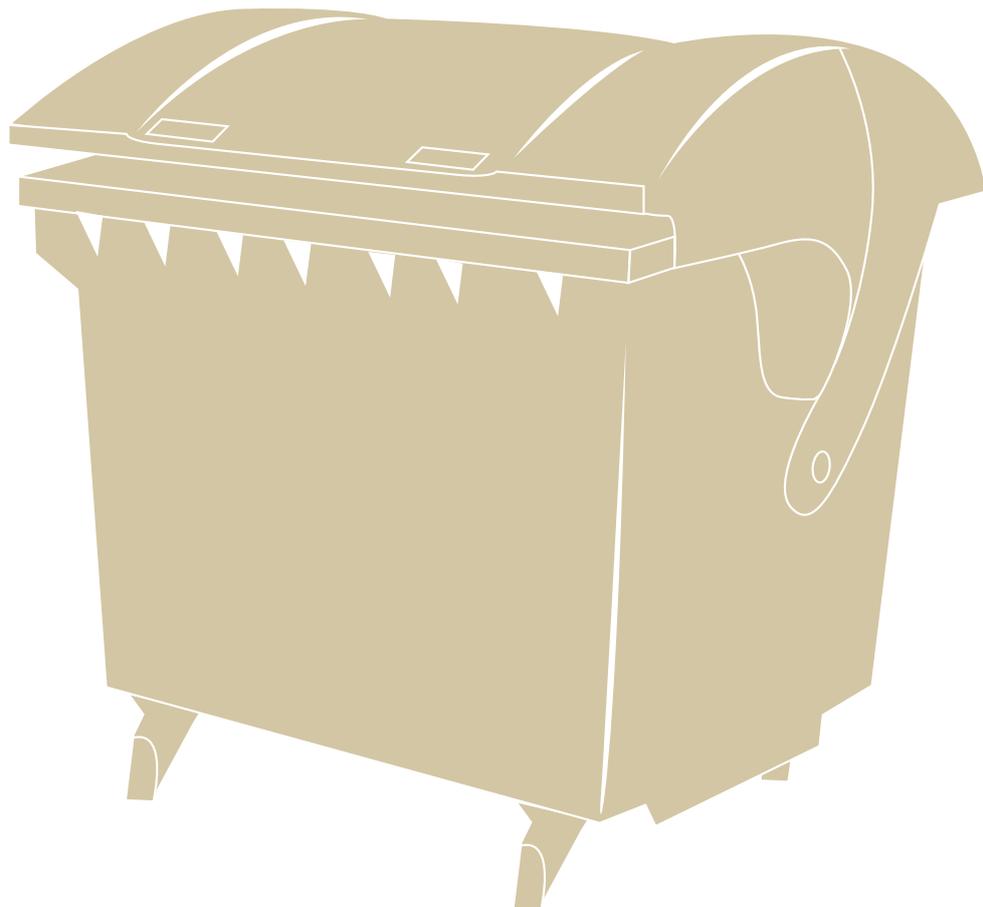


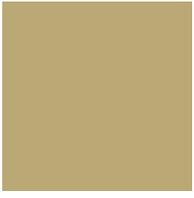
*Foyer Display – "Everyone Has a Role to Play", 2012*



4.

Non-food retail outlets







For the purpose of this guide, non-food retail outlets are large stand-alone retailers that are generally not part of a group retail centre or, if they are part of a group retail centre, they have their own waste facilities. They do not manufacture, prepare or serve food as their sole or substantial product. Typical non-food retail outlets include hardware stores, bulky goods stores, furniture stores, variety and department stores and retail barns.

## 4.1 Typical non-food retail waste systems

Typically bins for general garbage and separate bins for paper/cardboard and co-mingled recyclables are used. Where large volumes of packaging materials are generated balers and compactors can be installed to reduce the volume.

## 4.2 Retail building rating schemes

There are two main building ratings tools in Australia; Green Star and the National Built Environment Rating Scheme (NABERS). NABERS is a voluntary scheme that rates and accredits the sustainable performance of an existing building using a star system. Energy and water performance in retail outlets are covered by NABERS, but not waste.

### 4.2.1 Green Star

Green Star is a rating system administered by the Green Building Council of Australia for new buildings. Retail waste is assessed using the *Green Star - Retail Centre v1* rating tool which rates the environmental attributes of new and refurbished retail centres (This tool may not apply to non-food retail businesses that are not in retail centres). Waste performance is rated in two ways under the materials element. Firstly, the provision and accessibility of storage areas for recycling materials generated during ongoing use is assessed.

Mat-1 specifies that:

‘Three points are awarded where a dedicated storage area for the separation and collection of recyclables from tenancies and common areas is provided and it:

- is adequately sized to handle the recyclable waste streams specified in the compliance requirements
- includes a holding area for items of reuse
- meets the access requirements of ‘Policy for Waste Minimisation in New Developments’ (NSW, 2004):
  - Section A, points A12 through A17
  - Section C, points C14 and C15
- is separate from, but adjacent to, general waste facilities
- is located in the same level as the loading dock with a clearly marked, sign posted, convenient and guaranteed access route which allows:
  - level access from tenancies (or goods lifts are provided)
  - avoids the need for manual handling of the waste.’

The second way that waste performance is measured is by the level of reuse of existing building materials and use of recycled building materials during construction.

## 4.3 Better practice systems

Most office occupants spend significant amounts of time in the building and generate waste as part of their normal activities. However, most people using non-food retail facilities only spend a short time in the building and don’t often generate waste. The number of staff who work on site is relatively small and in many cases they also don’t generate much waste. If a non-food retail outlet has an office area, it is generally small and the amount of office paper produced is also likely to be small. Small quantities of office paper can be placed in the cardboard or



co-mingled recyclables collection streams.

Most waste generated from non-food retail facilities is bulk packaging material that protects goods delivered to the facility for sale or distribution. Most deliveries come through the loading dock and goods are often removed from the packaging at, or close to the loading dock. This simplifies the logistics of waste management as waste packaging can be separated and disposed of at the loading dock.

Some non-food retail outlets also generate quantities of less common waste types including polystyrene and plastic or metal coat hangers. In some cases, these are separated for recycling and collected by recyclers who specialise in these materials. Offices in non-food retail buildings also generate small amounts of other waste types. Current and potential methods for collection and disposal of other waste types are covered in Section 2.12.

## 4.3.1 Cardboard

Cardboard is a major component of the waste stream in non-food retail buildings. If enough waste cardboard is generated a compactor may be used, otherwise cardboard may be placed in, and collected from, bulk bins.

Tenants and cleaners should flatten cardboard boxes as much as possible to save space in bins. Front-lift bins with wire panels that allow contamination checks are used widely for cardboard (Figure 22). Cardboard is generally very bulky but comparatively light weight. As a result it compacts well and compactors and balers are ideal for containing and transporting cardboard.



Figure 22 Bulk bin for cardboard

## 4.3.2 Garbage

A compactor may be used for garbage if the business is large enough and produces enough waste. Garbage can be collected in bulk bins in smaller businesses.

Audits show that most waste generated from non-food retail buildings is recyclable. These materials can only be recycled if they are separated and this is where problems can occur. Waste materials are often mixed so well, or physically glued or fixed to each other, that separation is either impossible, or not cost-effective. This mixed waste is the main component of the garbage stream in non-food retail buildings.

## 4.3.3 Plastic film

Plastic film, usually in the form of shrink pallet wrap, is another major component of non-food retail building waste. Like cardboard it is very bulky, but comparatively light weight so it compacts well. Large quantities of plastic film are not generally as common as cardboard and so the film is most often compacted in a baler, rather than collected in bins. Plastic film wrap is most suitable for recycling if it is kept clean and separate from other types of plastic.



## 4.3.4 Recyclable containers and paper

Recyclable containers may be generated by staff and some customers. These items should be collected co-mingled with other recyclables, such as other types of paper, as quantities are likely to be low. Bins for co-mingled recyclables are generally justified where these materials are generated in sufficient quantity.

## 4.3.5 Pallets

Where possible wooden and plastic pallets should be reused or returned to the supplier/processor for recycling. Refer to Table 10 for recycling options .

## 4.3.6 Food

Some non-food retail outlets have small cafes or cafeterias and food may also be present in the waste stream in these cases. Typically food is disposed of in the garbage waste stream.

Non-food retail buildings without cafes, generally do not produce significant quantities of food — usually only the remains of small staff meals. With some commitment, small amounts of food can be recycled reasonably easily on site, although some level of expertise is required.

Some issues and strategies relating to food waste generation and recovery are covered in Section 2.10.

### Composting and worm farms

If a building has gardens or grounds, a composting system could be established with building management's permission. Composting requires little effort other than regularly turning and aerating the compost. Information on composting techniques is widely available – many local councils provide brochures and training and also sell composting bins.

In some buildings without gardens or grounds, worm farms have been used to dispose of food waste. Although well-managed worm farms do not emit odour, the possibility of odours is enough to discourage some office management from using these systems. There are some types of food waste that worms will not eat, such as meat, and the castings and liquid produced from worm farms also has to be managed. Worm farms in offices require significant staff expertise and commitment and are still quite uncommon. Details of some proprietary small-scale food processing systems can be found in Appendix B Waste management equipment.

## 4.4 Access and collection point

Access for collection vehicles is not normally a problem at non-food retail facilities. These buildings are normally well set up to receive deliveries by heavy vehicles and most have purpose-built loading docks. However, problems can arise when the use of the dock has expanded over time and space has become limited. As a result, waste facilities are located in an ad hoc way in areas adjacent to the dock at some sites.

Dock design in new developments should allow sufficient space for suitable waste storage and collection infrastructure, including possibly two compactors and/or space for a baler, bulk bins and wheelie bins.

Consideration should also be given to clearance heights as front-lift collection vehicles need up to 6.2 m clearance in order to empty bins. For this reason, front-lift bins are often stored outside buildings (see Figure 55 and Figure 59).

## 4.5 Public place recycling systems

Refer to Section 2.17 for information relating to public place waste management.



## 4.6 Ongoing management

In offices, cleaning contractors perform almost all of the internal waste collection tasks. In non-food retail facilities, staff are often required to collect waste from where it is generated on site, place it in collection bins or equipment and operate the compaction and baling equipment. This is often viewed as an undesirable job and is usually delegated to casual or junior staff.

Several strategies can be used to avoid mistakes when separating waste and recyclables and to make sure that bins and equipment are used correctly. These include:

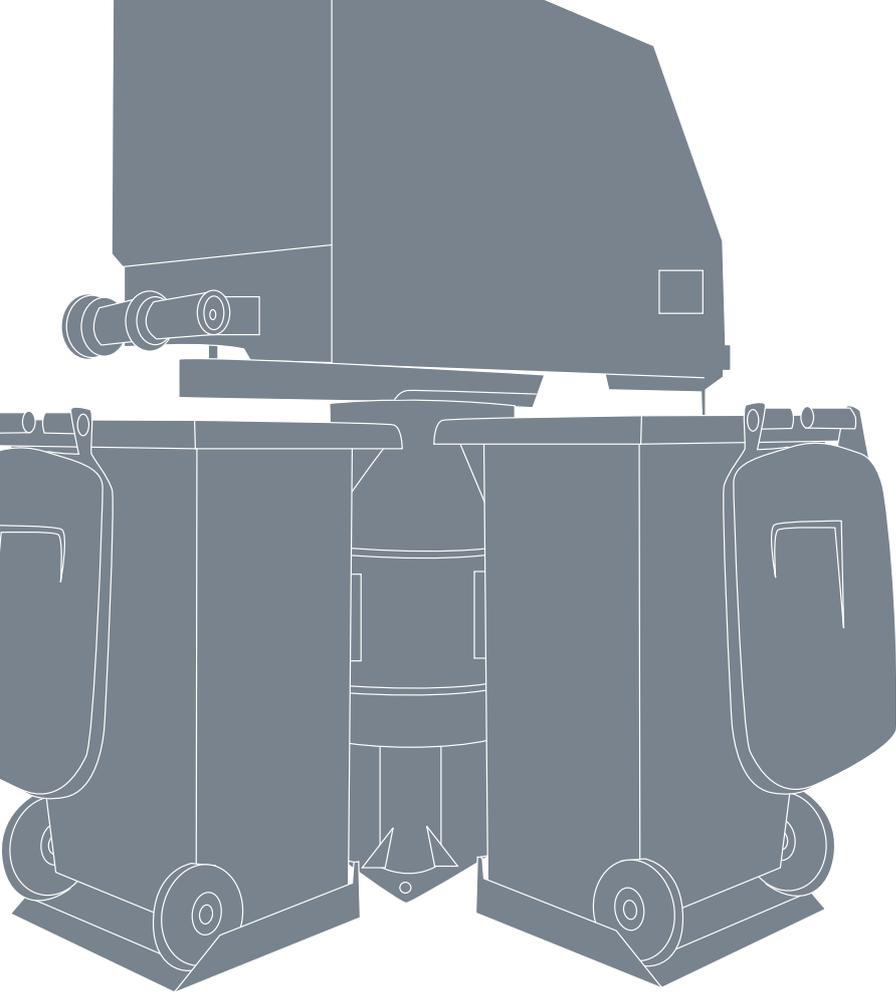
- training all staff, no matter how junior or casual, in correct waste separation, collection procedures and safe use of equipment
- using clear signage with consistent design and colours in waste storage rooms and on bins (see Appendix E Standard signage)
- appointing a dock master to be responsible for the proper separation of waste and the use of waste infrastructure
- including waste-related responsibilities in job descriptions at all levels.

## 4.7 Waste management strategies

In addition to diverting more materials through recycling systems, a range of other waste avoidance and resource recovery strategies are widely used at non-food retail business. These include:

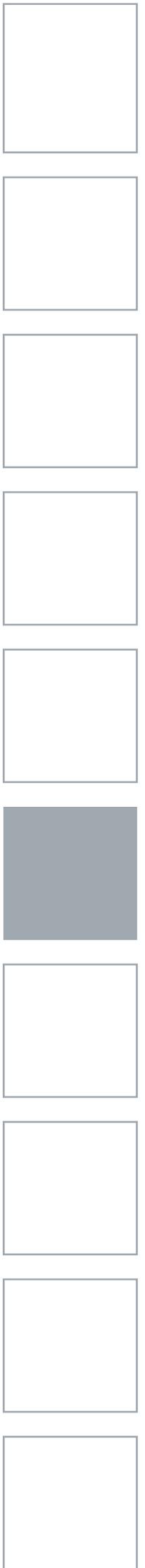
- waste avoidance
  - present all waste reduction initiatives to staff as part of their induction program
  - streamline large distribution mailings – remove duplicate names and out-of-date entries from mailing lists
  - return unsolicited mail to sender
  - investigate the use of retractable cotton hand towels as an alternative to paper towels in toilets
  - consider leasing office equipment so that you can upgrade and not be responsible for equipment disposal
- reuse
  - return cardboard cartons and pallets to suppliers for reuse
  - donate unsaleable clothing to charities
  - establish systems with supply chain stakeholders to ship products in reusable packaging
- recycle
  - flatten cardboard boxes as much as possible to take up less space in bins
  - develop a 'buy recycled' purchasing policy
  - buy products packed in recyclable packaging.

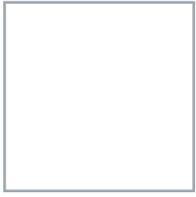
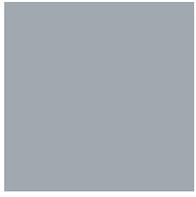
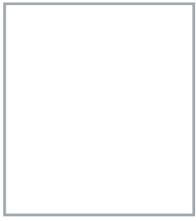
For more information on recycling locations and choosing a recycling contractor go to <http://businessrecycling.com.au/>, an initiative of Planet Ark, NSW EPA, Queensland Government, Pitney Bowes, Zero Waste SA and Mobile Muster.



# 5.

Food retail outlets







Food retail outlets are commercial businesses that sell fresh, cooked or packaged food and, in some cases, also prepare food for sale. They include large cafes, restaurants, clubs, franchised takeaway stores and supermarkets. Some commercial buildings have food retail areas as well as other types of commercial operations such as accommodation, offices and group retail centres.

## 5.1 Typical food retail waste systems

The different types of food retail business and waste systems are listed in Table 14.

Table 14 Typical food-retail businesses and waste types

Food handling and sale	Types	Typical waste composition	Main responsibility for waste
Cooked or prepared, served and consumed on site.	Restaurants, cafes, function centres, hotels.	If run well, little 'back of house' food preparation waste, some food scraps from plates, packaging waste, plastics.	Staff
	Food halls with public seating.	Beverage containers, paper and plastic packaging waste.	Cleaners and customers.
Cooked or prepared, served or sold and consumed off site.	Food halls, takeaway stores, some cafes.	If run well, little 'back of house' food preparation waste, packaging waste, plastics.	Staff
Freshly prepared and packaged on site but sold and taken away to be consumed elsewhere.	Supermarkets, some takeaway shops.	If run well, little 'back of house' food preparation waste, packaging waste, plastics.	Staff
Packaged and placed on shelves, sold and taken away to be consumed elsewhere.	Supermarkets, speciality food shops.	Bulk packaging waste, cardboard and plastics.	Staff

Most people using food retail facilities only spend a relatively short time in the building. Customers may not generate any waste on site, and when they do it is handled by staff. There are also situations where customers generate waste and also have the responsibility of disposal. Generally, the relatively small number of staff who work at food retail sites generate very little waste.

If food retail outlets have office areas they are likely to be small and so the amount of office paper produced is likely to be small. Office paper can be placed in the cardboard or co-mingled recyclables collection streams.

Most waste generated from non-food retail facilities is bulk packaging material that protects goods delivered to the facility for sale or distribution. Most deliveries come through the loading dock and goods are often removed from the packaging at, or close to the loading dock. This simplifies the logistics of waste management as waste packaging can be separated and disposed of at the loading dock.

If the business is large enough and produces enough waste, a compactor may be used for garbage and/or cardboard. These materials may otherwise be placed in, and collected from, bulk bins (Figure 23). Tenants and cleaners should flatten cardboard boxes as much as possible to save space in bins.

Balers are also commonly used for cardboard as well as plastic film, two materials that make up large proportions of the food retail waste stream. These materials are very bulky but are comparatively light weight. They compact well and compactors and balers are ideal equipment for containing and transporting these wastes.

Some food retail outlets also generate less common waste types, including polystyrene and plastic — these are separated for recycling in some cases. Other types of waste are often only generated in small amounts and/or occasionally. Current and potential methods for collection and disposal of these waste types are covered in Section 2.12.



Figure 23 Flattened cardboard in a bulk bin

## 5.2 Retail building rating schemes

In Australia there are two main building ratings tools; Green Star and the National Built Environment Rating Scheme (NABERS). NABERS is a voluntary scheme that rates and accredits the sustainable performance of an existing building using a star system. Energy and water performance in retail outlets are covered by NABERS, but not waste.

### 5.2.1 Green Star

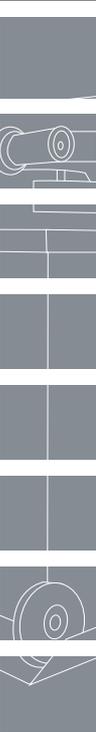
Green Star is a rating system administered by the Green Building Council of Australia for new buildings. Retail waste is assessed using the Green Star - Retail Centre v1 rating tool which rates the environmental attributes of new and refurbished retail centres (This tool may not apply to non-food retail businesses that are not in retail centres). Waste performance is rated in two ways under the materials element. Firstly, the provision and accessibility of storage areas for recycling materials generated during ongoing use is assessed.

Mat-1 specifies that:

'Three points are awarded where a dedicated storage area for the separation and collection of recyclables from tenancies and common areas is provided and it:

- is adequately sized to handle the recyclable waste streams specified in the compliance requirements
- includes a holding area for items of reuse
- meets the access requirements of 'Policy for Waste Minimisation in New Developments' (NSW, 2004):
  - Section A, points A12 through A17
  - Section C, points C14 and C15
- is separate from, but adjacent to, general waste facilities
- is located in the same level as the loading dock with a clearly marked, sign posted, convenient and guaranteed access route which allows:
  - level access from tenancies (or goods lifts are provided)
  - avoids the need for manual handling of the waste.'

The second way that waste performance is measured is by the level of reuse of existing building materials and use of recycled building materials during construction.



## 5.3 Better practice systems

### 5.3.1 Food

Food can form a large proportion of the waste stream in food retail outlets and its density makes disposal expensive. Food is generally disposed of in the garbage waste stream.

Some issues and strategies relating to food generation and recovery are covered in Section 2.10.

Where quantities of waste food are high, the minimisation and recovery of this material should be addressed. Food waste can be recycled reasonably easily on site with some commitment, although some level of expertise is required.

#### Composting and worm farms

If the building has gardens or grounds, a composting system could be established. Composting can be done in the open or in-vessel and requires surprisingly little effort. Information on composting techniques is widely available.

Large worm farms are another option, although worms require a greater level of management and may require significant expertise and commitment.

Details of some proprietary small-scale food processing systems can be found in Appendix B Waste management equipment. Information on on-site organics waste recycling technology can be found at [www.recycledorganics.com/managefoodwaste.htm](http://www.recycledorganics.com/managefoodwaste.htm).

### 5.3.2 Cardboard

Cardboard can be a major component of the waste stream from food retail buildings<sup>9</sup>. A compactor may be used if quantities are large enough; otherwise cardboard may be placed in, and collected from, bulk bins. Tenants and cleaners should flatten cardboard boxes as much as possible to save space in bins. Front-lift bins with wire panels allow contamination to be checked and are widely used for this material. Balers are also commonly used for cardboard. The small quantity of paper generated should be recycled with cardboard.

Cardboard is generally very bulky but comparatively light weight - it compacts well and compactors and balers are ideal for containing and transporting cardboard. The main problem with cardboard from food retail buildings is that it can be contaminated with food and liquids. This makes it unsuitable for recycling.

### 5.3.3 Garbage

If the business is large enough and produces enough waste, a compactor may be used for garbage. For smaller businesses, garbage may be collected in bulk bins.

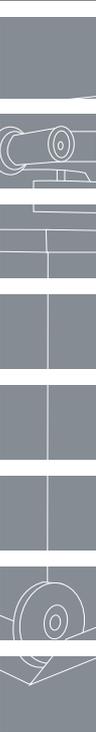
Food is a major component of waste streams from many food retail outlets, although in many cases, there is little left over food because food retail operators are very efficient<sup>10</sup>. Much of the garbage generated from food retail buildings is recyclable. However, these materials can only be recycled if they are separated and this is where problems can occur. Waste materials are often so mixed or physically contaminated, that separation is either impossible or not cost-effective. This mixed waste is the main component of the garbage stream in these buildings.

### 5.3.4 Plastic film

Plastic film is not normally a major component of food retail buildings waste streams – any that is generated is often contaminated with food or liquid. Plastic film is very bulky but comparatively light weight and compacts well. However, large quantities are not as common and it is generally compacted in a baler, rather than collected in bins. Contaminated plastic film is not suitable for recycling and must be disposed of in the garbage stream.

<sup>9</sup> 11% - Balfe, Chris and Bâli, Elif (1998) *The Keys to Unlocking Successful Hotel Recycling Resource Recycling April* or 16% - [www.greenstarinc.org/old/enevsv3n10.htm](http://www.greenstarinc.org/old/enevsv3n10.htm)

<sup>10</sup> Around 45-46% - [www.greenstarinc.org/old/enevsv3n10.htm](http://www.greenstarinc.org/old/enevsv3n10.htm) and Balfe, Chris and Bâli, Elif (1998) *The Keys to Unlocking Successful Hotel Recycling Resource Recycling April*



### 5.3.5 Recyclables

Some food retail businesses such as hotels and restaurants generate large quantities of recyclable containers, particularly glass bottles<sup>11</sup>. Glass is very dense which makes it difficult to store and move efficiently. There is often limited space available back-of-house to store glass containers. In the past, bottles had to be kept whole so they could be separated into different colours for recycling, which increased the storage space required.

Now, the use of optical sorting equipment at recovery facilities means that systems that crush glass on site are now increasingly popular. However, if there is sufficient space; it may still be more viable to store whole bottles in wheelie bins. More information can be found in Appendix B Waste management equipment.

### 5.3.6 Other types of waste

Some food retail outlets also generate quantities of less common waste types including polystyrene boxes, cooking oil and steel drums. Polystyrene boxes in which fresh or chilled food is delivered can often be returned to the markets.

Cooking oil is commonly recycled through specialist oil recyclers. Typically they will provide a large container for storing the oil on site before collection by recyclers.

Steel drums can be recycled in the co-mingled stream and should be crushed where possible to reduce space.

## 5.4 Access and collection point

Access for collection vehicles is not normally a problem at food retail facilities. These buildings are normally well set up to receive deliveries by heavy vehicles and most have purpose-built loading docks. However, problems can arise when the use of the dock has expanded over time and space has become limited. As a result, waste facilities are located in an ad hoc way in areas adjacent to the dock at some sites.

Dock design in new developments should allow sufficient space for suitable waste storage and collection infrastructure, including possibly two compactors and/or space for a baler, bulk bins and wheelie bins.

Consideration should also be given to clearance heights as front-lift collection vehicles need up to 6.2 m clearance in order to empty bins. For this reason, front-lift bins are often stored outside (see Figure 55 and Figure 59).

As waste is mostly stored at the loading dock, waste does not normally need to be moved from storage areas to a collection point.

## 5.5 Public place waste management

Refer to Section 2.17 for information relating to general requirements.

In addition to diverting more materials through recycling systems, a range of other waste avoidance and resource recovery strategies are widely used in food retail businesses. These include:

- waste avoidance
  - buy and use dispenser beverages in concentrate or bulk form
  - use refillable condiment bottles
  - purchase items in bulk. Avoid purchasing multipacks and single serve containers
  - stop the use of polystyrene foam and petroleum-based plastic takeaway packaging
  - check delivered food carefully for rotten and damaged product
  - clearly label all materials with details of contents, storage handling and expiration dates
  - use non-wrapped straws
  - provide ceramic cups, mugs, crockery and cutlery rather than disposable
  - review serving sizes to reduce waste from uneaten food

<sup>11</sup> As much as 40%, Waitakere City Council (NZ) (2000/2001) *The Better Restaurant and Café Guide*



- review the need to provide newspapers and magazines free of charge if not requested
- rotate perishable stock
- order produce to be delivered with excess foliage removed
- serve carbonated beverages from a post-mix
- use retractable cotton hand towels as an alternative to paper towels in toilets
- lease office equipment so that you can upgrade and not be responsible for equipment disposal
- present all waste reduction initiatives to staff as part of their induction program
- reuse
  - donate used linens, towels, uniforms and furniture to charity
  - donate used flowers to a local hospice or hospital
  - return cardboard cartons to suppliers for reuse
  - store food in reusable containers
  - use reusable coasters
  - work with supply chain stakeholders to ship products in reusable packaging
- recycle
  - develop a 'buy recycled' purchasing policy
  - buy products packed in recyclable packaging
  - keep cardboard clean — soiled cardboard cannot be recycled
  - flatten cardboard boxes as much as possible to save space in bins
  - only buy beverages in containers which can be recycled by your contractor
  - provide bins for the separation of recyclables in guest rooms
  - use biodegradable paper, corn resin, potato starch or sugar cane-based containers and products.

For more information on recycling locations and choosing a recycling contractor go to <http://businessrecycling.com.au/>, an initiative of the Planet Ark, NSW EPA, Queensland Government, Pitney Bowes, Zero Waste SA and Mobile Muster.

## 5.6 Ongoing management

In offices, cleaning contractors perform almost all the internal waste collection tasks. At food retail facilities staff are often required to collect waste from where it is generated on site, place it in collection bins or equipment and operate compaction and baling equipment. Often this is seen as an undesirable job, which is usually delegated to casual or junior staff.

Several strategies can be used to avoid mistakes when separating waste and recyclables and make sure bins and equipment are used correctly. These include:

- training all staff, no matter how junior or casual, in correct waste separation and collection procedures and safe use of equipment
- using clear signage with consistent design and colours in waste storage rooms and on bins (see Appendix E Standard signage)
- appointing a dock master to be responsible for the proper separation of waste and use of waste infrastructure
- including waste-related responsibilities in job descriptions at all levels.



## 5.7 Better practice case studies

### 5.7.1 Woolworths targets zero food waste to landfill<sup>12</sup>

Woolworths has set the ambitious target of diverting all food waste from landfill by 2015. This will be achieved by:

- developing waste avoidance initiatives with suppliers
- educating consumers about minimising food waste
- adopting smarter in-store practices to reduce surplus
- donating any surplus edible food to charities through the Fresh Food Rescue Program
- composting food waste that can't be eaten.

Woolworths has found significant benefits from avoiding food waste including:

- business and consumer cost savings
- more people in need receive food aid through food donation
- energy, water and waste savings due to a more efficient supply of food
- reduced greenhouse gas emissions from the diversion of food waste from landfill.

What is Woolworths doing in-store?

#### **Smarter in-store practices**

Reducing food waste starts with smarter in-store practices including:

- educating staff
- improving ordering systems
- better stock management
- incorporating mark downs and special deals – for example two for one deals where customers can buy fresh pasta and a pasta sauce rather than two packets of pasta.

#### Educating consumers

Initiatives to educate consumers about avoiding food waste include:

- providing ideas and suggestions in-store for menu planning
- implementing portion size labelling
- working with Love Food Hate Waste to develop recipe cards that focus on leftovers
- discussing the issue of food waste in the free monthly magazine.

<sup>12</sup> Source: An extract from <http://www.lovefoodhatewaste.nsw.gov.au/business/case-studies/woolworths-ltd.aspx>



## What is Woolworths doing in the community?

There is inevitably a surplus of fresh food by the end of each day. Although not always fit-for-sale, much of it is good quality and can easily be collected and turned into nutritious, healthy meals for the needy or vulnerable in our society. Through the Fresh Food Rescue Program and working in partnership with food charities like Foodbank, OzHarvest and SecondBite, Woolworths has:

- provided fresh food for more than 1.5 million meals for families in need
- donated 1354 tonnes of groceries to food rescue programs
- 687 stores operating successful food rescue programs.

A reverse logistics program was implemented in 2010. Groceries that cannot be sold are transported from the supermarkets back to distribution centres and then collected by Foodbank. Currently, 567 supermarkets are aligned with the Reverse Logistics Program.

In regional areas, food which is not suitable for human consumption is distributed to farmers and zoos for animal feed. In metropolitan areas, where facilities are available, food waste is composted. EarthPower received 7785 tonnes of food waste, generating enough electricity to power 290 homes for a year.

## 5.7.2 Molly Coddle Café<sup>13</sup>

The Molly Coddle Café in Stanmore is constantly working to avoid and minimise waste. Through careful ordering, working closely with suppliers and being inventive with leftovers, the Café team are successfully avoiding food waste.

There are many things that the Café does to avoid food waste including:

- weekly stock inventory of fresh produce, ordering other supplies as needed and getting bread and milk delivered daily
- working with suppliers to determine minimum requirements to avoid unnecessary bulk purchases
- investing in equipment such as a meat and cheese slicer
- freezing surplus items like bread rolls and croissants for use in other recipes
- using surplus produce in other dishes. For example, rocket wasn't being used before it started to spoil so it was added to the bacon and egg rolls which made them even more popular
- regularly looking at customer plate waste and adjusting serving sizes as required.

For their unavoidable waste, Molly Coddle Café participated in a composting trial with support from Marrickville Council. The trial involved separating kitchen scraps from the waste stream and composting it in two Aerobins in Stanmore Reserve.

<sup>13</sup> Source: An extract from <http://www.lovefoodhatewaste.nsw.gov.au/business/case-studies/molly-coddle-cafe.aspx>



### 5.7.3 Club Sapphire<sup>14</sup>

Club Sapphire is a leading club in the Bega Valley Shire that started as a lawn bowls club. The club now has more than 175,000 visitors per year, employs more than 100 staff and provides around 200,000 meals from its bistro each year.

In 2009, the club reduced waste to landfill by 62 tonnes per year, which saved \$1718 in waste disposal costs. Forty nine per cent, or 399 tonnes, of material removed from the club was recycled. This was achieved by implementing a range of better waste management practices (Table 15).

Table 15 Better waste management practices at Club Sapphire

Area of change	Benefits
Waste and recycling contracts	The club reviewed its recycling and waste contracts and changed from two waste companies to one. They negotiated a better price by having one contractor handle both recycling and waste.
Waste bin size	The club increased the size of its garbage bins from 240 L to 660 L. This reduced the frequency of collection and resulted in better value.
Separation of recyclables	The club introduced new bins behind the bar to make it easier to separate recycling from general waste. This led to improvements in recycling rates for co-mingled glass, steel and plastic.
Type of recycling	The club introduced recycling for plastic shrink wrap and all other beverage wrapping. The club also made sure that materials like printer and toner cartridges, cooking oil and mobile phones were recycled appropriately.
Reuse	The club worked with suppliers to arrange for polystyrene boxes and waxed vegetable boxes to be returned on subsequent visits. This reduced packaging waste and reduced supplier packaging costs.

<sup>14</sup> Source: *Minimising Waste – Novotel Northbeach (2010) Business Trading Lightly* NSW Government and Southern Councils Group [www.btl.net.au](http://www.btl.net.au).

### 5.7.4 Petersham Bowling Club<sup>15</sup>

Petersham Bowling Club (PBC) is a community not-for-profit organisation that is avoiding food waste by making simple changes to the way the bistro is managed and operated. Revising and changing the menu has reduced the amount of food waste and is saving money. The menu was changed from standard bistro foods to freshly cooked pizzas, pastas and salads. The style of food that was previously on offer, like deep fried fish and schnitzels and chips, wasn't really suitable for the diversity of customers who use the club. The pizza and salad menu was found to have broader appeal. In addition, there were difficulties in stocking fresh meats that may or may not be ordered, such as steaks. With the new menu, meat with a longer fridge life is used.

Changing the menu is not the only action that the PBC has implemented. The PBC team has looked at the way food is ordered and served. Each week, fresh produce is checked and ordered as needed. This helps to reduce the amount of excess stock. Serving sizes of some items have also been changed. For example, a lot of tartar sauce was being wasted so the serving size was changed to save money.

The PBC bistro kitchen team also run a small catering business which can use 'leftover' food items from the bistro. For example, when steaks have not been sold in the bistro but require use, they will be made into a Thai beef salad. This flexibility in designing the catering menu (decided by the chef) means that there is very little food waste.

Through support from Marrickville Council, the PBC also established some onsite compost bins for any unavoidable food waste. In the last six months, 245 kilograms of organic materials have been composted and kept out of landfill.

Ideas that are working include:

- weekly stock inventory and ordering as needed
- changing the menu to reduce waste
- using unsold items to create meals
- changing the serving sizes of condiments and sides.

Financial savings are estimated to be between five and ten per cent. The club has also achieved a 20 per cent reduction in waste going to landfill through recycling paper and cardboard, glass, plastic, aluminium, cooking oil, printer cartridges, corks and composting organic waste.

<sup>15</sup> Source: An extract from <http://www.lovefoodhatewaste.nsw.gov.au/business/case-studies/petersham-bowling-club.aspx>.

### 5.7.5 Handybin Waste Services and Coffs Harbour Ex-Services Club.

Handybin Waste Services is an Australian company based at Coffs Harbour, on the North Coast of NSW. It has been servicing the local community for 15 years and is the largest waste service provider on the North Coast.

Coffs Harbour Ex-Services Club is a registered club and part of the Coffs Ex-Services Memorial and Sporting Club Limited (CEX) Group that also includes Woolgoolga Bowling Club and Urunga Golf and Sports Club. The club includes a number of bars, restaurants and function rooms and hosts entertainment, events, sporting groups, conferences, weddings and many other types of functions.

#### Why introduce a new system?

The Coffs Harbour Ex-Services Club had several drivers for introducing a new waste management system. These were to:

- reduce costs
- do something positive for the environment
- reduce occupational health and safety (OH&S) risks

Although reducing costs and helping the environment are important, eliminating OH&S risks was the priority driver for the change to a new system.

Previously club staff were using 50 litre hand bins to collect and handle waste. These bins had to be lifted onto trolleys and then tipped into three cubic metre bulk bins at the loading dock. The bulk bins then had to be moved by forklift onto the dock access ramp. The different heights of the bins and the dock caused some OH&S problems and the cost to modify the dock height was prohibitive.

Glass was also being collected in bags that were not suitable which presented further OH&S risks.

#### How does it work?

Handybin Waste Services provided a complete waste service to the club based on 240 litre wheelie bins for the collection and processing of mixed waste (garbage), mixed recyclables, organic food material and cardboard. The service commenced in October 2007.

Recyclables and cardboard are processed through Handybin's MRF for recycling and organic food material is processed through the Biomass AWT Facility to produce compost, which is sold locally.

Mixed waste is also put through the Biomass AWT Facility where, after processing, metals and some plastics are recovered and the resulting material is used to rehabilitate old mine sites.

#### Costs

Handybin spent about \$500 on education when the system was first implemented. The club also agreed to purchase biodegradable corn-starch bags to hold the organic food waste as plastic bags would contaminate the composting process.

#### Benefits and savings

Measurable benefits were realised in three main areas:

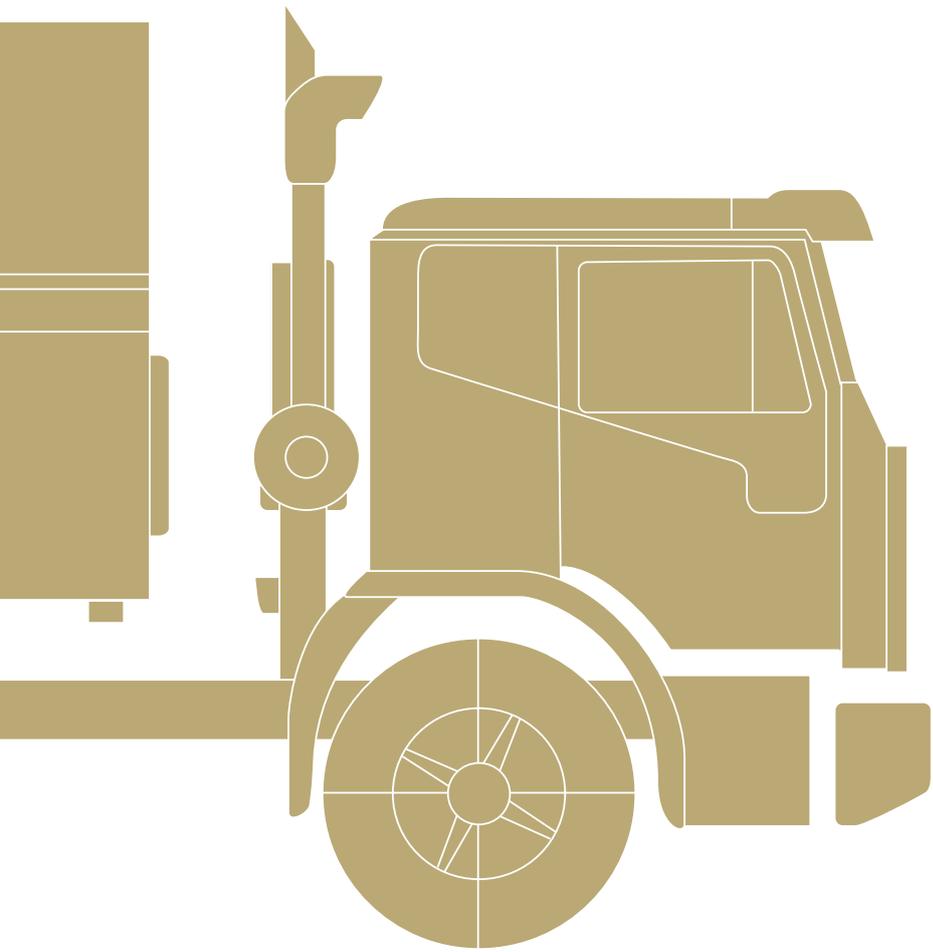
- 84 per cent by volume of waste from the Club is being diverted from landfill
- \$2500 per year is being saved in waste disposal costs
- greenhouse gas emissions are reduced by 1.6 tonnes per week.

The club also reviewed its overall purchasing of non-recyclable and non-compostable products.

Most importantly, under the new system, staff do not have to lift and empty hand bins or heavy bags of glass, reducing the risks involved in manual handling. A forklift is no longer needed to move bins around which also eliminated associated risks.







6.

Group retail centres







Group retail centres are commercial facilities where groups of small retailers are located together and share a common waste and recycling system. They include shopping centres, malls and plazas where an integrated waste management system is provided by a single building manager.

Many group retail centres also include major retail stores as ‘anchor’ tenants who generally have their own separate loading docks and own waste management arrangements. These types of retailers are covered in Section 4 Non-food retail outlets.

Many group retail centres include food halls and eating areas (covered in Section 5 Food retail outlets), and public places (covered in Section 2.19 Public place waste management). This section addresses the management of waste from smaller non-food outlets. However, it is not possible to isolate food retail outlets from this section entirely.

## 6.1 Typical group retail centre waste systems

Tenants and retailers are responsible for taking their own waste from their shop or premises to a common waste area in most group retail centres. Unlike other commercial operations, where a relatively small group of people use the waste management system, a large number of people use the system in a group retail environment. This may be the case even when the centre’s own staff clean, and are responsible for the common and public areas. Some shopping centres have hundreds of tenants, which means that hundreds of different people use one, or a few, common waste facilities.

Waste is usually collected by retailers in their own premises in wheelie bins or in plastic bags which are then wheeled or carried to the waste storage area. Larger group retail centres usually have compactors for garbage and cardboard, but other systems such as wheelie bins, bulk bins and balers may also be used.

Taking the waste to the bin room is one of the most undesirable jobs and is often given to the tenant’s most junior and/or casual staff. Waste separation and the use of waste bins is often very poor in group retail centres due to a number of factors, including:

- poor training
- lack of time
- lack of storage for separated materials in shops
- anonymity provided by having so many different users.

Waste rooms in group retail centres are often a dumping ground for a range of materials including shopping trolleys, broken fittings and equipment and other bulky items — the source of these is not always known.

## 6.2 Retail building rating schemes

In Australia there are two main building ratings tools; Green Star and the National Built Environment Rating Scheme (NABERS). NABERS is a voluntary scheme that rates and accredits the sustainable performance of an existing building using a star system. Energy and water performance in retail outlets are covered by NABERS, but not waste.

### 6.2.1 Green Star

Green Star is a rating system administered by the Green Building Council of Australia for new buildings. Retail waste is assessed using the *Green Star - Retail Centre v1* rating tool which rates the environmental attributes of new and refurbished retail centres (This tool may not apply to non-food retail businesses that are not in retail centres). Waste performance is rated in two ways under the materials element. Firstly, the provision and accessibility of storage areas for recycling materials generated during ongoing use is assessed.

Mat-1 specifies that:

‘Three points are awarded where a dedicated storage area for the separation and collection of recyclables from tenancies and common areas is provided and it:

- is adequately sized to handle the recyclable waste streams specified in the compliance requirements



- includes a holding area for items of reuse
- meets the access requirements of 'Policy for Waste Minimisation in New Developments' (NSW, 2004):
  - Section A, points A12 through A17
  - Section C, points C14 and C15
- is separate from, but adjacent to, general waste facilities
- is located in the same level as the loading dock with a clearly marked, sign posted, convenient and guaranteed access route which allows:
  - level access from tenancies (or goods lifts are provided)
  - avoids the need for manual handling of the waste.'

The second way that waste performance is measured is by the level of reuse of existing building materials and use of recycled building materials during construction.

## 6.3 Better practice systems

Waste has to be transported from the point of generation in the tenant's premises to the collection point, either the loading dock or waste storage room. This can be done either by the tenant's staff or the centre's cleaners.

Taking the waste to the bin room is one of the most undesirable jobs and is often given to the tenant's most junior and/or casual staff, therefore the system must be simple and easy to understand.

**Since group retail centres include both food retail and non-food retail categories, information provided under the heading Better practice systems in Sections 2, 4 and 5 should be used to develop and implement a suitable waste management system for this category .**

### 6.3.1 Critical success factors

Research has identified a number of critical success factors when providing recycling services in group retail centres . Aspects to consider include:

- strategy
  - establish a policy and goals for recycling
  - make recycling mandatory
  - prioritise source separation
  - establish contracts with service providers for operation and maintenance
- organisational involvement
  - appoint a program champion at management level
  - manage the recycling program as a cooperative organisation
  - liaise and partner with the retail tenants and suppliers
- development processes
  - make the waste infrastructure layout convenient
  - implement *ISO 14001 Environmental Management Systems*.
  - manage waste data relative to performance indicators
- culture and organisational climate
  - implement an awareness campaign
  - educate staff, tenants and stakeholders
  - provide a door-to-door collection service for retailers



- ensure recyclable materials are transported by the recycler
- financial impact
  - provide economic incentives
  - invest in resource recovery facilities.

### 6.3.2 Better practice strategies

Strategies used in better practice systems include:

- providing clear signs in the bin rooms and consistent wording, symbols and colours on all bins
- providing clean bins and bin rooms that are free of dumped and undisposed waste. Dirty and untidy waste facilities indicate that building management does not care and tenants will then fail to use facilities correctly
- closed-circuit television (CCTV) monitoring of waste rooms and bin storage areas
- including terms in lease agreements outlining and enforcing proper use of the waste facilities
- training of all management and tenant staff in the use of the waste system and any equipment
- repairing signs, labels, bins and equipment and promptly replacing damaged equipment using the same designs
- changing all waste and recycling signs if there are changes in corporate designs, colours or look – a mix of new and old signs and labels is unacceptable
- installing swipe cards, or other electronic access control devices to be used by tenants to access the bin room or waste management equipment
- regular monitoring by building management on all parts of the waste system, including the bins, bin storage areas and equipment as well as tenant and cleaner behaviour for misuse, contamination of recycling, damage, dumped rubbish and other problems
- including terms in cleaning contracts that set out what cleaners must do to keep the waste system and equipment in good order
- providing a collection service for waste and recycling to avoid the need for tenant staff to use the waste rooms. Then building management has full control over
  - what is being disposed of
  - separation of waste and recyclables
  - correct use of waste and recycling bins
  - use of the waste storage facilities
  - use of bins and other equipment.

Even if these services cost more, tenants will support initiative where their staff have more time for customer service and other duties, rather than waste management.

Implementing these strategies may seem like a lot of effort initially, but they become easier to manage as tenants and cleaners get used to working with the system.



## 6.4 Tenants

Usually retail tenants pay for waste collection service as part of their rent. Therefore any economic benefits that might result from reductions in waste are not easily passed on to tenants. This is a major barrier to further waste reduction in group retail centres.

Waste reduction efforts implemented by tenants can reduce disposal costs by:

- increasing the amount of recyclables diverted and disposed of at a lower cost
- decreasing the number of services required for waste collection and reducing collection costs.

Waste reduction activity by tenants can provide a financial windfall for the building managers and/or owners. However, waste decreases are likely to be comparatively small and are generally only measurable for large tenants. Large tenants generate the most waste, so savings should be passed on to them to reward and encourage further waste reduction activities.

Savings could be passed directly to tenants if waste collection charges were separated from rental charges, in a similar way that municipal waste charges are separate items on household rate notices in NSW. Tenants could then see the benefits of reducing the amount of waste sent to landfill. Alternatively the financial benefits of waste reduction could be linked to other incentives such as:

- catering for a function with awards, drinks and food for tenant staff
- donating the amount to a charity
- putting money towards a credit system on an annual review of rent
- staff satisfaction gained as a result of achieving better sustainable outcomes

## 6.5 Access and collection point

Access for collection vehicles is not normally a problem at group retail centres as they are normally well set up to receive deliveries by heavy vehicles and most have purpose-built loading docks. Problems can arise as the use of the dock has expanded over time and space has become limited. As a result waste facilities are located in an ad hoc way in areas adjacent to the dock at some sites.

Dock design in new developments should have sufficient space for suitable waste storage and collection infrastructure, including possibly two compactors and/or space for a baler, bulk bins and wheelie bins. Separate rooms should be allocated for storage of waste bins, baled material and waste infrastructure to avoid congestion on the dock. Consider clearance height, as front-lift collection vehicles need up to 6.2 m of clearance in order to empty bins. Front-lift bins are often stored outside for this reason (See Figure 55 and Figure 59).

As waste can usually be stored at or near the loading dock, there are not normally any issues with moving waste from storage areas to a collection point in these facilities. However, tenant staff and cleaners will have to bring waste from shops and other retail outlets. This may require crossing public areas which may be unacceptable to building management. A series of back-of-house corridors are often used for tenants and cleaners, but centre designers must be careful to ensure waste does not need to be transported too far.

## 6.6 Public place waste management

Refer to Sections 2.17 and 5.5 for information relating to public place waste management.



## 6.7 Ongoing management

Unlike other commercial buildings, waste management at group retail centres are undertaken by a large group of individuals – one or more from every retailer, tenant or occupant. In most other commercial building types, a small select group of workers such as staff or cleaning contractors perform almost all of the waste collection tasks.

Delivering waste to the bin room is often seen as an undesirable job and is usually delegated to temporary, casual or junior staff, who may be more transient and less reliable than senior staff. For this reason, the waste system in the bin storage rooms must be simple and easy to understand.

Several strategies can be used to avoid mistakes during waste and recycling separation and to make sure that bins and equipment are used correctly. These include:

- training all staff, no matter how junior or casual, in correct waste separation, collection procedures and safe use of equipment
- using clear signage with consistent design and colours in the waste storage rooms on bins (see Appendix E Standard signage);
- appointing a dock master to be responsible for the proper separation of waste and use of waste infrastructure
- including waste-related responsibilities in job descriptions at all levels.

## 6.8 Waste management strategies

In addition to diverting more materials through recycling systems, a range of other resource recovery strategies are widely used in group retail centres. These include:

- developing a 'buy recycled' purchasing policy
- providing washable cups, mugs, crockery and cutlery
- presenting all waste reduction initiatives to staff as part of their induction program
- streamlining large distribution mailings – remove duplicate names and out-of-date entries from mailing lists
- returning unsolicited mail to sender
- using retractable cotton hand towels as an alternative to paper towels in toilets
- leasing office equipment so that you can upgrade and not be responsible for equipment disposal
- only purchasing paper that is recyclable and/or contains recycled content
- purchasing items in bulk. Avoid purchasing multipacks and single serve containers
- buying products packed in recyclable packaging
- only buying beverages in containers which can be recycled by your contractor.

For more information on recycling locations and choosing a recycling contractor go to <http://businessrecycling.com.au/>, an initiative of the Planet Ark, NSW EPA, Queensland Government, Pitney Bowes, Zero Waste SA and Mobile Muster.



## 6.9 Better practice case study

### 6.9.1 Stockland Shopping Centre Balgowlah

The Stockland Shopping Centre at Balgowlah has been operating for just over three years and contains 60 specialty stores serving Sydney's lower Northern Beaches. The centre has 12,852 m<sup>2</sup> of floor space and sits below a medium-density residential complex.

A Coles supermarket is the 'anchor' tenant and its waste system is completely separate to that operated by centre management. Coles uses a waste collection contractor that services all of its stores independent of the centres in which they operate.

#### Impetus for change

The drive to reduce Stockland Balgowlah's waste disposed to landfill has been driven by Stockland management's overall mission to be a more economically and environmentally sustainable organisation.

Many of the changes that are made to waste management practices at the Balgowlah centre are changes that are made to all of Stockland's retail centres and these are driven by Stockland's Retail division, not necessarily by the individual centres.

#### Infrastructure change

In the centre's first year of operation, the waste collection system consisted of a number of 1100 L bins for garbage only and very limited capacity for recyclables.

At the end of the first year, Stockland obtained a 23 m<sup>3</sup> compactor which it used to keep cardboard and paper separate from the general waste stream.

At the end of the second year, the waste contractor added a number of 1100 L waste bins for co-mingled recyclables and several 240 L wheelie bins for food organics, which is taken to Earthpower at Camellia.

Stockland representatives were able to confirm that the changes made to waste management at the centre had saved the organisation money by diverting waste from landfill, but they could not disclose a definite figure, or nominate which savings were directly attributable to which changes.

#### Behavioural change

When changes have been made to waste collection infrastructure, centre management has promoted these changes with internal educational programs. This makes sure that all tenants and employees are aware of the new system and how their waste disposal responsibilities would have to change accordingly.

When a separate system for recyclables and organics was commenced on site, centre management adopted three strategies to inform tenants of their new obligations and to enforce these changes. These three strategies were:

- education
- policing
- communication.

Education strategies have included:

- meeting with key retailers to discuss changes to the waste collection infrastructure and how their responsibilities would have to alter to make the changes successful
- engaging a representative from the waste management contractor to visit the centre and educate all retailers in person as the changes took effect
- educating cleaners and security guards of the changes and their responsibilities to check bins and relocate waste or inform management if they see that waste has been placed in the incorrect bin.



Policing measures have consisted of:

- employing a security guard to enforce proper waste separation in the first week following the changes
- regularly checking of bins by centre management and returning contaminated material (such as organic waste in a recycling bin, or plastic film in an organics bin) to a tenant if it is clear that the contaminated waste was generated by that store.

Communication methods have included:

- face-to-face talks with retailers
- memos sent to retailers to explain changes to infrastructure and subsequent changes to tenant and employee responsibilities
- colour-coded signage on and above bins to clearly identify which bins are dedicated to each waste stream, and what items fall within each waste category
- colour-coded bin lids and signage to clearly identify which waste may be placed in each bin
- colour-coded bins with signage in common public areas – such as food-courts and mall areas – to allow customers to clearly identify each bin type and directly place their waste into an appropriate bin.

In the summer of 2011–2012, a campaign push from centre management encouraged retailers to separate their waste at source into recycling and general waste.

### Key accomplishments

In its second year of operation, the Balgowlah centre was able to reduce its waste volume sent to landfill by 25 per cent. In the centre's third year, the volume of waste sent to landfill was half of that disposed in the second year.

Today, the centre recycles 60 per cent of all waste generated and all organics are sent to Earthpower where it is converted into energy.

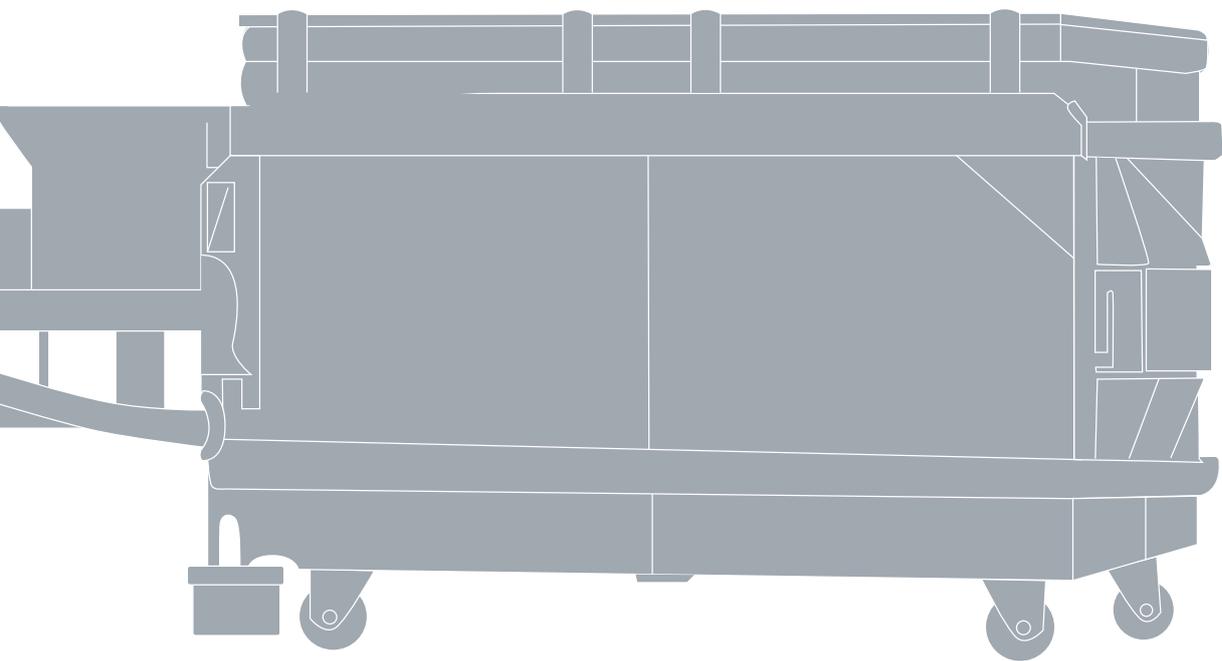
### Current challenges

Due the high turnover of staff in the retail sector, the education process has to be ongoing. Some tenants forget to properly inform their new employees about their responsibilities to dispose of waste properly.

The centre is currently investigating the prospect of installing a second compactor for garbage. Forty per cent of the waste generated by the centre is still sent to landfill. Sending waste to landfill is the most expensive option for the centre. The cost of disposal is calculated by volume and the installation of a compactor for general waste could offer significant savings for the organisation.

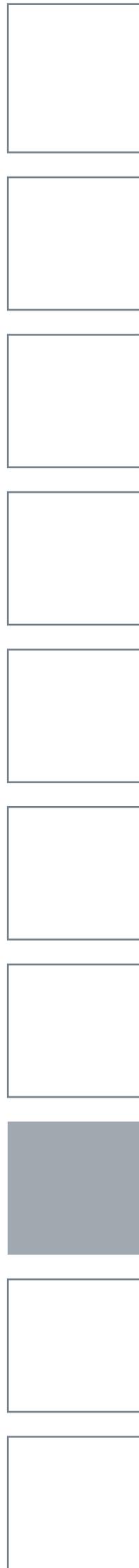
The centre is home to a green grocer and a fish shop and these operations receive some goods in polystyrene boxes. The centre cannot recycle this waste, but investigations are underway into technologies that melt polystyrene down into small slabs. This technology is still in the prototype stage.

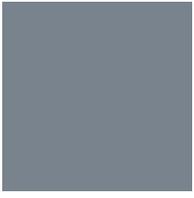




# 7.

## Hospitality and accommodation





Hospitality and accommodation businesses primarily provide accommodation, but may also have bars and restaurants. This category includes large hotels and motels – hotels also provide meals and snacks for room service and functions. In all cases, food is typically cooked, prepared, served and consumed on site.

## 7.1 Typical hotel and accommodation waste systems

Hotels and motels perform a number of functions that can be broadly grouped into three areas:

- food and beverage
- accommodation
- functions and events.

Hotels and motels also present particular waste management challenges due to the:

- wide variety of functions and staff roles
- 24-hour nature of operations
- requirement for immediate good service.

Most people using accommodation facilities only spend a relatively short time at the facility, in contrast to office building occupants. Hotel and accommodation uses may not generate any waste on site or the waste they generate may be handled by staff. In some cases customers are responsible for disposing of waste that they have generated.

In many cases, the number of staff who work at accommodation facilities is relatively small and they generate very little waste.

Most waste generated from hospitality and accommodation facilities results from packaging that protects goods delivered to the facility for sale. Most deliveries come through the loading dock. Goods are removed from the packaging or it is stripped off, often at, or close to, the loading dock. This simplifies the waste management logistics at accommodation facilities as waste packaging can be separated and disposed of at the loading dock.

A compactor may be used for garbage and/or cardboard if the business is large enough and produces enough waste. These materials may otherwise be placed in and collected from bulk bins. Staff and cleaners should flatten cardboard boxes as much as possible to save space in the bins. Balers are also commonly used for cardboard as well as plastic film: two materials that make up large proportions of the accommodation waste stream. These materials are very bulky but are comparatively light weight and compactors and balers are ideal equipment for containing and transporting cardboard and plastic film.

Some accommodation facilities may also generate quantities of less common waste types including polystyrene. In some cases these are separated for recycling.

## 7.2 Accommodation building rating schemes

In Australia there are two main building ratings tools; Green Star and the National Built Environment Rating Scheme (NABERS). Green Star is a rating system administered by the Green Building Council of Australia for new buildings. Currently there is no Green Star rating tool for hotels, motels or accommodation buildings.

NABERS is a voluntary scheme that rates and accredits an existing building's sustainable performance using a star system. Energy and water performance in hotels are covered by NABERS, but not waste.

## 7.3 Better practice systems

### 7.3.1 Food

Generally, food generated from accommodation businesses is disposed of in the waste stream. Some issues and strategies relating to food waste generation and recovery are covered in Section 2.10.

High quantities of food waste are a problem if management wants to manage and process it on site. Larger quantities of waste need larger and more sophisticated equipment for processing — space and a level of technical expertise is needed to ensure the system and equipment works properly.

### Composting and worm farms<sup>17</sup>

A composting system could be established if a building has gardens or grounds. Resorts, country hotels and motels may be most suited to these systems. Composting can be done in the open or in-vessel and requires surprisingly little effort. Information on composting techniques is widely available – more information can be found at the Recycled Organics Unit at the University of NSW [www.recycledorganics.com](http://www.recycledorganics.com)<sup>17</sup>.

Large worm farms are another option, although worms require a greater level of management than composting systems and may require significant expertise and commitment.

Details of some proprietary small-scale food processing systems can be found in Appendix B Waste management equipment.

### 7.3.2 Cardboard

Cardboard can be a major component of waste generated in accommodation buildings<sup>18</sup>. A compactor may be used if quantities are large enough, otherwise cardboard may be placed in, and collected from, bulk bins. Tenants and cleaners should flatten cardboard boxes as much as possible to save space in bins. Front-lift bins with wire panels allow contamination to be checked and are widely used for this material. Balers are also commonly used for cardboard.

Cardboard is generally very bulky but comparatively light weight — it compacts well and compactors and balers are ideal for containing and transporting cardboard.

### 7.3.3 Plastic film

Plastic film is not normally a major component of hotel and accommodation waste streams – any that is generated is often contaminated with food or liquid. Plastic film is very bulky but comparatively light weight and compacts well. However, large quantities are not as common and it is generally compacted in a baler, rather than collected in bins. Contaminated plastic film is not suitable for recycling and must be disposed of in the garbage stream.

### 7.3.4 Recyclables

Accommodation business, especially hotels, with or without large restaurants, can generate large quantities of recyclable containers, particularly glass bottles. Glass is very dense which makes it difficult to store and move efficiently.

There is often limited space available back-of-house to store glass containers. In the past, bottles had to be kept whole so they could be separated into different colours for recycling, which increased the storage space required.

Now, the use of optical sorting equipment at recovery facilities means that systems that crush glass on site are increasingly popular. However, if there is sufficient space; it may still be more viable to store whole bottles in wheelie bins. More information can be found in Appendix B Waste management equipment.

### 7.3.5 Newspapers and magazines

Accommodation businesses, particularly large hotels, often provide a range of daily newspapers to customers as well as magazines in rooms and common areas. Newspapers and magazines are recyclable, although the quality of the paper does not normally make them suitable for separate collection. Your waste management contractor can advise you of the best way they can be handled for recycling.

### 7.3.6 Office paper

Hotels have office areas and often business centres – both are usually relatively small. Although the amount of office paper produced is also likely to be small, it may be worth separating and for collection as an office paper stream.

<sup>17</sup> <http://www.recycledorganics.com/>

<sup>18</sup> 11% - Balfe, Chris and Băli, Elif (1998) *The Keys to Unlocking Successful Hotel Recycling Resource Recycling April*

### 7.3.7 Garbage

If the business is large enough and produces enough waste, a compactor may be used for garbage. For smaller businesses, garbage may be collected in bulk bins. In some cases, refrigerated cool rooms are used for storing food waste in order to prevent odour, insects and vermin.

Food is a major component of waste streams from many hotels, particularly those that have more than one commercial kitchen and 24-hour operation<sup>19</sup>. In many cases, kitchen operators are very efficient and there is little left over food.

Many of the components of the garbage generated from accommodation businesses are recoverable in some way. However, often these materials can only be recycled if separated and this is where problems can occur. Waste materials are often either so mixed or physically contaminated that separation is either not possible or not cost-effective. This mixed waste is the main component of the garbage stream in these buildings.

### 7.3.8 Other waste

Some accommodation businesses, especially those with large kitchens, also generate quantities of less common waste types including polystyrene boxes, cooking oil and steel drums.

Polystyrene boxes, in which fresh or chilled food is delivered, can often be returned to the markets or seller.

Cooking oil is widely recycled through specialist oil recyclers. Typically oil recyclers will provide a large container for storing oil on site before collection by recyclers.

Steel drums can be recycled in the co-mingled stream and should be crushed where possible to reduce space.

Pallets should be reused where possible and returned to suppliers or processors for recycling (see Table 10 for details). Mattresses should be recycled through mattress recyclers (Table 10).

Other types of waste are generated in small amounts and/or occasionally. Current and potential methods for collection and disposal of these waste types are covered in Section 2.12.

## 7.4 Access and collection point

Access for collection vehicles is not normally a problem at accommodation businesses. These are normally well set up to receive deliveries and larger facilities have purpose-built loading docks. Problems can arise when the use of the dock has expanded over time and space on the loading dock has become limited. As a result, waste facilities are located in an ad hoc way in areas adjacent to the dock at some sites.

Dock design in new developments should allow sufficient space for suitable waste storage and collection infrastructure, including space for two compactors and/or a baler, bulk bins, wheelie bins and potentially a refrigerated cool room. Consider clearance height, as front-lift collection vehicles need up to 6.2 m of clearance in order to empty bins (See Figure 55 and Figure 59). Front-lift bins may not be suitable for this reason.

## 7.5 Public place waste management

Refer to Sections 2.17 and 5.5 for information relating to public place waste management.

## 7.6 Ongoing management

Unlike office buildings, where cleaning contractors perform almost all the internal waste collection tasks, staff at accommodation facilities are often required to collect waste from where it is generated on site, place it in collection bins or equipment and operate compaction and baling equipment.

Several strategies can be used to avoid mistakes when separating waste and recyclables and to make sure that bins and equipment are used correctly. These include:

- training all staff, no matter how junior or casual, in correct waste separation and collection procedures and safe use of equipment

<sup>19</sup> Around 45-46% - <http://www.greenstarinc.org/enews/enews3n10.htm> and Balfe, Chris and Băli, Elif (1998) *The Keys to Unlocking Successful Hotel Recycling* Resource Recycling April

- using clear signage with consistent design and colours in the waste storage rooms and on bins (see Appendix E Standard signage);
- appointing a dock master to be responsible for the proper separation of waste and use of waste infrastructure; and
- including waste-related responsibilities in job descriptions at all levels.

## 7.7 Waste management strategies

In addition to diverting more materials through recycling systems, a range of other waste avoidance and reduction strategies are widely used in hospitality and accommodation businesses. These include:

- waste avoidance
  - order produce to be delivered with excess foliage removed
  - purchase items in bulk. Avoid purchasing multipacks and single serve containers
  - review serving sizes to reduce waste from uneaten food
  - review the need to provide newspapers and magazines free of charge if not requested
  - investigate the use of retractable cotton hand towels as an alternative to paper towels in toilets
  - lease office equipment so that you can upgrade and not be responsible for equipment disposal
  - present all waste reduction initiatives to staff as part of their induction program
- reuse
  - donate used linens, towels, blankets, soap, shampoo, uniforms and furniture to charity
  - donate used flowers to a local hospice or hospital
  - store food in reusable containers
  - return cardboard cartons to suppliers for reuse
  - work with supply chain stakeholders to ship products in reusable packaging
- recycle
  - develop a 'buy recycled' purchasing policy
  - buy products packed in recyclable packaging
  - provide bins for the separation of recyclables in guest rooms
  - buy beverages in containers which can be recycled by your contractor
  - flatten cardboard boxes as much as possible to save space in bins
  - keep cardboard clean – soiled cardboard cannot be recycled.

For more information on recycling locations and choosing a recycling contractor go to <http://businessrecycling.com.au/>, an initiative of the Planet Ark, NSW EPA, Queensland Government, Pitney Bowes, Zero Waste SA and Mobile Muster.

## 7.8 Better practice case studies

### 7.8.1 Novotel Northbeach<sup>20</sup>

Novotel Northbeach is a 4.5 star hotel located on the NSW South Coast. The hotel has taken an environmental leadership role in sustainable hotel management.

In 2008, the hotel reduced waste to landfill by 66 tonnes per year. It also reduced general waste collection and increased recycling in guest rooms by 16 per cent and increased food waste and organics recycling by 75 per cent.

The hotel achieved this through:

- increasing the types of recycling. The hotel now recycles paper, cardboard, polystyrene boxes, wax boxes, paints, solvents, e-waste, cooking oil, glass, tin, building materials, light globes, candles, linen, furniture, toners and plastic wrap
- managing food waste. The hotel restaurant, Windjammers, donates more than 450 kg of food to Oz Harvest every year and the quantity of organic waste processed in their worm farm tripled in one year.

The hotel is proposing additional actions including:

- purchasing durable and reusable products
- choosing products with the less packaging or packaging that can be reused or recycled
- asking suppliers if they take back packaging
- buying in bulk to reduce packaging
- using biodegradable material if packaging is unavoidable
- managing stock to avoid over purchasing.

## 7.8.2 Hilton Sydney

The Hilton Sydney is a large international hotel complex in Sydney's CBD. There are:

- 579 guest rooms
- two bars
- one café
- one restaurant
- one exhibition space
- four levels of conference space
- eight floors of office space.

The hotel enjoys an occupancy rate of about 95 per cent and the conference spaces are in demand. More than 50 per cent of the business revenue is derived from food and beverage sales and over 650,000 meals were prepared and served at the hotel in 2011.

### Impetus for changing the waste management program

Hilton International has a worldwide goal to reduce both greenhouse gas emissions and waste output by 20 per cent.

### Actions taken to better manage waste management

In the past all recycling was sorted off site but all recycling is now sorted into separate bins on site. All staff members have been trained to sort rubbish into the appropriate bins.

In 2011, Hilton installed a small Hungry Giant composting machine. All operations staff members were trained in its use and after a successful trial period, Hilton installed a larger, permanent machine.

Installing a composting machine that could treat 20 per cent of their waste stream (the approximate size of the organics portion) and reduce output by 80 per cent goes some way to reducing waste output by 20 per cent.

### Results

Hilton expected the Hungry Giant would reduce food waste by 80 per cent but only a 40 per cent reduction in organic output was achieved. This rate of reduction is still considered successful from Hilton's perspective.

The composting machine has also enabled the Hilton to reduce its greenhouse gas emissions by 151–200 tonnes per month and they also saved 25–50 per cent of costs on the previous waste contract.

The total reduction in waste exported from the premises has reduced waste management costs by 25–50 per cent.





## Glossary

### Baler

An electrical or hydraulically-powered device for compressing and securing compressed materials into bales which retain their shape by wire ties or strapping (Figure 24).



Figure 24 A baler

### Better practice waste management

Better practice waste management is the installation and maintenance of services and infrastructure that enable garbage, dry recyclables, organics and bulky waste handling systems and collection services to be completed in a way that achieves the best possible waste minimisation and resource recovery outcome. Better practice management systems include effective, efficient and safe systems that are easy to use by tenants and cleaners and easy to be serviced by collection contractors.

### Bulk bins

For the purpose of this guide, bulk bins are garbage and recycling bins with capacity of one cubic metre or greater. Bulk bins are sometimes fitted with wheels for manoeuvrability and are serviced by 'front-lift' or 'rear-lift' vehicles. These bins are often referred to as 'skip bins' or 'hoppers' (not to be confused with the hoppers in side-lift collection vehicles) (Figure 25 and Figure 26).



Figure 25 Front-lift bulk bins for cardboard (left) and garbage (right)



Figure 26 Rear-lift bulk bin

### Bulky waste services

Services and facilities to manage large bulky items that would not be collected in a typical garbage service, such as furniture, shop fittings or white goods (Figure 27).



Figure 27 Bulky waste

- Chute** A ventilated, essentially vertical tube that passes down through the floors of a building and opens directly into a waste room on a lower level or connects with a compactor in the waste room. Waste or recyclables are placed into a small door in the chute on each floor. One or more chutes may be installed to transport garbage and recyclables.
- Collection point** The point from which garbage or recyclables is collected and transferred from the storage receptacle to the collection vehicle.
- Co-mingled recyclables** A waste stream that substantially includes a mixture or blend of recyclable materials. This term is often used to refer to a mixture of containers (such as glass and plastic bottles, steel and aluminium cans), paper and cardboard. A stream that includes all these materials is 'fully co-mingled'. The same stream that does not include paper and cardboard is referred to as 'co-mingled containers'.
- Compactor** Equipment for compacting and holding compacted waste material. Typical compactors have two parts, the compactor itself – a hydraulic ram that compresses waste material– and a bin, into which waste is forced. Compactors can have different sized bins. A stationary or fixed compactor is attached to the ground and the bin can be detached for emptying. Integrated or transportable compactors have the compactor and bin fused together in one unit (Figure 28). Compactors differ from balers in that the compacted material remains in a bin until discharged for disposal. It is not baled or wrapped for transport or disposal.



Figure 28 Transportable compactor

- Development control plan (DCP)** DCPs support local environmental plans and provide specific, more comprehensive guidelines for types of development or small sections of the planned local government area.
- Diversion rate** The proportion of the total waste stream diverted from disposal. Usually shown as a percentage and represented by the calculation:

$$\text{Diversion Rate} = \frac{\text{Weight of diverted materials}}{\text{Total weight of waste stream}} \times 100$$

- Front-lift bins** Roughly cubic containers, open at the top and usually made of steel that range in size from 1–4.5 m<sup>3</sup> and are serviced by front-lift vehicles. To facilitate emptying, the bins have sleeves welded on either side that accommodate the forks of the truck's lifting mechanism and hinged lids which open to allow the waste to fall out when the bin is inverted. Bins of this type can be modified for specific uses (e.g. adding mesh panels for cardboard bins that allow visual examination of contamination levels). Front-lift bins are used where large amounts of waste need to be stored between collections. These bins are often referred to as 'skip bins' or 'hoppers' ().

**Front-lift truck**

A truck fitted with a specially designed compactor body that features hydraulic lifting apparatus which extend over the cabin at the front of the vehicle. A door is situated in the roof immediately behind the cabin. Specially designed front-lift bins are lifted over the cabin and the contents are tipped into the truck through the door in the roof (Figure 29).



Figure 29 Front-lift truck

**Garbage services**

Services and facilities to manage residual waste that is not collected by a dedicated recycling or organics service.

**Indemnity**

Indemnity means that a party providing services to a particular property will not be held responsible for any loss or damage to the property as a result of routine provision of the service.

**Local environmental plan**

Local environmental plans are prepared by councils to guide planning decisions for local government areas. They allow councils to supervise the way land is used through development and zoning controls.

**Office paper**

Paper mainly used in offices and for office applications. Typically office paper is:

- white, but can be any colour, usually pastel shades
- A4 size, but can be any size up to A3 and occasionally larger
- 80 gsm (grams per square metre) although lighter and heavier grades are also found.

**Organics services**

Services and facilities to manage garden and food organics (Figure 30), which may include a bin-based collection system or on site composting.



Figure 30 Food waste collection bins

**Personal protective equipment (PPE)**

Any item used or worn by a person to minimise the risk to their health or safety, such as gloves, safety shoes, glasses, high visibility clothing and aprons.

**Presentation area**

An area on site at a development that acts as an intermediate waste storage area between the normal storage area and collection point (which may be on or off site).

**Rear-lift truck**

A truck fitted with a specially designed compactor body, which features hydraulic apparatus at the rear that lifts bins and empties them into a semi-cylindrical bowl

running across the width of the truck. The bowl is swept by a 'paddle' that pulls the contents of the bowl into the truck body and provides some compaction (Figure 31).



Figure 31 Rear-lift collection vehicle

### Recovery rate

The amount of material recovered from a product group as a proportion of overall waste generation as represented by the equation:

$$\text{Recovery rate} = \frac{\text{Weight of recyclables in recycling bin}}{\text{Weight of recyclables in recycling bin} + \text{weight of recyclables in garbage bin}}$$

### Recycling services

Services and facilities to manage dry recyclable materials. The type of recyclables collected in the recycling service may vary across different areas and collectors, but generally covers all recyclable materials generated in a typical business. These include paper and cardboard, glass bottles and jars, steel cans and aerosols, aluminium packaging and plastic containers. Recyclables may be collected as separate streams of each material type or as a co-mingled (mixed) stream

### Side-lift collection vehicle

A truck fitted with a specially designed compactor body which features hydraulic lifting apparatus extends outwards from the side of the vehicle towards the kerb during operation to collect wheelie bins up to 360 litres in capacity. The lifting apparatus consists of an extendable 'arm', at the end of which is usually a two- or three-fingered pincer or grab, which takes hold of the bin, draws it back towards the vehicle and lifts it up to empty the contents into the truck. The bin contents are tipped into the hopper which is positioned at the front of the body immediately behind the cab. A compaction mechanism is situated at the bottom of the hopper and there is generally a paddle that rotates about a central point, sweeping across the bottom of the hopper and pushing any materials collected there into the body. Other mechanisms, like an auger are also used. A rear door on the body opens to allow the contents to be discharged. This is done by gravity when the body is raised by a hydraulic ram. These vehicles are most commonly used for domestic bin collections in Australia but some are used commercially (Figure 32).



Figure 32 Side-lift collection vehicle

- Source-separation** Physical separation of a waste stream into its components at the point of generation. Material streams separated in this way are 'source-separated'.
- State environmental planning policy (SEPP)** A planning instrument made by the State (the Minister for Planning). State environmental planning policies (SEPPs) make sure that government policies are carried out uniformly, deal with state-wide issues and set guidelines for regional environmental plans and local environmental plans.
- Waste management plan (1)** A document that sets out how one or more waste streams generated by a particular organisation or from a particular location are produced, stored, transported, recovered, minimised and disposed of. Waste management plans should also cover other issues such as the amount and types of waste generated, staff and stakeholder roles and responsibilities, time frames, targets and performance indicators.
- Waste management plan (2)** A document, often required by a DCP, that details the type and amount of garbage and recyclable material that is likely to be generated during the construction, demolition, and ongoing operation of a development. It also details where and how the garbage and recycling should be stored, how it will be reprocessed, disposed of and handled. A waste management plan is generally required as part of the documentation supporting a development application. Requirements for these types of waste management plans may vary between local government areas.
- Wheelie bin** A moulded plastic container, in a variety of different designs, that incorporates two or four wheels, a close-fitting hinged lid and handles for individual transport by hand. Wheelie bins are designed to be lifted and emptied by purpose-built equipment and typically have capacities of 80, 120, 240 (Figure 33), 360, 660, 1000, 1100, 1500 or 2000 litres. Wheelie bins are also often referred to as mobile bins, mobile garbage bins or MGBs.



Figure 33 Two, 240 litre wheelie bins

For more information on waste equipment and vehicles please refer to Appendix B Waste management equipment and Appendix C Collection vehicles.

## Abbreviations

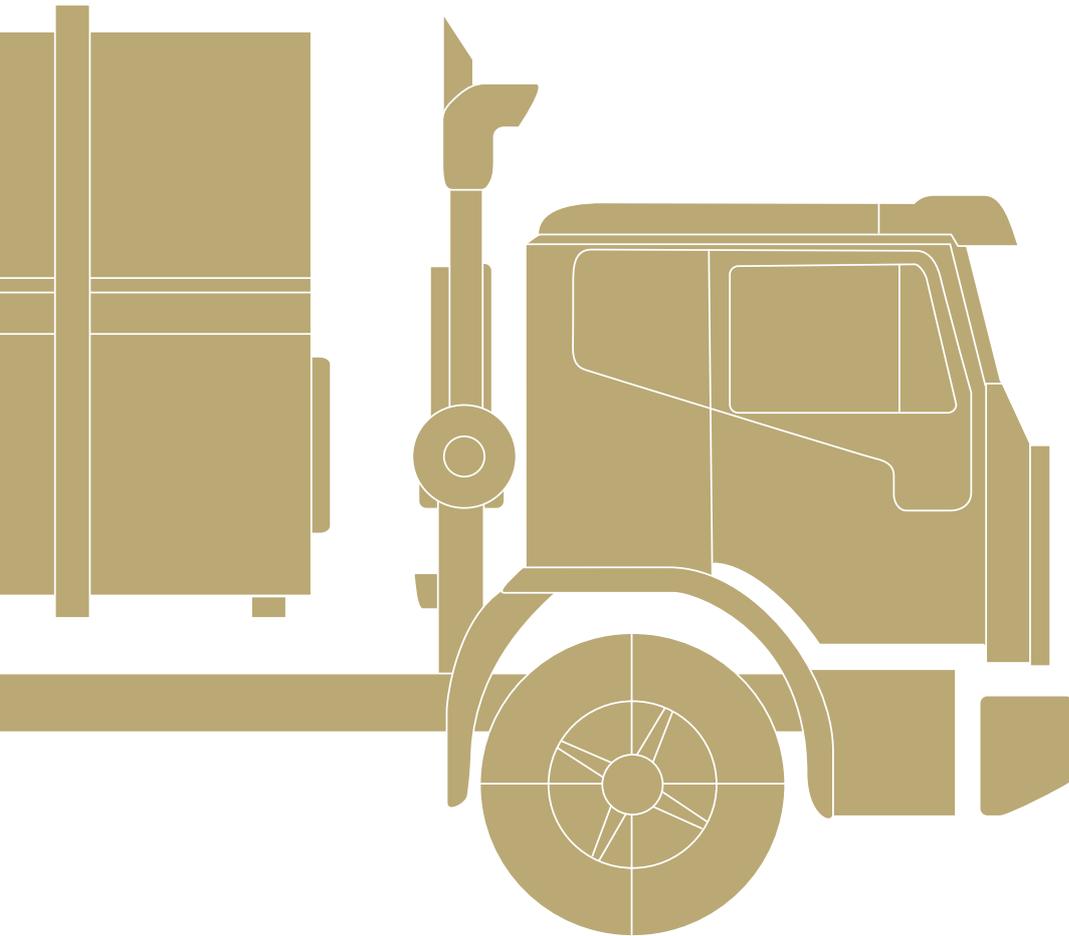
Approx.	approximately
AS	Australian Standard
C&D	construction and demolition
C&I	commercial and industrial
CCTV	closed circuit television
gsm	grams per square metre
IT	information technology
MSW	municipal solid waste
n/a	not applicable
NSW EPA	NSW Environment Protection Authority
OH&S	Occupational Health and Safety
PPE	personal protection equipment

## Units

L	litre
m	metre
m <sup>3</sup>	cubic metre
m <sup>2</sup>	square metre



# Appendices





## Appendix A

### Waste generation rates

Waste generation rates have been estimated based on a survey of a range of different businesses in August 2012. A summary of the survey methods and data presented here. For all results, including statistical analysis of the data, the full survey report, *Commercial Waste Generation Survey NSW EPA September 2012*, can be obtained from the NSW EPA.

#### Survey method

The data was gathered by surveying a range of businesses. A number of small retail business with shop fronts were approached directly unannounced and staff asked about floor areas, waste and recycling quantities and other measures such as number of meals and occupied bed nights. Larger businesses were contacted by telephone or e-mail and appointments were made to meet with relevant staff and inspect waste facilities. In some cases, organisations approached were able to provide information directly without a site visit. Some information was obtained from other sources. All data sources are listed below:

- survey conducted by GHD
- 'Bin Trim' pilot study – provided by the NSW EPA
- data provided by Stockland
- data obtained from the General Property Trust website <http://www.gpt.com.au/GPTCorp/content.aspx?urlkey=Waste>.

The recorded data was converted into a standard measure of litres per 100 m<sup>2</sup> of floor space per day. For some businesses other measures were calculated including per meal, per coffee sold, per customer and per occupied room night.

It should be noted that there were significant variations in waste generation rates across the businesses surveyed and even between similar individual businesses. The number of businesses surveyed within some business types was also very small. The number of businesses surveyed in each case is shown in the last column of Table 16.

The data is provided as a guide only and care should be taken when using it.

#### Survey data

Waste generation rates were estimated for different businesses per 100 m<sup>2</sup> of floor space per day (Table 16). Waste generation rates were also estimated where measures other than per 100 m<sup>2</sup> were appropriate for different business types where they apply (Table 17). These include waste generation rates per meal, per coffee sold, per customer and per occupied room night. Data in the tables below was generated based on a survey of 137 businesses of various types.

Table 16 Estimated commercial and retail waste generation rates

Type of premises	Average L per 100 m <sup>2</sup> per day		Maximum L per 100 m <sup>2</sup> per day		Number of businesses surveyed
	Waste	Recycling	Waste	Recycling	
Backpackers accommodation, boarding house, guest house	30	10	35	15	2
Showrooms	10	25	22	100	5
Butcher	185	100	200	145	2
Delicatessen	30	0	30	0	1
Fish shop	250	85	250	85	1
Greengrocer	310	410	310	410	1
Hairdresser	40	40	62	55	4
Restaurants	190	190	460	490	7
Supermarket with fresh food	30	0	30	0	1
Supermarket without fresh food	140	75	140	72	1
Takeaway	175	685	175	690	1
Hotels, bars, pubs	80	35	300	85	4
Licensed club	25	20	35	27	4
Motel (with public restaurant)	20	0	20	0	1
Motel (without public restaurant)	25	0	25	0	1
Offices	8	6	16	12	2
Primary education	7	0	7	0	1
Tertiary education	25	3	40	7	3
Cafes	215	130	500	220	42
Book and video shops	25	60	52	172	5
Bakeries	295	165	500	245	3
Services	55	10	160	30	7
Chemists	185	60	500	115	3
Grocery and convenience stores	25	90	40	240	6
Dry cleaning	35	10	50	17	2
Home ware and kitchenware shops	10	70	15	225	6
Newsagents and stationery shops	15	215	15	715	4
Medical and optical	35	10	80	17	3
Shopping centres	15	10	25	25	9
Variety gift stores	15	35	22	110	5
Pawnbrokers	20	0	30	1	2
Shops less than 100 m <sup>2</sup> floor space	80	80	860	715	63
Shops more than 100 m <sup>2</sup> floor space	80	65	300	490	42
All food retail	180	135	860	685	31
All non-food retail	40	50	300	715	69
All retail	80	70	860	715	111

Table 17 Alternate waste generation measures

Business Type	Garbage (L) per measure	Recycling (L) per measure	Measure
Bakery	2.5	1.2	per meal
Café	2.9	1.3	per meal
Café	2.0	1.1	per coffee
Hotel (accommodation)	1.1	3.3	per meal
Hotel (accommodation)	3.4	10.2	per occupied room per night
Motel with restaurant	13.7	0	per occupied room per night
Motel without restaurant	5.5	0	per occupied room per night
Guest house	3.0	1.3	per occupied room per night
University	2.6	7.2	per student per year
Restaurant	0.7	0	per customer
Restaurant	2.0	0.9	per meal
Backpackers hostel	11.4	2.3	per occupied room per night

## Bin storage space

The calculations in Table 18 and Table 19 are examples and are provided as a guide only. Readers are encouraged to make their own calculations based on their own budget, waste streams, storage areas and other requirements. Readers should negotiate with their waste contractor to determine the best combination of bin sizes, types and collection frequencies for their situation and budget.

Table 18 Bin number calculation examples

Business type	Measure	Waste estimate per day	Waste estimate per week	Number of bins per week	Example option
Butcher	100 m <sup>2</sup> floor area	1 x 185 L garbage = 185 L  1 x 100 L recycling = 100 L	185 x 6 days = 1110 L garbage  100 L x 6 = 600 L recycling	4.6 x 240 L garbage 1 x 660 L recycling	Garbage: 2 x 240 L bins once a week, 3 x 240 L bins once a week  Recycling: 1 x 660 L once a week
Greengrocer	300 m <sup>2</sup> floor area	3 x 310 L garbage = 930 L  3 x 410 L recycling = 1230 L	930 x 7 days = 6510 L garbage  1230 x 7 days = 8610 L recycling	5.9 x 1100 L or 2.2 x 3 m <sup>3</sup> garbage  2.9 x 3 m <sup>3</sup> recycling	Garbage: 1 x 1100 L bin daily  Recycling: 1 x 3 m <sup>3</sup> bin once a week
Shopping Centre	100,000 m <sup>2</sup> floor area	1000 x 15 L garbage = 15,000 L  1000 x 10 L recycling = 10,000 L	15,000 x 7 days = 105,000 L (105 m <sup>3</sup> )  10,000 x 7 days = 70,000 L (70 m <sup>3</sup> )	1.19 x 30 m <sup>3</sup> compactor, 1:3 compaction rate = 90 m <sup>3</sup> garbage  0.8 x 30 m <sup>3</sup> compactor, 1:3 compaction rate = 90 m <sup>3</sup> recycling	Garbage: 1 x 30 m <sup>3</sup> compactor every five days  Recycling: 1 x 30 m <sup>3</sup> compactor once a fortnight
Café	100 coffees per day	2.0 L x 100 coffees = 200 L garbage  1.1 L x 100 coffees = 110 L recycling	200 x 7 days = 1400 L garbage  110 x 7 days = 770 L recycling	5.8 x 240 L garbage  3.2 x 240 L recycling	Garbage: 1 x 240 L bin daily  Recycling: 1 x 240 L bin three times per week
Restaurant	150 meals per day	2.0 L x 150 meals = 300 L garbage  0.9 L x 150 meals = 135 L recycling	300 x 7 days = 2100 L garbage  135 x 7 days = 945 L recycling	8.8 x 240 L garbage  3.9 x 240 L recycling	Garbage: 1 x 240 L bin daily, 2 x 240 L twice per week  Recycling: 2 x 240 L bins twice per week

Table 19 Example storage space calculations

Example option	Bin footprints	Number of bins	Total bin storage area required	Area required considering manoeuvring space
Garbage: 2 x 240 L bins once a week, 3 x 240 L bins once a week Recycling: 1 x 660 L once a week	240 L - 0.24 m <sup>2</sup> 660 L - 1.16 m <sup>2</sup>	240 L - 5 660 L - 1	$1.2 \text{ m}^2 + 1.16 \text{ m}^2 = 2.36 \text{ m}^2$	$2.36 \text{ m}^2 \times 2 = 4.8 \text{ m}^2$
Garbage: 1 x 1100 L bin daily Recycling: 1 x 3 m <sup>3</sup> bin once a week	1100 L - 1.7 m <sup>2</sup> 3 m <sup>3</sup> - 2.7 m <sup>2</sup>	1100 L - 1 3 m <sup>3</sup> - 1	$1.7 \text{ m}^2 + 2.7 \text{ m}^2 = 4.4 \text{ m}^2$	$4.4 \text{ m}^2 \times 2 = 8.8 \text{ m}^2$
Garbage: 1 x 30 m <sup>3</sup> compactor once a week Recycling: 1 x 30 m <sup>3</sup> compactor once a fortnight	30 m <sup>3</sup> bin + compaction equipment = 24 m <sup>2</sup> Footprints vary according to type and size of equipment and manufacturer	2	$2 \times 24 \text{ m}^2 = 48 \text{ m}^2$ Includes space for access and manoeuvring	
Garbage: 1 x 240 L bin daily Recycling: 1 x 240 L bin three times per week	240 L - 0.24 m <sup>2</sup>	240 L - 2	$0.24 \text{ m}^2 \times 2 = 0.48 \text{ m}^2$	$0.48 \text{ m}^2 \times 2 = 0.96 \text{ m}^2$
Garbage: 1 x 240 L bin daily, 2 x 240 L twice per week Recycling: 2 x 240 L bins twice per week	240 L - 0.24 m <sup>2</sup>	240 L - 4	$0.24 \text{ m}^2 \times 4 = 0.96 \text{ m}^2$	$0.96 \text{ m}^2 \times 2 = 1.92 \text{ m}^2$

## Appendix B

### Waste management equipment

A variety of bins and equipment exist for handling, collecting and storing waste and recycling in commercial buildings. The type of bin or equipment required depends on the type of material to be handled and the type of premises in which it's used.

#### Mobile bins

The most common bins used in almost every commercial waste management applications are mobile bins. Mobile bins can be any one of a variety of different-sized moulded plastic containers that incorporate two or four wheels, a close-fitting lid and handles for individual transport by hand. They are designed for lifting and emptying by purpose-built equipment.

Mobile bins with two wheels are commonly referred to as 'wheelie bins', and range in sizes from 80 litres up to 360 litre capacity. Wheelie bins in commercial and retail applications in Australia are generally 240 litres in capacity. Exact bin measurements differ between manufacturers but typical wheelie bin dimensions are given in Table 20.

A much wider range of mobile bins are available in Australia than are actually used. The most common capacities of larger mobile bins in commercial and retail applications in Australia are 660 litres and 1100 litre. Exact measurements differ between manufacturers but typical bin dimensions are shown in Table 21.

Regardless of their size, mobile bins are typically serviced by vehicles that lift them on a hydraulic 'comb' at the rear of the vehicle and empty the contents into a deep bowl. A large blade sweeps the waste into the body of the truck. They are often referred to as 'rear-lift' bins for this reason.

Table 20 Typical wheelie bin dimensions

Bin Capacity	80 L	120 L	140 L	240 L	360 L
Height (mm)	870	940	1065	1080	1100
Depth (mm)	530	560	540	735	885
Width (mm)	450	485	500	580	600
Approx footprint (m <sup>2</sup> )	0.24	0.27	0.27	0.43	0.53

Table 21 Typical larger mobile bin dimensions

Bin Capacity	660 L	770 L	1100 L	1300 L	1700 L
Height (mm)	1250	1425	1470	1408	1470
Depth (mm)	850	1100	1245	1250	1250
Width (mm)	1370	1370	1370	1770	1770
Approx footprint (m <sup>2</sup> )	1.16	1.5	1.7	1.21	1.27

## 240 litre bins

Wheelie bins of 240-litre capacity are a very versatile and flexible container. Most are produced to a standard design which allows for small quantities of waste to be moved easily by hand. They can be used for storing and moving waste within premises as well as for direct collection for waste disposal.



Figure 34 Two, 240-litre capacity wheelie bins



Figure 35 Typical 240 litre capacity bin specifications

## 660 litre bins

At 660 litres, these bins have the equivalent capacity of almost three 240 litre bins. They feature four wheels, one on each corner, and a hinged lid. They are used where the quantities of materials generated are larger than can be easily accommodated by 240 litre bins. Their footprint is only slightly larger than two, 240 litre bins and they can be easily pushed and manoeuvred by staff on foot or towed by tow motors or tractors.



Figure 36 A 660 litre bin



Figure 37 Typical 660 litre bin specifications

## 1100 litre bins

With a capacity of just over one cubic metre, these bins have the equivalent volume of more than four 240 litre bins. They also feature four wheels, one on each corner and a hinged lid. These bins are used where large quantities of waste are generated but where larger front-lift bins might not be easily located and emptied. These bins have the advantage of being emptied by a rear-lift vehicle which can enter and easily manoeuvre in areas such as basements and loading docks, where clearance is less than six metres. They also can be easily pushed and manoeuvred by staff on foot or towed by tow motors or tractors.



Figure 38 A 1100 litre bin

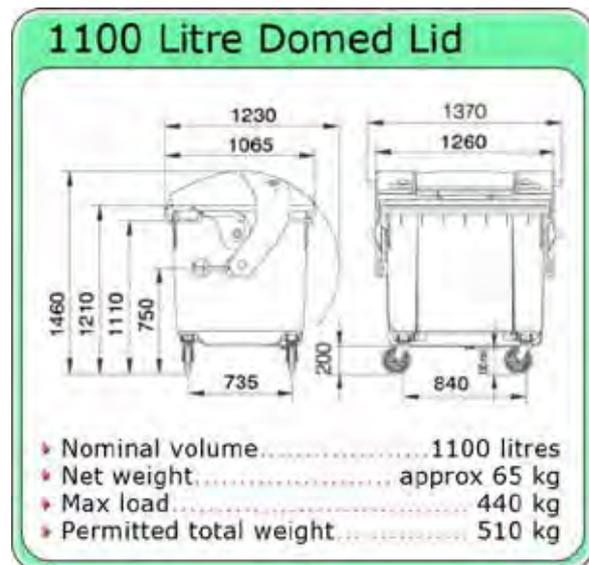


Figure 39 Typical 1100 litre bin specifications

## Australian Standard

Wheelie bins with capacities up to 1700 L should comply with Australian Standard AS 4123 Mobile WasteContainers. There are seven parts to the standard as listed below:

- **Part 1 – Containers with two wheels and a capacity up to 400 L for lifting devices – dimensions and design.** This standard specifies dimensions and design requirements for mobile waste containers with two wheels with a nominated capacity up to 400 litres
- **Part 2 – Containers with four wheels with a capacity from 500 L to 1200 L with flat lid(s), for trunnion and/or lifting devices – dimensions and design.** This standard specifies dimensions and design requirements for mobile waste containers with four wheels, flat lids and a capacity from 500 litres to 1200 litres to be used by trunnion and/or comb lifting devices
- **Part 3 – Containers with four wheels with a capacity from 770 L to 1300 L with dome lid(s), for trunnion and/or lifting devices – dimensions and design.** This standard specifies dimensions and design requirements for mobile waste containers with four wheels, dome lids and a capacity from 770 litres to 1300 litres to be used by trunnion and/or comb lifting devices
- **Part 4 – Containers with four wheels with a capacity from 750 L to 1700 L with flat lid(s), for wide trunnion or BG and/or wide comb lifting devices – dimensions and design.** This standard specifies dimensions and design requirements for mobile waste containers with four wheels, flat lids and a capacity from 750 litres to 1700 litres to be used by wide trunnion or BG lifting and/or wide comb lifting devices;
- **Part 5 – Performance requirements and test methods.** This standard specifies the performance requirements and test methods for mobile waste containers up to 1700 litres as covered by parts 1–4 of AS 4123;
- **Part 6 – Health, safety and environment.** This standard provides the most essential safety and health requirements for mobile waste containers;
- **Part 7 – Colours, marking and designation requirements.** This standard specifies the colours, markings and designation requirements for mobile waste containers up to 1700 litres as covered by parts 1–4 of AS 4123.

## Large bulk bins

### Front-lift bins

These bins range from 1– 4.5 m<sup>3</sup> in size and are typically serviced by vehicles that lift them on a hydraulic ‘forks’ at the front of the vehicle, over the cab and empties them into the body of the vehicle. A hydraulic ram then compacts the collected waste. For this reason, they are termed ‘front-lift vehicles’.

Front-lift vehicles require at least 6.2 m height clearance to empty bins which means that they cannot be used in many applications. They are nevertheless very common and are most often located outdoors where overhead clearance is not an issue.



Figure 40 Front-lift garbage bins



Figure 41 Front-lift cardboard bins

### Rear-lift bins

Some specially designed three cubic metre bulk bins (Figure 42) can be serviced by rear-lift vehicles, often by pulling them up using a cable on the rear of the vehicle. These are becoming less common.



Figure 42 Rear-lift bin

Common bulk bin sizes are provided in Table 22. Please note that the dimensions given are a guide only and differ according to each manufacturer.

Table 22 Large bin dimensions

Bin Type	2 m <sup>3</sup>	3 m <sup>3</sup>	4.5 m <sup>3</sup>
Height (mm)	865	1225	3750
Depth (mm)	1400	1505	1605
Width (mm)	1830	1805	1805
Approx footprint (m <sup>2</sup> )	2.6	2.7	2.9

## Skips

A variety of bin types come under the general heading of 'skips'. Mostly these are 'marrell' bins (Figure 43) but some are also roll-on-roll-off or 'RORO' bins and have subtypes including hook (Figure 44) and dyno bins.

Generally they are all open, that is they have no lid and are not enclosed or sealed. They range in size from 1–36 m<sup>3</sup> and are most often used where large amounts of dry waste, such as building material, is generated. They usually require a significant amount of space on site for vehicle access unless they are located on property boundaries so that vehicles depositing and collecting them can manoeuvre in the street.



Figure 43 Marrell bin



Figure 44 Roll-in-roll-out (RORO) hook bin

## Tipper bins

Tipper bins are bins designed to be lifted and tipped by either a forklift or a mechanical (hydraulic) bin tipper. The tipper bins are usually designed to allow the bin to roll forward when loaded and unlatched, and then return to an upright locked position. The bins may or may not have castors attached under the sub-frame for manoeuvrability.

## Compactors

A compactor is a device for compacting material and holding compacted material. There are two types of compactors; fixed and integrated. Fixed (or stationary) compactors have two parts, the compactor itself – a

hydraulic ram that compresses waste material and is often fixed to the ground – and a bin, where waste is forced into. Integrated (or transportable) compactors (Figure 45) have both the compactor mechanism and the bin in one unit. Bins can be 5–30 m<sup>3</sup> in size.

Compactors are commonly used in situations like shopping centres where large amounts of easily compacted materials are generated, such as putrescible waste and cardboard. Space is also often at a premium. Compactors compress materials down to about a third of their uncompacted volume so that a 30 m<sup>3</sup> compactor can hold the equivalent of up to 90 m<sup>3</sup> of uncompacted waste. Provide adequate clearance to services to avoid potential damage to property..



Figure 45 Integrated waste compactor

## Balers

Balers compress materials such as cardboard and plastic film and tie them into bales so that they remain compacted (Figure 46). They are used in situations where large amounts of bulky materials such as cardboard and plastic film are produced but not enough is produced to warrant a compactor and/or where space is limited.



Figure 46 Vertical cardboard baler

The advantages of balers are that bulky materials can be compressed and not occupy valuable bin capacity. The balers themselves come in a wide variety of sizes and capacities and have a small footprint. Balers can be customised by size and use requirements. Although some balers operate automatically, someone is normally required to load and operate the baler which is a disadvantage. The bales can also be large, heavy and difficult to move by hand. Sometimes equipment such as a forklift is required to move them.

### Bale frames

Bale frames are stands which are used in conjunction with a bale bag to collect recyclable material – usually plastic, cardboard or mixed recyclables (Figure 47 and Figure 48). These stands hold the bale bag open at the top allowing for easy placement of material into the bale.

Bale frames are most suitable for small to medium-sized applications and businesses with space restrictions.



Figure 47 Bale frame with bag



Figure 48 Aluminium cans in a bale frame

### Bin lifters

These are lightweight bin lifting devices that attach to larger bins, such as front-lift bins or open bins, and use hydraulic or air strut supports to assist users to empty wheeled bins into the larger bins. They help make emptying smaller bins into larger bins easier and safer for operators. Bin lifters may be powered (hydraulic) or unpowered. There are a variety of different types, sizes and lifting capacities (e.g. Figure 49 and Figure 50).



Figure 49 Bin lifter with safety cage



Figure 50 A simple gas strut bin lifter

Equipment manufacturers and distributors.

Table 23 Equipment Manufacturers and Distributors

Equipment	Manufacturer/ distributor	Country of origin	Material	Website
Baler	Miltek	Australia	Cardboard, plastic film	<a href="http://www.miltek.com.au/">http://www.miltek.com.au/</a>
	Harris	United States		<a href="http://www.harrisequip.com/company/">http://www.harrisequip.com/company/</a>
	Elephants Foot	Australia		<a href="http://www.elephantsfoot.com.au/">http://www.elephantsfoot.com.au/</a>
	Alukram	Australia		<a href="http://www.alukram.com/index.html">http://www.alukram.com/index.html</a>
	WasteTech	Australia		<a href="http://www.wastech.com.au/">http://www.wastech.com.au/</a>
	Hungry Giant	Australia		<a href="http://www.hungrygiant.com.au/equipment_sales_rentals.htm">http://www.hungrygiant.com.au/equipment_sales_rentals.htm</a>
	Pakmor	Australia		<a href="http://www.pakmor.com.au/index.php">http://www.pakmor.com.au/index.php</a>
	LSM Engineering	Australia		<a href="http://www.lsmltd.com/">http://www.lsmltd.com/</a>
	Australian Bale Press	Australia		<a href="http://www.ausbale.com.au/">http://www.ausbale.com.au/</a>
	Autobaler	Australia		<a href="http://www.autobaler.com.au/about-us.asp">http://www.autobaler.com.au/about-us.asp</a>
	Torque Industries	Australia		<a href="http://www.torqind.com/hydra-pac/">http://www.torqind.com/hydra-pac/</a>
Wheelie bins	Sulo	Australia	All purpose	<a href="http://www.sulo.com.au/">http://www.sulo.com.au/</a>
	Mastec	Australia		<a href="http://www.mastec.com.au/">http://www.mastec.com.au/</a>
	Australian Waste Management	Australia		<a href="http://www.australianwastemanagement.com.au/products/wheelie-bins/">http://www.australianwastemanagement.com.au/products/wheelie-bins/</a>
	WasteTech	Australia		<a href="http://www.wastech.com.au/">http://www.wastech.com.au/</a>
	Crackerjack Industries	Australia		<a href="http://crackerjackindustries.com.au/plastic_wheelie_bins.htm">http://crackerjackindustries.com.au/plastic_wheelie_bins.htm</a>
	Wrightway	Australia		<a href="http://www.wrightwayproducts.com.au/home/our-products.html">http://www.wrightwayproducts.com.au/home/our-products.html</a>
	Mr Wheelie Bin	Australia		<a href="http://www.mrwheeliebin.com.au/2-wheeled-bins.html">http://www.mrwheeliebin.com.au/2-wheeled-bins.html</a>
Chutes	Wilkinson	United State	Waste and recycling	<a href="http://www.whrise.com/index.html">http://www.whrise.com/index.html</a>
	WasteTech	Australia		<a href="http://www.wastech.com.au/">http://www.wastech.com.au/</a>
	JD McDonald	Australia		<a href="http://jdmacdonald.com.au/chutes-and-compactors/chutes/garbage-chute">http://jdmacdonald.com.au/chutes-and-compactors/chutes/garbage-chute</a>
	Elephants Foot	Australia	Cardboard, plastic film	<a href="http://www.elephantsfoot.com.au/">http://www.elephantsfoot.com.au/</a>
Chute compactors	WasteTech	Australia	Waste and recycling	<a href="http://www.wastech.com.au/compactors/chutes-compactors.html">http://www.wastech.com.au/compactors/chutes-compactors.html</a>

Compactors	WasteTech	Australia	Waste and recycling	<a href="http://www.wastech.com.au/Compactors/compactors.html">http://www.wastech.com.au/Compactors/compactors.html</a>
	JD McDonald	Australia		<a href="http://jdmacdonald.com.au/chutes-and-compactors">http://jdmacdonald.com.au/chutes-and-compactors</a>
	Elephants Foot	Australia		<a href="http://www.elephantsfoot.com.au/">http://www.elephantsfoot.com.au/</a>
	Miltek	Australia		<a href="http://www.miltek.com.au/">http://www.miltek.com.au/</a>
	Harris	United State		<a href="http://www.harrisequip.com/company/">http://www.harrisequip.com/company/</a>
	Process System Services	Australia		<a href="http://www.process-systems.com.au/waste_paper_compactors.html">http://www.process-systems.com.au/waste_paper_compactors.html</a>
	Pakmor	Australia		<a href="http://www.pakmor.com.au/index.php">http://www.pakmor.com.au/index.php</a>
	Autobaler	Australia		<a href="http://www.autobaler.com.au/testimonials.asp">http://www.autobaler.com.au/testimonials.asp</a>
In Vessel Composting	Hot Rot	New Zealand	Food and organics	<a href="http://www.hotrotsolutions.com/">http://www.hotrotsolutions.com/</a>
	VCU Europe	United Kingdom		<a href="http://www.vcutechology.com/index.htm">http://www.vcutechology.com/index.htm</a>
	Big Hanna	Sweden		<a href="http://www.bighanna.com/index.htm">http://www.bighanna.com/index.htm</a>
	Hungry pig	Australia		<a href="http://www.hungrypig.net/installations.htm">http://www.hungrypig.net/installations.htm</a>
	ESP Limited	New Zealand		<a href="http://www.esplimited.co.nz">http://www.esplimited.co.nz</a>
	Closed Loop	South Korea		<a href="http://www.closedloop.com.au">http://www.closedloop.com.au</a>
Vacuum Systems	Marimatic	Finland	Waste and recycling	<a href="http://www.marimatic.fi/index.php">http://www.marimatic.fi/index.php</a>
	ENVAC	Sweden		<a href="http://www.envacgroup.com/">http://www.envacgroup.com/</a>
Open Bins	WasteTech	Australia	Inert and bulky waste and recycling	<a href="http://www.wastech.com.au/">http://www.wastech.com.au/</a>
	Skip Factory	Australia		<a href="http://www.skipfactory.com.au/">http://www.skipfactory.com.au/</a>
	BinCorp	Australia		<a href="http://www.bincorpequip.com.au/">http://www.bincorpequip.com.au/</a>
	ACT Industrial	Australia		<a href="http://www.actindustrial.com.au/about-us">http://www.actindustrial.com.au/about-us</a>
	Zofex Pty Ltd	Australia		<a href="http://www.hotfrog.com.au/Companies/Zofex">http://www.hotfrog.com.au/Companies/Zofex</a>
	TORO Waste Equipment	Australia		<a href="http://www.truelocal.com.au/business/toro-waste-equipment/smithfield">http://www.truelocal.com.au/business/toro-waste-equipment/smithfield</a>
	VitalQuip	Australia		<a href="http://www.vitalquip.com.au/home/photo-gallery/">http://www.vitalquip.com.au/home/photo-gallery/</a>
Front-lift bins	TORO Waste Equipment	Australia	Waste and recycling	<a href="http://www.truelocal.com.au/business/toro-waste-equipment/smithfield">http://www.truelocal.com.au/business/toro-waste-equipment/smithfield</a>
	Skip Factory	Australia		<a href="http://www.skipfactory.com.au/">http://www.skipfactory.com.au/</a>
	BinCorp	Australia		<a href="http://www.bincorpequip.com.au/">http://www.bincorpequip.com.au/</a>
	ACT Industrial	Australia		<a href="http://www.actindustrial.com.au/about-us">http://www.actindustrial.com.au/about-us</a>
	VitalQuip	Australia		<a href="http://www.vitalquip.com.au/home/photo-gallery/">http://www.vitalquip.com.au/home/photo-gallery/</a>
	Zofex Pty Ltd	Australia		<a href="http://www.hotfrog.com.au/Companies/Zofex">http://www.hotfrog.com.au/Companies/Zofex</a>
	Superior Pak	Australia		<a href="http://www.superiorpak.com.au/">http://www.superiorpak.com.au/</a>
	Mastec	Australia		<a href="http://www.mastec.com.au/">http://www.mastec.com.au/</a>

Bin lifters	WasteTech	Australia	Waste and recycling	<a href="http://www.wastech.com.au/Bin-Lifters/bin-lifters.html">http://www.wastech.com.au/Bin-Lifters/bin-lifters.html</a>
	Crackerjack Industries			<a href="http://crackerjackindustries.com.au/bin_lifters.htm">http://crackerjackindustries.com.au/bin_lifters.htm</a>
	LiftMaster			<a href="http://www.liftmastermh.com.au/">http://www.liftmastermh.com.au/</a>
	Parmor			<a href="http://www.pakmor.com.au/index.php">http://www.pakmor.com.au/index.php</a>
	Wrightway			<a href="http://www.wrightwayproducts.com.au/">http://www.wrightwayproducts.com.au/</a>
	Mr Wheelie Bin			<a href="http://www.mrwheeliebin.com.au/bin-lifters.html">http://www.mrwheeliebin.com.au/bin-lifters.html</a>
	Australian Waste Management			<a href="http://www.australianwastemanagement.com.au/products/bin-lifters/">http://www.australianwastemanagement.com.au/products/bin-lifters/</a>

*Disclaimer: The NSW EPA neither endorses nor disapproves of any equipment, suppliers, organisations or activities mentioned in this guide.*

### Organics processing systems

Table 24 summarises the key details of a range of different in-vessel composting systems. Not all of the key information is known for all systems.

Table 24 In-vessel organics processing systems

System name, manufacturer, country of origin	System type	Details	Capacity per day (t)	Retention time (days)	Typical applications	Feedstock	Costs (a\$ approx)
Wright Environmental Management, Canada	Aerated, static, continuous flow, composting.	World's largest supplier of completely-enclosed, continuous flow, composting systems. More than 55 units in United States, Canada and UK. Mass of material is constantly moving through vessel and extracted at end by an auger. Odour controlled - units are sealed and subject to negative air pressure. Air is drawn out and passed through biofilter. Leachate collected in sump system and recirculated within unit.	0.27 – 300	10 - 14	Prisons, hospitals, universities and military facilities.	Municipal solid wastes, biosolids, food and agricultural wastes, green waste and animal processing waste.	\$350,000
Earth Tub, Green Mountain Technologies, USA	Agitated, batch-flow, composting.	Features power mixing, aeration and bio-filtration of all process air. Liquids are not recirculated but collected and disposed to sewer or into a holding tank. Volume reduction is typically 70 per cent or more. After processing compost is discharged through an external door.	0.068 per tub	20 - 40	Schools, universities, restaurants, hospitals and supermarkets.		\$9,900 per tub
Earth Flow, Green Mountain Technologies, USA	Horizontal, containerised, agitated, continuous flow, composting.	Features auger that mixes and advances the compost down the vessel with each pass and discharges it at end. Speed and number of passes made by auger can be controlled automatically.	0.25 – 1.5				
Big Hanna, Susteco, Sweden	Agitated, aerated, continuous flow, composting.	T240 unit features rotating cylinder, temperature sensors, fan aeration system, biofilter, digital display and data logger to record temperature and other settings.	0.17		Housing estates, schools, hotels, prisons and research centres.		
Go Mixer, Advanced Biotechnologies, Canada	Decomposes food waste into nutrient rich water suitable for use as a supplement to irrigation and watering systems.	Product water virtually odour free and suitable for use as supplement to irrigation and watering systems. Controls for temperature and water supply are all automatic. Operation can be manual or automatic.	0.75		Resort hotels, cruise ships, hospitals, nursing homes, ski resorts, isolated domestic residences, country clubs and restaurants.	Almost all organic food waste products including meat, vegetables, baked goods, fruit and paper napkins, kitchen preparation waste, table scraps, small fish and chicken bones.	

System name, manufacturer, country of origin	System type	Details	Capacity per day (t)	Retention time (days)	Typical applications	Feedstock	Costs (a\$ approx)
CV Composter, ECS, USA	Horizontal, containerised, aerated, static, batch-flow, composting.	Stainless steel interiors and stainless or galvanised metal exteriors. Compatible with roll-on-roll-off vehicles which is how they are moved. Vessels are completely sealed and collect leachate/condensate in the aeration floor. Load and mix using conveyor and heavy duty compost mixer supplied by ECS	1 – 50	8-25			
Rocket Composters, Tidy Planet, UK	Horizontal, containerised, agitated, composting.	Thermostatic controls automate process. Unit operates from a standard single-phase 240-volt power supply. Also features a four-channel data logger and software. Optional macerator and de-waterer packages are available. In use at University of Cumbria and Brunel University in UK.	1		Universities	Cooked and uncooked meat, fish, fruit and vegetables, garden waste and animal waste including some types of bedding.	\$105,000 per unit
Bio-Mate, Weimar Biotech, Malaysia	Horizontal, containerised, batch-flow, composting.	Process uses aerobic high-temperature enzymes. Resulting product can be discharged daily, weekly or as often as required.	1	1 – 2		Food sources, agricultural resources, marine products and sewage sludge.	
BioBin, Peat's Soil Mix, Australia	Containerised, aerated, batch flow, composting.	Originally developed to process chicken mortalities. Since been expanded to process other feedstocks. Bin incorporates a blower to provide adequate aeration and preserving aerobic condition for decomposition. Biofilter controls leachate waste.		7	Universities, defence facilities	Range of organics including food waste and animal mortalities.	\$18,000 - \$20,000 per bin
Super C-3, Nature's Soil, USA	Horizontal, containerised, continuous-flow, rotating drum, composting.	Unit is in an insulated ISO storage container and uses a bio-thermal technology that eliminates odours, pests and leaks. Organic waste is blended and processed through three chambers. A computer monitors and regulates conditions for best bio-thermal processing.	1		Supermarkets, hotels, restaurants, hospitals, nursing homes, schools and universities.		

System name, manufacturer, country of origin	System type	Details	Capacity per day (t)	Retention time (days)	Typical applications	Feedstock	Costs (a\$ approx)
MX Mixer-Composter, Acres Composting, Solutions	Horizontal, containerised, aerated, agitated, batch flow, composting.	Made of stainless steel and has hinged lid for loading. Features automatic system to control mixing-aeration process, temperature and porosity. Model sizes range from 4.6 m <sup>3</sup> to 25.2 m <sup>3</sup> and comes in fixed or mobile configurations.				Abattoir waste, poultry mortalities and institutional food wastes.	
BioChamber, BioSystem Solutions, USA	Horizontal, containerised, agitated, aerated, continuous flow composting.	Technology is scalable, units are stackable, modular and feature automated loading, turning and compost discharge operations. Process controls measure and maintain temperature, oxygen and moisture content. Exhaust air is treated through a bio-filter and all leachate is captured. System also offers remote controls that can program operations for seven to 21 days.	1 – 800	7 - 21		Food waste (including meat, dairy and fish waste), animal manure, sewage sludge (biosolids) and other biodegradable waste.	
BioTower, BioSystem Solutions, USA	Vertical aerated, continuous-flow composting.	Vertical design provides very small footprint, suitable for processing where space is restricted. Features automated loading, turning and compost discharge operations. Process controls measure and maintain temperature, oxygen and moisture content. Exhaust air treated through bio-filter and all leachate captured. System offers remote control system that can program operations for seven to 21 days.	1 – 20	7 - 21		Food waste (including meat, dairy and fish waste), animal manures, sewage sludge (biosolids) and other biodegradable waste.	
B.W. Organics, USA	Rotating drum, continuous-flow composters.	Product range includes portable and stationary units ranging from 2.3 m <sup>3</sup> to 73.4 m <sup>3</sup> .			Prisons, dairies and poultry farms.	Animal waste including cattle, pig and horse manure and bedding, waste from chicken hatcheries, abattoirs, canneries and food and fish waste, and bio-solids.	

System name, manufacturer, country of origin	System type	Details	Capacity per day (t)	Retention time (days)	Typical applications	Feedstock	Costs (a\$ approx)
Minicom, Andar Environmental, New Zealand	Containerised, agitated, continuous-flow.	Two models of 1.1 m <sup>3</sup> and 01.7 m <sup>3</sup> capacity.			Restaurants, hotels and educational institutions.		
Rotocom, Andar Environmental, New Zealand	Rotating drum, continuous-flow composters.	Can destroy pathogens and seeds. Features integrated temperature and moisture control system and all leachate is contained. Aeration is continuous and maintains consistent oxygen levels.				All types of organic waste.	
Vertical In-Vessel Composting, Gravity Environmental Technologies, Limited New Zealand	Vertical, continuous flow composting.	Originally known as the Vertical Compost Unit (VCU). As few as one module can be bought and operated but several modules can be connected to process larger quantities. Process kills seeds weeds and pathogens. Uses passive system with no turning or forced airflow. Feedstock mixed in hopper at ground level and fed into the top of the unit, material moves down through the unit as it breaks down and is released at bottom. Twenty cubic metre units have very small footprint. Sealed so no odour escapes. Contamination can be removed either at the front end or screened after processing. Two smaller versions 5 m <sup>3</sup> and 12 m <sup>3</sup> are also available.	0.5 +	4 – 14		Poultry and cattle mortalities, sewerage sludge and tannery waste, shredded green or wood waste, food waste.	\$200,000 (25m3) \$85,000 (10m3)
HotRot, New Zealand	Containerised, aerated, agitated, continuous-flow	Enclosed chamber that sits parallel with the ground. Slow-moving rod mixes contents and increases porosity. Air injection system promotes degradation. Ancillary equipment (augers, conveyors, shredders and dewatering units) can be supplied as part of turnkey installation. Completely odour free. Equipped with monitoring equipment for online diagnostics and data recording. Fully insulated, protecting process from ambient conditions. Used successfully in New Zealand, Europe, USA, and Canada since 2001.	Up to 2.5	16 – 20	Universities	Food waste, including meat scraps, animal mortalities and intensive animal husbandry waste, tannery waste – skin scraps, sludge, wool dust, green waste, timber processing wastes and shredded cardboard	\$410,000 per unit

System name, manufacturer, country of origin	System type	Details	Capacity per day (t)	Retention time (days)	Typical applications	Feedstock	Costs (a\$ approx)
Hungry Giant, Australia	Vertical, agitated, aerated, continuous-flow composting	No pre-shredding or grinding required. Processing takes place as material falls through unit and discharged from beneath. Forced aeration. Controls can be set for automatic mixing and aeration based on temperature.	0.7		Shopping centres		
Closed Loop, South Korea	Agitated, aerated, continuous-flow composting	Forced aeration. Breaks down 90 percent of materials in 24 hours. Sophisticated ventilation and deodorisation system to prevent odours.	Up to 1.4		All types of food service applications such as schools, restaurants, hospitals	Fruit, vegetables, grains, dairy, meat, fish, poultry, egg shells, crustacean shells, liquids, biodegradable food packaging.	
Vermigold. Tat-G Corp and Vermigold Ecotech, Australia and India	Continuous-flow vermiculture	System achieves 90 percent reduction in volume and includes an organic digester, organic processor and composting worms. Digester can be solar or electric powered and computer controlled Waste processor shreds and mixes waste before introduction to organic digester.	0.1 – 2	7 – 14		Kitchen waste including tea leaves, egg shells, fruit and vegetable peels, cooked food scraps, meat and bones, garden waste including leaves and grass, cardboard waste and paper waste.	
Worm Wigwam, Sustainable Agricultural Technologies, USA	Continuous-flow vermiculture	Produces microbial rich, natural fertiliser and soil conditioner in three months				Kitchen and cafeteria waste, garden waste, livestock manure and office paper.	

System name, manufacturer, country of origin	System type	Details	Capacity per day (t)	Retention time (days)	Typical applications	Feedstock	Costs (a\$ approx)
Institutional Size Vermi-composting Systems, Sustainable Agricultural Technologies, USA	Continuous-flow, aerated, vermiculture	Forced air-controlled ventilation system, vector and vermin protected. About one hour maintenance required each day.	Up to 0.18	45 - 90	Hospitals, cafeterias, prisons and supermarkets		Up to \$21,600 per unit
BioLane. BioSystem Solutions, USA	Continuous-flow vermiculture	Climate control system - monitors worm activity and worm density, moisture levels, automated waste loading, soil harvesting and collection and can process between one and 200 or more tonnes of organic material per day. Each unit is modular, scalable and stackable. All leachate is captured and it eliminates pathogens and weed seeds.	1 – 200			Food waste, including meat, dairy and fish, animal manures, sewage sludge (biosolids) and other biodegradable waste.	
Tat-G Organic Digester, Tat-G, Australia	Continuous-flow vermiculture.	Makes standard worm farms for small quantities but can manufacture custom facilities to process between two and ten tonnes of organics per week. Units use solar or mains powered water reticulation to keep contents moist.	36.5 - 192		Dairy farms, hotels, schools, resorts, restaurants, sporting facilities, mines, canteens and office facilities.	Cardboard packaging and organic waste including cooked and raw food scraps, lawn and garden clippings and manures.	



## Innovative waste handling and recycling systems

### Vacuum systems

Vacuum waste collection systems are used overseas and have some potential in commercial applications. They are most often used in public and residential applications, but in some cases these can also incorporate small-scale commercial operations. The most likely potential use in a commercial situation would arise if they were installed during construction of a 'campus' of commercial buildings, perhaps with just one occupant.

The vacuum system consists of a network of underground pipes that rise to the surface, either as waste inlets in public places or extending up the services columns of buildings. A computerised vacuum system draws the waste through the pipes to an externally accessible waste collection point on the edge of the site. The waste is deposited into bins or compactors which are collected by a contractor.

There could be one inlet for each waste type, such as mixed waste, organic waste and paper waste. These materials are stored temporarily in the waste inlets until the next emptying cycle.

These systems are remotely monitored and controlled by operators at the waste collection station. The main advantages of vacuum systems are that personnel are not required to collect bins from the surface and vehicles do not need to travel in public areas, offering better public amenity.

Smaller-scale systems can be used for shopping centres, airports, hospitals and nursing homes.

### Chutes

Although not common in Australia, some office buildings feature chutes where waste is placed and then falls into a bin or compactor on a lower level. Chutes are not uncommon in residential buildings in Australia and operate under the same principle. Where compactors are used, they compress waste and discharge it into bins which are removed for collection.

An example of a chute system can be found in the Qatar Financial Centre in Doha. Chutes have been installed in the building with access doors at the cleaners' room on each floor (Figure 51). At the end of the chute is a small compactor (Figure 52) which presses waste into bricks for storage in the bins. Chutes are also used at ANZ Stadium in Sydney for transporting waste from upper levels to the basement.



Figure 51 Waste chute door



Figure 52 Compactor at chute base

Chutes may not be suitable to transfer some recyclables. The drop down the chute can lead to damage or even destruction of recyclable materials – particularly glass. Cardboard can also become stuck in the chute and cause a fire hazard. Other recyclables, such as paper and plastics, are also highly flammable. Therefore, having large quantities of recyclables stored at the bottom of a long shaft that runs the height of the building could constitute a fire hazard.

Despite these risks, many modern chutes have fire mitigation features built in, such as sprinkler systems and automatically closing doors. Chutes should also be designed to reduce noise and fire risks. They should be completely enclosed in a fire-rated shaft, made of an approved material, and fitted with sprinklers in accordance with the *Building Code of Australia*. Chutes should also have a diameter of 500 mm or greater and be cylindrical in shape to avoid waste being caught within the chute.

There needs to be a service room (or compartment) on each floor of the development to allow access to the garbage chute. Access doors should have an effective self-sealing system. Chutes should terminate in a garbage and recycling room and discharge directly into a receptacle or waste compactor in a manner that avoids spillage and overflow.

Despite the risks, consideration should be given to installing two chutes in any application, one for garbage and one for recycling. This avoids the need for cleaners to transport recyclables by hand from upper levels.

### Automatic depackager

The inability to process packaged food waste has been one problem identified in the area of small-scale food waste processing. UK company BioSep has produced an automatic depackaging unit that separates and washes the plastic packaging component and removes tins, glass and other non-organic foreign material.

This unit is also capable of processing large plastic bags which are often used as bin liners. Using bin liners makes food waste collection easier, cleaner and eliminates the need for bin washing.

### Cushion pack<sup>21</sup>

This technology converts used cardboard into a packaging material. The German-made machines perforate used cardboard to create a soft, flexible mat that can be used as an alternative to bubble wrap and other void-fill materials. Different models have throughputs of 2–10 m<sup>3</sup> per hour.

Example diagrams of waste management systems

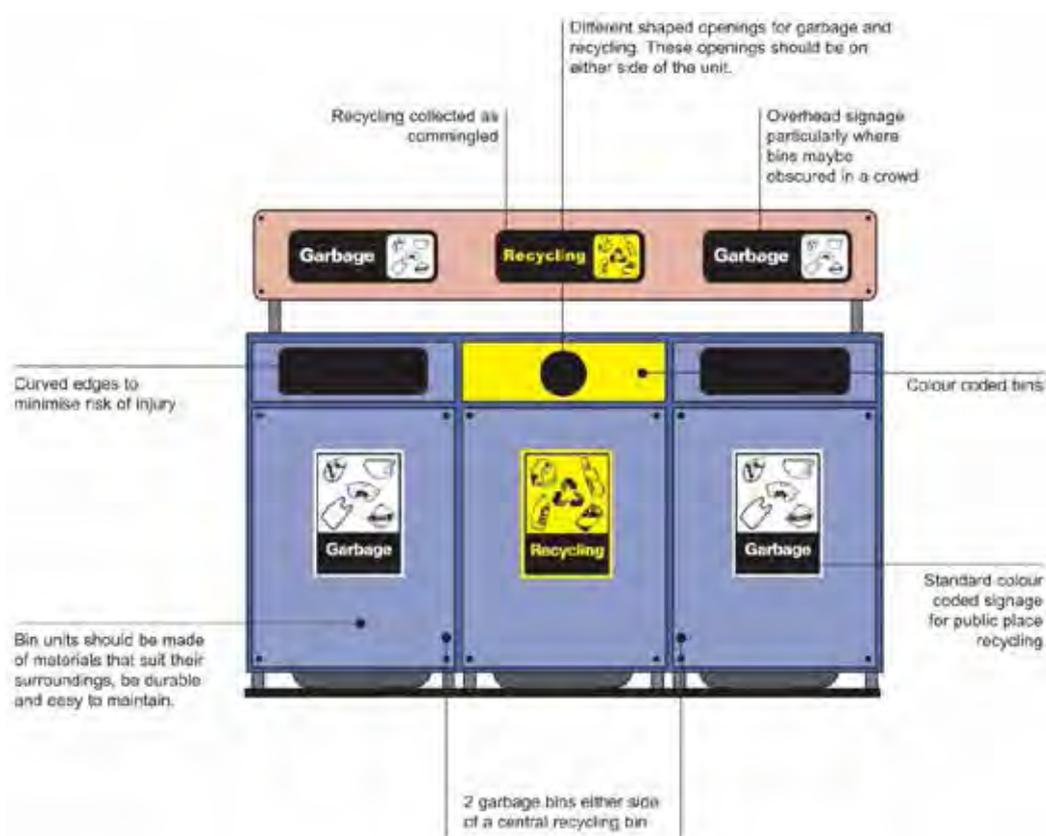


Figure 53 Key elements of a public place recycling bin station

21 <http://www.brentwood.com.au/cushion-pack>



Figure 54 Example loading dock design

An example loading dock design and potential location of a garbage and/or cardboard compactor to allow easy access for collection vehicles is provided in Figure 54. This loading dock would be typical for a shopping centre, hotel, office or any other large retail building. The diagram also shows nearby storage areas for garbage and recycling bins, a bin wash area and hand-washing facilities.

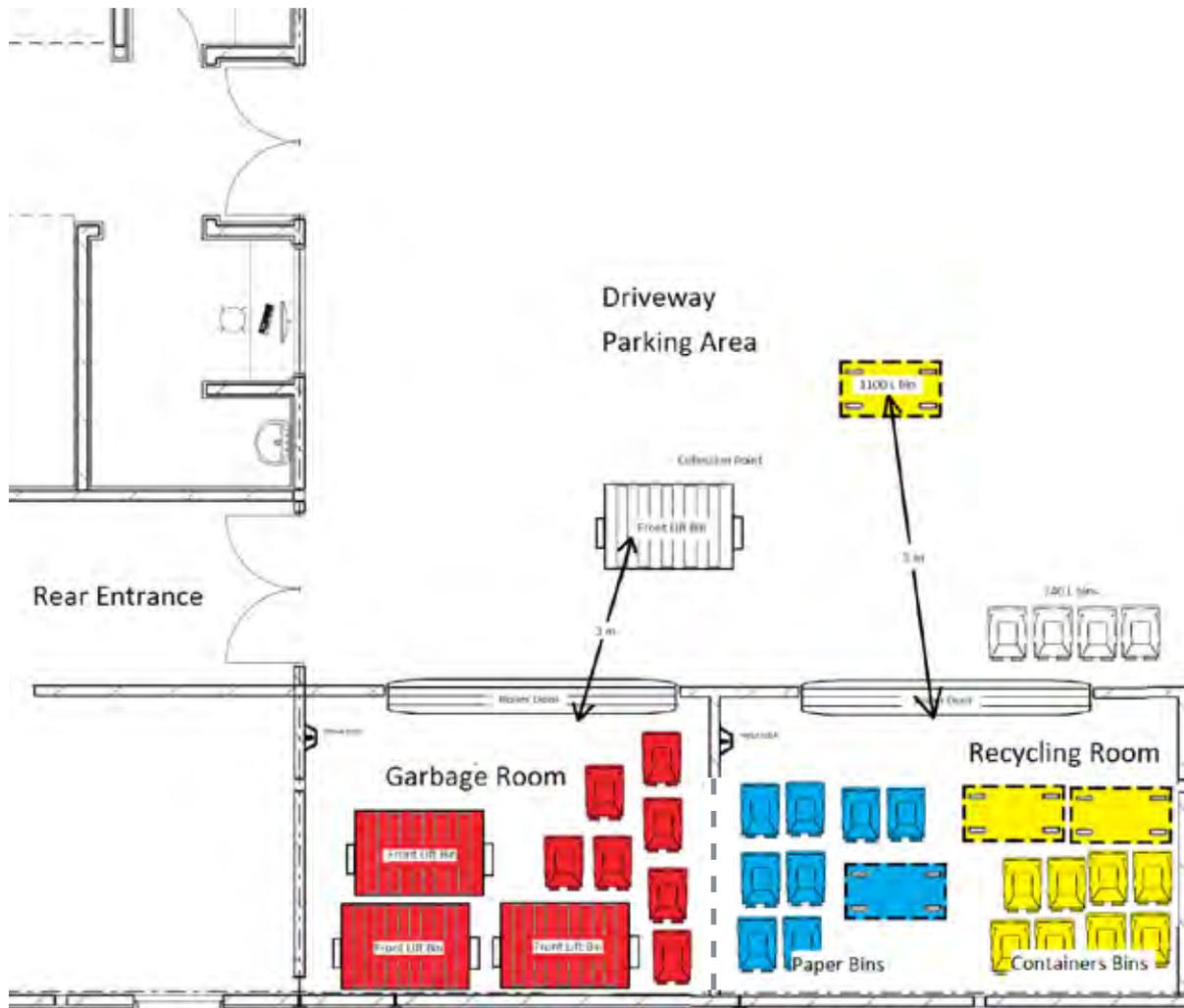


Figure 55 Example storage area and collection point

An example bin storage area and collection point is shown in Figure 55. There are enclosed storage rooms for garbage and recycling bins and easily accessible areas outside these rooms where bins can be serviced. As the collection point is right outside the bin rooms, drivers could take bins directly from the storage location for servicing. Bin storage areas like this would be typical at a small shopping centre, hotel or other retail building.

## Appendix C

### Collection vehicles

#### Waste collection vehicles

Generally, there are two types of waste collection service. The first service type involves emptying the contents of each customer's bin or bins into a truck with waste from many other customers. These trucks are fitted with a compactor that compresses waste, so that it takes up as little volume as possible and allows for as much waste as possible to be loaded on board.

The trucks drive between different customers on a 'run' that generally extends over a certain geographic area. Visits to disposal facilities are included in the run and most runs also end at a disposal facility. A good deal of care is taken by contractors to work out how to service all the customers along the shortest route and in the quickest time. Services that lengthen the route or the time it takes to complete a run generally cost more.

The second service type involves collecting waste in a single large bin (often an open bin or compactor) from a customer and delivering it directly to a disposal facility where it is emptied. The empty bin is then usually returned to the customer and the customer is without the bin for the time it takes for the return journey.

The waste collection vehicles may be side-loading, rear-end loading or front-end loading. The size of the vehicle varies according to the type and frequency of the collection service. Thus, it is impossible to specify what constitutes the definitive waste collection vehicle, but the characteristics outlined below provide a guide.

#### Rear loading collection vehicle

Rear loading collection vehicles (Figure 56, Figure 57) are commonly used for garbage and recyclables collection. They can also be used to collect waste stored in mobile bins or bulk bins.

Dimensions and specifications vary according to the manufacturer, but typical dimensions are shown in Table 25.

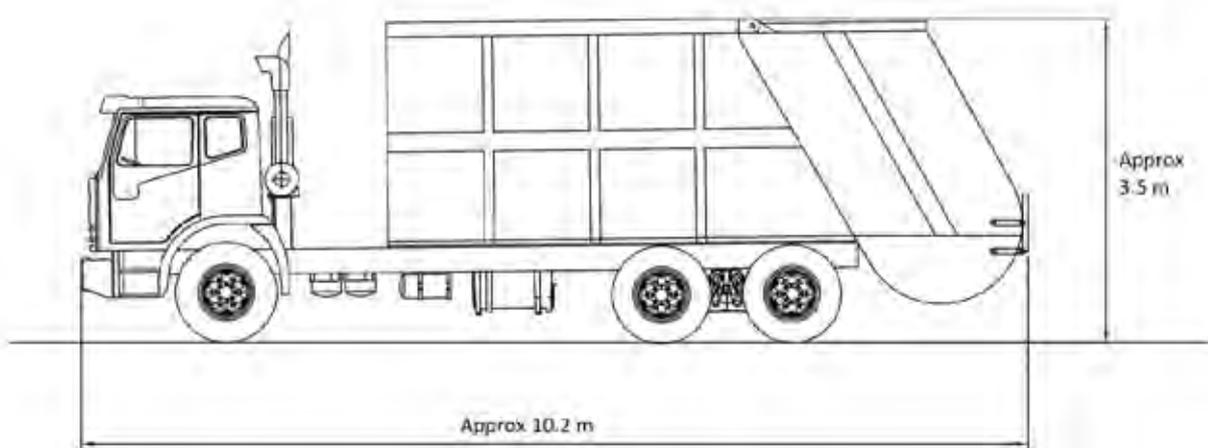


Figure 56 A typical rear-lift collection vehicle

Table 25 Typical dimensions of rear-lift collection vehicle

Dimension	Measure
Length overall	Up to 10.24 m
Width overall	2.5 m
Operational height	Up to 3.5 m
Travel height	Up to 3.5 m
Weight (vehicle only)	12.4 tonnes
Weight (payload)	9.5 t
Turning circle	18.0 m



Figure 57 A rear-lift collection vehicle

## Side loading collection vehicles

Side loading collection vehicles are suitable for collecting mobile bins up to 360 litres in size (Figure 58, Table 26).

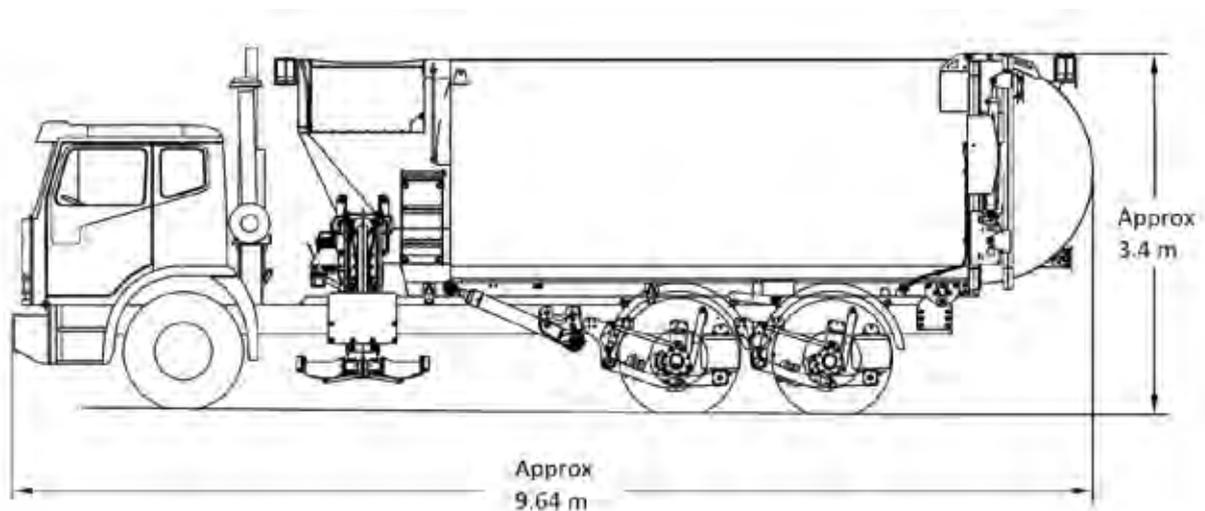


Figure 58 Typical side-lift vehicle specifications

Table 26 Typical side-lift vehicle dimensions

Dimension	Measure
Length overall	Up to 9.64 m
Front overhang	1.51 m
Wheelbase	5.20 m
Rear overhang	2.93 m
Turning circle kerb to kerb	17.86 m
Turning circle wall to wall	20.56 m
Front of vehicle to collection arm	3.8 m
Maximum reach of side arm	3.0 m
Travel height	Up to 3.63 m
Clearance height for loading	Up to 3.9 m

## Front-lift loading collection vehicle

Front-lift loading vehicles are commonly used for collecting commercial waste, and are only suitable for bulk bins with front-lift pockets (and not mobile bins) (Figure 59, Figure 60, Figure 61, Table 27).

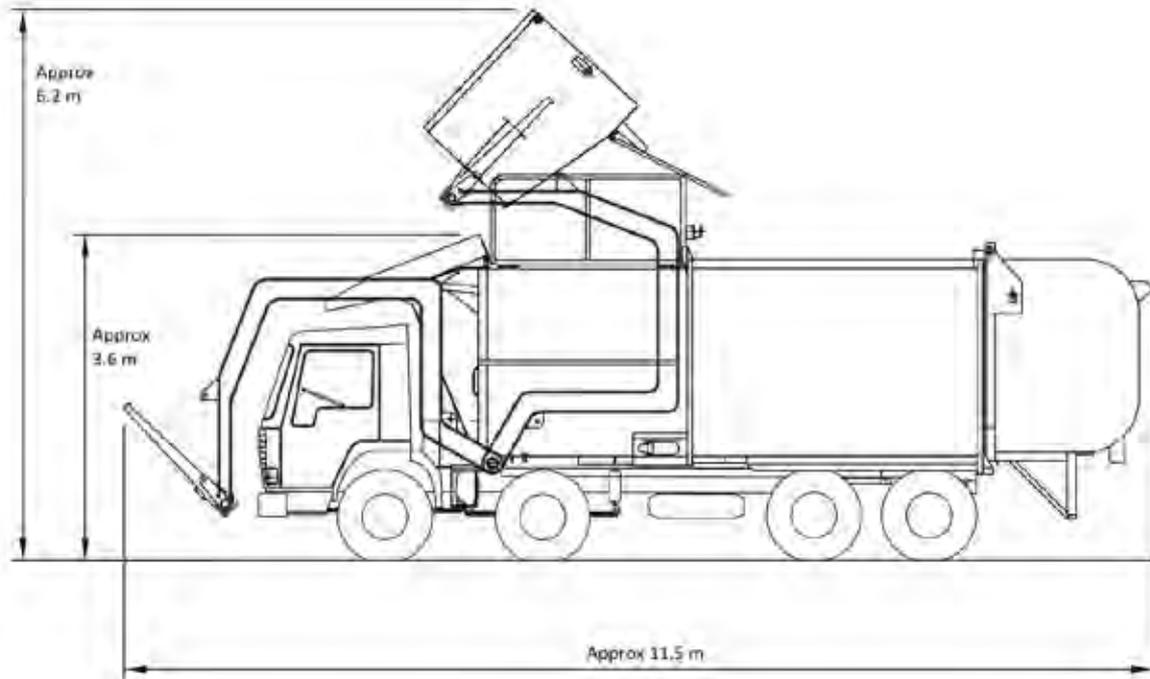


Figure 59 Typical front-lift collection vehicle dimensions

Table 27 Front-lift vehicle dimensions

Dimension	Measure
Length overall	Up to 11.5 m
Front overhang	1.51 m
Wheelbase	Up to 5.84 m
Rear overhang	3.17 m
Turning circle kerb to kerb	22.10 m
Turning circle wall to wall	23.66 m
Travel height	3.82 m
Clearance height for loading	Up to 6.2 m

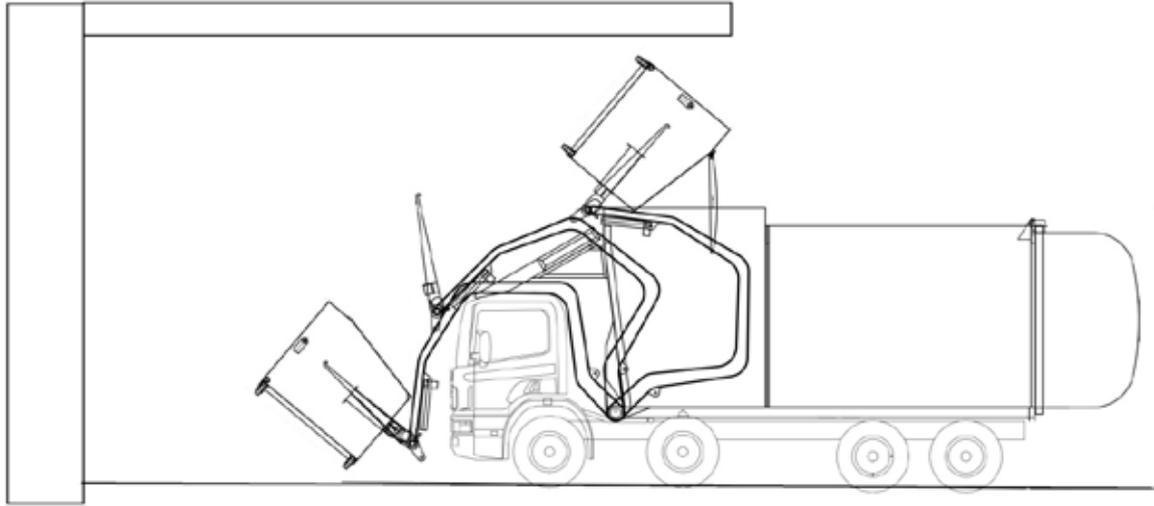


Figure 61 Overhead clearance of a front-lift truck



## Appendix D

### Vehicle access/turning circles

Designers are encouraged to consult with council and other relevant authorities prior to the design of roads and access points to ascertain specific requirements for the proposed development.

Appropriate heavy vehicle standards should be incorporated into the development design, including those specified in Acts, regulations, guidelines and codes administered by Austroads, Standards Australia, the NSW Roads and Traffic Authority, NSW WorkCover and any local traffic requirements.

#### Road and driveway construction and geometry

Roads and driveways must be designed and constructed in accordance with the relevant authority requirements to allow the safe passage of a laden collection vehicle in all seasons.

Factors to be considered in design include:

- gradients for turning heads
- longitudinal road gradients
- horizontal alignments
- vertical curves
- cross-falls
- carriageway width
- verges
- pavement widths
- turning areas (see below)
- local area traffic management requirements (for example speed humps)
- sight distance requirements
- clearance heights (for example a vertical clearance of 6.5 metres is required to load front-lift vehicles)
- manoeuvring clearance
- road strength (industrial-type strength pavement required, designed for a maximum wheel loading of seven tonnes per axle to accommodate garbage and recycling collection vehicles).

#### Collection from basements

Collection vehicles may enter building basements to collect waste and/or recyclables provided the following requirements are met:

- compliance with *Australian Standard AS 2890.2 Parking Facilities: Off-Street Commercial Vehicle Facilities*
- height to the structural members and upper floor ceiling provided in the collection vehicle manoeuvring and service area should allow for a typical collection vehicle travel/operational height requirements
- adequate provision of space clear of structural members or vehicle parking spaces to allow a three-point turn by collection vehicles
- the basement floor should be an industrial-type strength pavement and designed for a maximum wheel loading of seven tonnes per axle to accommodate garbage and recycling collection vehicles.

#### Vehicle turning circles

This information is sourced from *AS 2890.2 Parking Facilities: Off-Street Commercial Vehicle Facilities*. Please refer to this standard for the latest vehicle access requirements.

Turning circles and clearances to kerbs, existing buildings or other obstructions should be designed to accommodate the largest size collection vehicle that could service the property. Any turning circle considerations



must also include allowances for driver steering error (manoeuvring clearance) and overhangs.

As a guide, a turning circle of 25 metre diameter kerb to kerb (27.8 metre diameter wall to wall, swept circle)<sup>22</sup> would accommodate most standard waste collection vehicles. A manoeuvring clearance of at least 0.3 metres (absolute minimum) on both sides of the theoretical swept circle path should be accommodated.

Better practice design for access and egress at a development calls for a separate entrance and exit, to allow the collection vehicle to travel in a forward direction at all times. Where there is a requirement for collection vehicles to turn at a cul-de-sac head within a development, the design should incorporate either a bowl, T- or Y-shaped arrangement. Vehicles should only be expected to make a three-point turn to complete a U-turn.

Vehicle turning circles can be reduced from those listed above (or as noted in the table below) by using a mechanical turntable (or similar). However, this type of equipment is expensive and requires regular maintenance to ensure it remains in good operating condition.

### Templates

Turning circle templates and reverse entry templates for medium and heavy rigid vehicles are provided below.

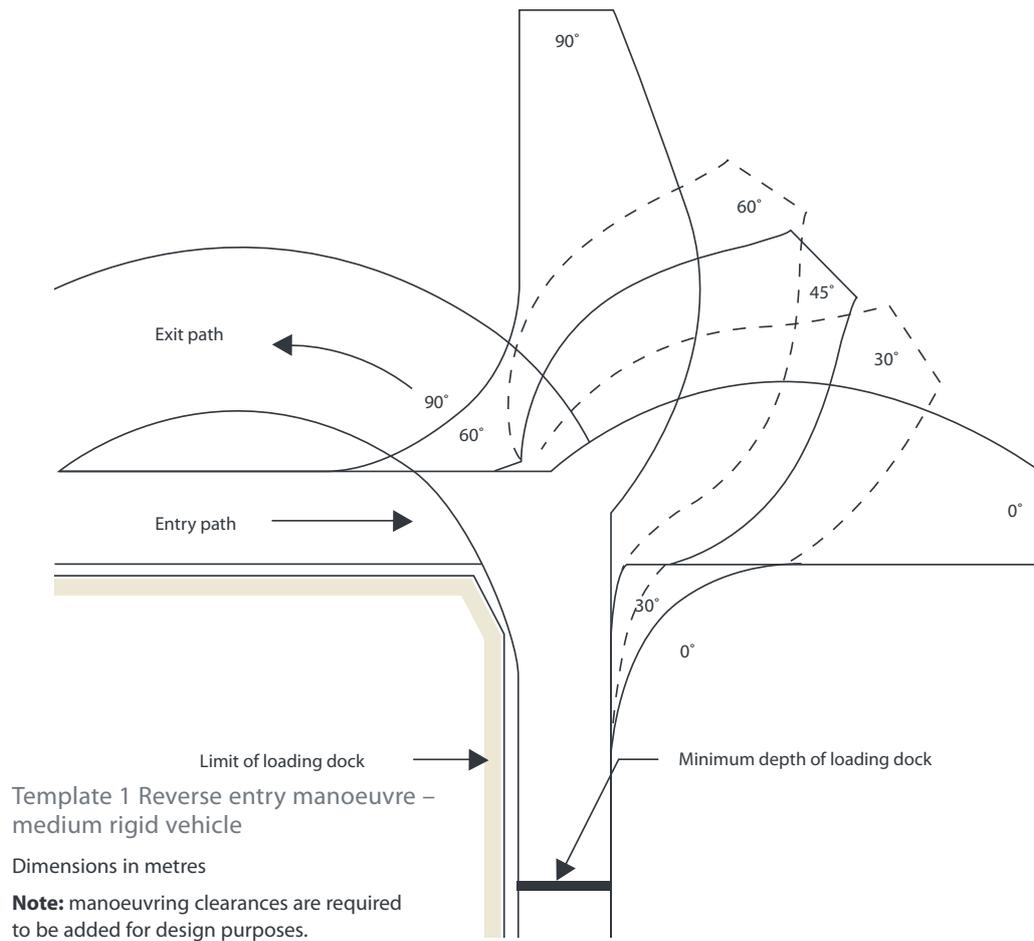
- Turning path templates should be used when designing access driveways and circulation roadways and when checking on the path of vehicles leaving service bays.
- Reverse entry templates should be used when designing service bays and service area aprons to accommodate the reversing manoeuvres required to undertake a Y-shaped turn.

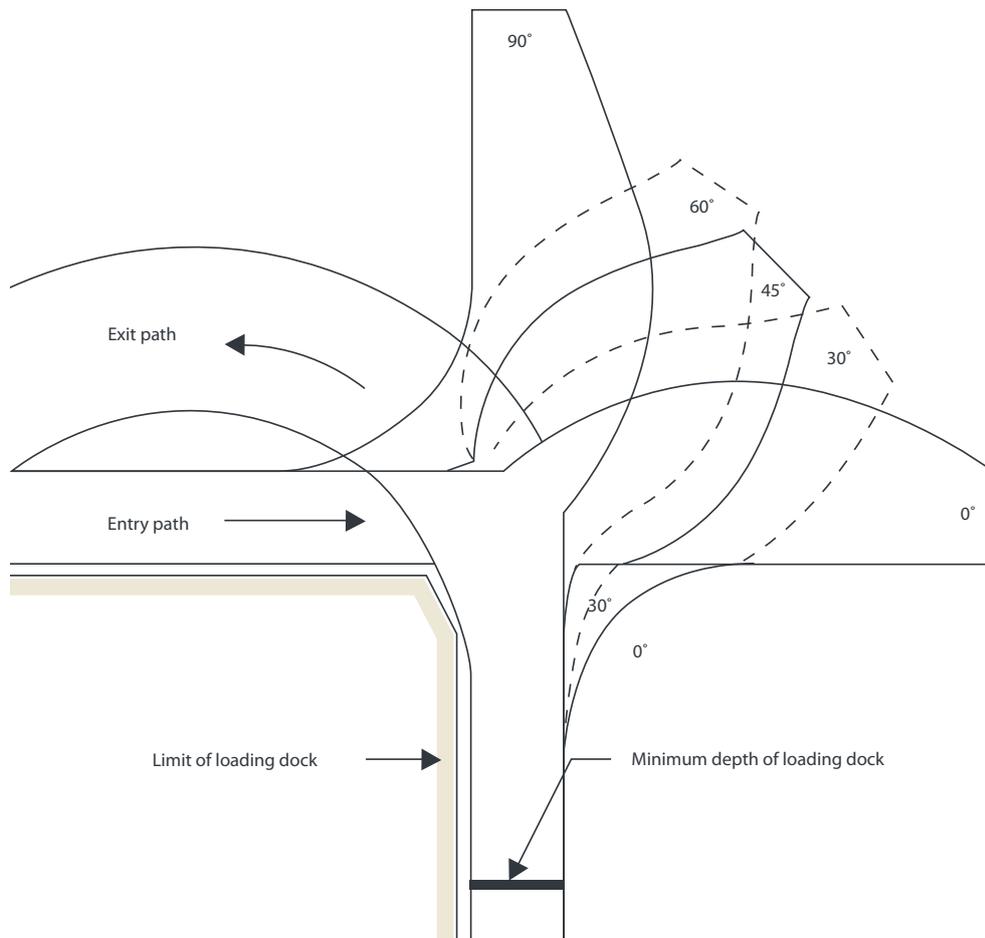
These templates can be printed and copied onto a transparent medium or imported into computer drawing packages to check vehicle paths on intersection layout drawings. These templates are applicable for the vehicle dimensions in Table 28.

Table 28 Turning circles

Vehicle class	Overall length (m)	Design width (m)	Deign turning radius (m)	Swept circle (m)	Clearance (travel) height (m)
Medium rigid vehicle	8.80	2.5	10.0	21.6	4.5
Heavy rigid vehicle	12.5	2.5	12.5	27.8	4.5

<sup>22</sup> Kerb-to-kerb measurements are based on the movement of the front outside tyre. Wall-to-wall (swept circle) measurements consider vehicle overhang and are based on the outermost extremity of the vehicle as it corners.

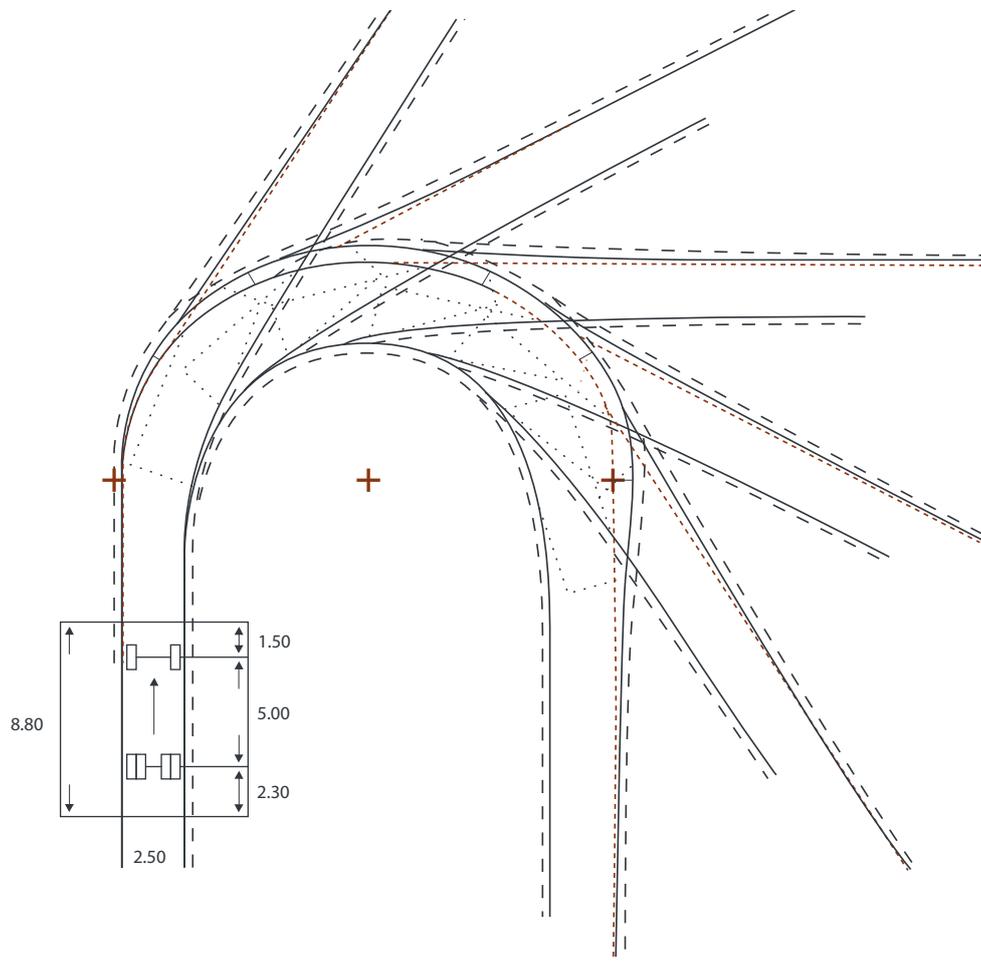




Template 2 Reverse entry manoeuvre – heavy rigid vehicle

Dimensions in metres

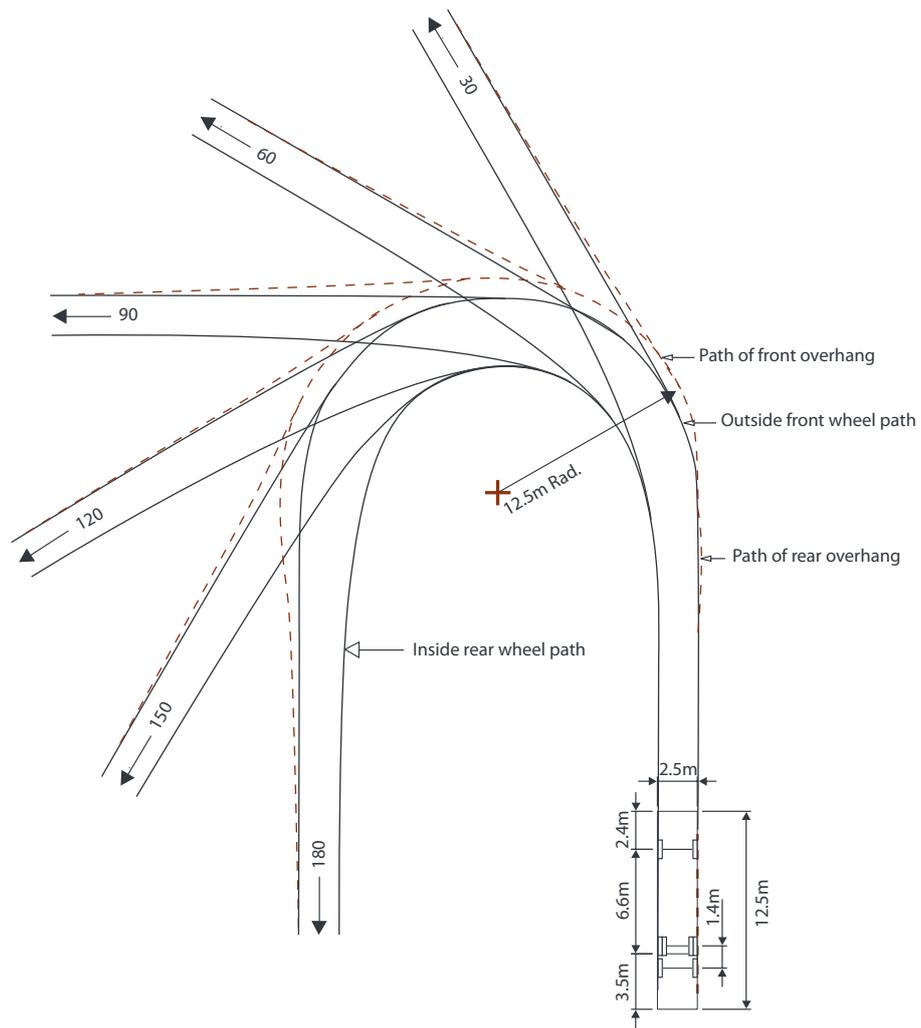
**Note:** manoeuvring clearances are required to be added for design purposes.



Template 3 Turning path template – medium rigid vehicle

Dimensions in metres

Minimum radius turn 10m



Template 4 Turning path template – heavy rigid vehicle

Dimensions in metres

Minimum radius turn 10m

## Appendix E

### Standard signage

The NSW EPA has developed sets of standard signs and labels for a wide variety of uses. The full set can be found at <http://www.environment.nsw.gov.au/warr/recyclingsigns.htm>, but some examples are listed below.

#### Waste signs

##### General recycling



##### Instructional



##### Construction and demolitions



##### Public place



##### Recycling



##### Garden organics and food waste



##### Garbage



## Safety signs

The design and use of safety signs for waste rooms and enclosures should comply with *AS 1319 Safety signs* for the occupational environment. Safety signs should be used to regulate and control safety-related behaviour, warn of hazards and provide emergency information, including fire protection information (e.g. Figure 62). Each development will need to decide which signs are relevant for its set of circumstances and services provided. Australian Standards are available from the SAI Global Limited website ([www.saiglobal.com](http://www.saiglobal.com)).



Figure 62 Examples of Australian standard signs

## Mobile bin colours

An Australian Standard for mobile bin colours has also been developed – *AS4123.7-2006 Mobile Waste Containers – Part 7: colours, markings and designation requirements*. The colour designations for common waste categories are listed in Table 29.

Table 29 Standard bin colours

Waste Category	Bin body colour	Bin lid colour
Garbage	Dark green or black.	Red
Recycling (commingled or containers)	Dark green or black.	Yellow
Paper / Cardboard	Dark green or black.	Blue
Organics (including co-collected food and garden organics)	Dark green or black.	Lime green

## Appendix F

### Checklists

#### Waste management plan checklist — design phase

The following checklist has been developed to confirm that the main issues essential for waste management when designing a new building have been considered. Use this checklist as a tool to ensure better practice principles have been considered in the design of proposed garbage and recycling facilities.

Key issues	Completed	Not applicable
<b>Initial planning</b>		
Have you consulted planning authorities and council to find out what planning regulations, codes and policies apply to the development?		
Have you engaged a consultant or contacted waste contractors to find out about available garbage and recycling services and identify future service requirements?		
<b>Selected garbage and recycling systems (general)</b>		
Does the development incorporate sufficient provisions to meet the garbage and recycling requirements for each tenant?		
Are systems easy to use and intuitive?		
Will waste bins and containers conform to relevant design standards?		
Will waste handling equipment, including chutes and compactors, conform to the relevant design and safety standards?		
<b>Storage space</b>		
Estimate waste quantities based on generation rates shown in Appendix A Waste generation rates.		
Is there sufficient space within each tenant unit to accommodate interim storage of at least two days' worth of segregated garbage and recycling?		
Is there sufficient space within the property boundary to store, in separate bins or containers, the volume of garbage and recycling (and organics where appropriate) likely to be generated at the development during the period between collections?		
Is bulky waste storage space required and has it been allowed for?		
Have storage areas been designed to accommodate easy access, internal manoeuvring of bins and cleaning?		
Have storage areas been designed to display signs and education materials?		
Is future service flexibility incorporated in the design?		
Has the design taken into account the need to separate services (such as meter boards) from waste storage areas in communal storage areas, if applicable? Where this is not possible, has additional space been allowed to prevent potential damage to services?		
<b>Storage location</b>		
Are storage areas conveniently located for tenants, staff and cleaners?		
Are storage areas located in a high pedestrian traffic area?		
Are storage areas out of sight or well screened from public areas?		
Are storage areas located an appropriate distance from waste sources to reduce potential amenity and OH&S impacts?		
Are composting or organics processing areas, if any, located with consideration for the potential amenity and environmental impacts?		

Key issues	Completed	Not applicable
<b>Waste collection points</b>		
Have collection points been identified that are located:		
■ away from intersections		
■ away from roundabouts or slow-points		
■ away from busy arterial roads		
■ away from narrow lanes		
■ in areas free from potential obstructions such as trees, overhanging buildings and overhead powerlines		
■ where they do not pose a hazard to traffic or pedestrians		
■ away from driveways, loading bays or parking bays		
■ where safe access is possible and there is adequate manoeuvring space		
■ where there is clear vision of oncoming traffic as the collection vehicle leaves the property.		
Are collection point(s) located on a level surface away from gradients and vehicle ramps?		
<b>Transfer of bins to the collection point</b>		
Is the bin transfer route free of steps?		
If 660 litre bins need to be wheeled to the collection point, does the site meet the following criteria:		
■ the distance should not exceed 75 m in all circumstances		
■ the bin transfer grade should not exceed 1:14		
■ there are no steps or kerbs		
Where bins between 660 L and 1.5 m <sup>3</sup> capacity need to be wheeled from the bin storage area to the collection point is the distance no more than 5 metres?		
Do any bins greater than 1.5 m <sup>3</sup> in capacity need to be wheeled from the bin storage area to the collection point. If so,:		
■ can moving be avoided?		
■ is the distance no more than 3 metres?		
■ is there no grade on the route more than 1:30?		
<b>Access for collection vehicles</b>		
Does the design allow for the waste collection vehicle to move in a forward direction with no (or minimal) need to reverse?		
Does the design accommodate access for heavy vehicles to collection points in accordance with relevant acts, regulations, guidelines, and codes administered by Austroads, the NSW Roads and Traffic Authority, NSW WorkCover and any local traffic requirements?		
<b>Occupational health and safety (OH&amp;S)</b>		
Has there been a preliminary risk and hazard analysis to identify potential OH&S risks associated with the proposed services and design layout?		
Has the design been modified to eliminate or minimise the identified risks?		
<b>Noise</b>		
Has the development design considered better practice measures to minimise noise associated with use and servicing of the waste management facilities?		
<b>Odour</b>		
Does the design incorporate ventilation for enclosed storage areas?		
Does ventilation comply with the relevant codes and standards?		
Are ventilation openings located as near to the ceiling and floor as possible?		

Key issues	Completed	Not applicable
Are ventilation openings located away from neighbours?		
Are ventilation openings protected against flies and vermin?		
Are refrigerated waste storage rooms installed if required?		
<b>Hygiene</b>		
Have storage areas been designed to prevent the entry of vermin?		
Are provisions for a tap, hose and correct drainage to sewer incorporated?		
<b>Amenity</b>		
Does the design of waste storage areas blend in with the development?		
<b>Security</b>		
As far as possible, does the design allow easy access to waste services for staff, cleaners, tenants and contractors but not the public?		
Do bins storage areas have lockable, self-closing doors, gates or shutters?		
Are bin areas sufficiently open and well lit to allow for use after dark?		
Are all internal garbage and recycling rooms and storage areas fitted with fire sprinklers, and rated to fire safety according to the <i>Building Code of Australia</i> ?		
<b>Signage and education</b>		
Does the design specify the need for signs in relevant areas of the building that identify the location of garbage bins, recycling bins and storage areas?		
Does the design specify requirements for signs to provide instructions on how to use the garbage and recycling facilities, including identifying recyclables?		
Have requirements for safety signs been identified?		



## Waste management implementation checklist — operational phase

The following checklist has been developed to confirm that the main issues essential for waste management implementation have been considered..

Key issues	Completed	Not applicable
<b>Initial planning</b>		
Have you engaged a consultant or contacted waste contractors to find out about available garbage and recycling services and identify future service requirements?		
Have you assigned a waste and recycling co-ordinator to take charge of the project? They will be responsible for:		
■ co-ordinating stakeholders		
■ designing the collection program		
■ assessing and recommending a cleaner and collection contractor		
■ facilitating education and communication		
■ monitoring and measuring progress		
■ answering questions		
■ trouble-shooting.		
Have you undertaken a waste stream analysis?		
The analysis should ask:		
■ What type of container or system is used to collect this material?		
■ What is the capacity of these containers?		
■ How many containers of this size are used?		
■ How often are they collected or serviced?		
■ How full are they normally when collected?		
■ What other relevant information is there about this stream?		
Is a stakeholder committee necessary?		
<b>Selected garbage and recycling systems (general)</b>		
Does the waste plan incorporate sufficient provisions to meet the garbage and recycling requirements for each tenant?		
Are systems easy to use and intuitive?		
Have you investigated what bins and equipment are best for your situation?		
Will waste bins and containers conform to relevant design standards?		
Will waste handling equipment, such as bins and compactors, conform to the relevant design and safety standards?		
Have you decided what materials will be recycled and what new services might be required?		
Have you worked out the roles and responsibilities of different stakeholders?		
Have you discussed with staff, cleaners and contractor how practices might be changed?		
Have you developed a plan for communicating with staff?		
Have you decided what targets should be set or what key indicators should be used?		
<b>Storage space</b>		
Is there sufficient space within each tenant unit to accommodate interim storage of at least two days' worth of segregated garbage and recycling?		
Is there sufficient space within the property boundary to store, in separate bins or containers, the volume of garbage and recycling (and organics where appropriate) likely to be generated during the period between collections?		
Is bulky waste storage space required and has a suitable space been identified?		



Key issues	Completed	Not applicable
Have storage areas been identified that accommodate easy access, internal manoeuvring of bins and cleaning?		
Have storage areas been identified that allow space for signs and education materials to be displayed?		
Has service flexibility been incorporated into identified storage areas?		
Has the identification of communal storage areas, if applicable, taken into account the need to separate services (such as meter boards) from waste storage areas? Where this is not possible, has additional space been allowed to prevent potential damage to services?		
<b>Storage location</b>		
Are storage locations conveniently located for tenants, staff and cleaners?		
Are storage areas located in high pedestrian traffic areas?		
Are storage areas out of sight or well screened from public areas?		
Are storage areas located an appropriate distance from waste sources to reduce potential amenity and OH&S impacts?		
Are composting or organics processing areas, if any, located with consideration for the potential amenity and environmental impacts?		
Have you decided what bins or equipment might be needed?		
<b>Waste collection points</b>		
Have collection points been identified that are located:		
■ away from intersections		
■ away from roundabouts or slow-points		
■ away from busy arterial roads		
■ away narrow lanes		
■ in areas free from potential obstructions such as trees, overhanging buildings and overhead powerlines		
■ where they do not pose a hazard to traffic or pedestrians		
■ away from driveways, loading bays or parking bays		
■ where safe access is possible and there is adequate manoeuvring space		
■ where there is clear vision of oncoming traffic as the collection vehicle leaves the property?		
Are collection point(s) located on a level surface away from gradients and vehicle ramps?		
<b>Implementation</b>		
Have you developed a time frame for implementation?		
Have you allowed plenty of time for delivery and installation of bins and equipment?		
Have you tendered for cleaning and waste collection?		
Have you set a date for the kick-off event and program launch?		
Transfer of bins to the collection point		
Is the bin transfer route free of steps?		
Where bins of 660 L need to be wheeled to the collection point, are the following criteria met:		
■ The distance is no more than 75 m in all circumstances?		
■ The bin transfer grade is no more than 1:14?		
■ There are no steps or kerbs, either up nor down?		
Where bins between 660 L and 1.5 m <sup>3</sup> capacity need to be wheeled from the bin storage area to the collection point is the distance no more than 5 metres?		

Key issues	Completed	Not applicable
Do any bins greater than 1.5 m <sup>3</sup> in capacity need to be wheeled from the bin storage area to the collection point. If so,:		
■ can moving be avoided		
■ is the distance no more than three metres		
■ is there no grade on the route more than 1:30		
<b>Access for collection vehicles</b>		
Does the location and arrangement of the collection point or storage area allow for the waste collection vehicle to move in a forward direction with no (or minimal) need to reverse?		
Does the location and arrangement of the collection point or storage area allow access for heavy vehicles in accordance with relevant acts, regulations, guidelines and codes administered by Austroads, the NSW Roads and Traffic Authority, NSW WorkCover and any local traffic requirements?		
<b>Occupational health and safety</b>		
Has there been a preliminary risk and hazard analysis to identify potential OH&S risks associated with the proposed services and storage area layout?		
Has the arrangement of the storage area been modified to eliminate or minimise the identified risks?		
<b>Noise</b>		
Have any better practice measures been implemented to minimise the noise associated with the use and servicing of waste management facilities?		
<b>Odour</b>		
Has adequate ventilation been taken into account for enclosed storage areas?		
Does ventilation comply with the relevant codes and standards?		
Are ventilation openings located as near to the ceiling and floor as possible, but away from neighbours?		
Are ventilation openings protected against flies and vermin?		
Has refrigeration been installed if required?		
<b>Hygiene</b>		
Do storage areas prevent the entry of vermin?		
Have a tap, hose and correct drainage to the sewer been incorporated?		
<b>Amenity</b>		
Does the waste storage area blend in with the development?		
<b>Security</b>		
As far as possible, can staff, cleaners, tenants and contractors easily access waste services but not the public?		
Do bins storage areas have lockable, self-closing doors, gates or shutters?		
Are bin areas sufficiently open and well lit to allow for their use after dark?		
Are all internal garbage and recycling rooms and storage areas fitted with fire sprinklers, and rated to fire safety according to the <i>Building Code of Australia</i> ?		
<b>Signage and education</b>		
Are there signs in relevant areas of the building that identify the location of garbage and recycling bins and storage areas?		
Are there signs providing instructions on how to use the garbage and recycling facilities, including identifying recyclables?		
Have requirements for safety signs been identified?		



Key issues	Completed	Not applicable
Do you have a communications and education program that addresses how new staff, tenants, cleaners and contractors will be told about the system?		
Do you have a monitoring and audit program worked out?		
Do you have complete system reviews scheduled?		
<b>Ongoing management</b>		
Has a building manager, caretaker or cleaners been engaged to:		
■ manage and clean waste storage areas and collection points		
■ transport bins to the collection point		
■ use and manage bins, compactors, balers and other waste equipment?		
Has an ongoing management plan been developed that identifies responsibilities for		
■ moving bins from the storage point to the collection point (if required) for collection		
■ washing bins and maintaining storage areas		
■ arranging for the prompt removal of dumped rubbish		
■ arranging for consistent signage on all bins and communal storage areas		
■ makin sure that all staff, tenants and cleaners are informed of the garbage and recycling arrangements?		

## Appendix G

### Other tools and references

Source	Document	Web
NSW Government	<i>Know your paper: a guide to purchasing recycled content office paper</i>	<a href="http://www.environment.nsw.gov.au/sustainbus/officewasteguides.htm">http://www.environment.nsw.gov.au/sustainbus/officewasteguides.htm</a>
NSW Government	<i>Know your printing paper: A guide to purchasing recycled content printing paper for corporate stationery and promotional materials</i>	<a href="http://www.environment.nsw.gov.au/sustainbus/officewasteguides.htm">http://www.environment.nsw.gov.au/sustainbus/officewasteguides.htm</a>
NSW Government	<i>Office products - a guide to sustainable purchasing and use</i>	<a href="http://www.environment.nsw.gov.au/sustainbus/officewasteguides.htm">http://www.environment.nsw.gov.au/sustainbus/officewasteguides.htm</a>
NSW Government	Office equipment	<a href="http://www.environment.nsw.gov.au/wrapp/Equip.htm">http://www.environment.nsw.gov.au/wrapp/Equip.htm</a>
City of Fort Collins	Recycling	<a href="http://www.fcgov.com/recycling/officeguide.php">http://www.fcgov.com/recycling/officeguide.php</a>
US EPA	How to Set Up a Recycling Program	<a href="http://www.epa.gov/epawaste/conserves/tools/rogo/program/index.htm">http://www.epa.gov/epawaste/conserves/tools/rogo/program/index.htm</a>
CalRecycle	Waste Prevention and Recycling at the Office	<a href="http://www.calrecycle.ca.gov/ReduceWaste/Office/default.htm">http://www.calrecycle.ca.gov/ReduceWaste/Office/default.htm</a>
NSW Government	WRAPP facts - doing a waste audit	<a href="http://www.environment.nsw.gov.au/wrapp/audit.htm">http://www.environment.nsw.gov.au/wrapp/audit.htm</a>
NSW Government	How to ... buy	<a href="http://www.environment.nsw.gov.au/wrapp/Buy.htm">http://www.environment.nsw.gov.au/wrapp/Buy.htm</a>
Ministry for the Environment NZ	<i>A Guide to Implementing Recycling Systems in Multi-Tenanted Office Buildings</i>	<a href="http://www.mfe.govt.nz/publications/sus-dev/recycling-jan04/index.html">http://www.mfe.govt.nz/publications/sus-dev/recycling-jan04/index.html</a>
A joint initiative of Commonwealth, State, and Territory government agencies	<i>Green Office Guide; A guide to help you buy and use environmentally friendly office equipment</i>	<a href="http://www.scribd.com/doc/188016/Green-Office-Guide">http://www.scribd.com/doc/188016/Green-Office-Guide</a>
WRAP UK	<i>Green Office: A Guide to Running a More Cost-effective and Environmentally Sustainable Office</i>	<a href="http://www.wrap.org.uk/sites/files/wrap/WRAP%20Green%20Office%20Guide.pdf">http://www.wrap.org.uk/sites/files/wrap/WRAP%20Green%20Office%20Guide.pdf</a>
WRAP UK	<i>Increasing SME Recycling: An examination of the barriers that exist to increasing levels of SME recycling and recommended solutions to these barriers (March 2011)</i>	<a href="http://www.wrap.org.uk/sites/files/wrap/SME_Recycling_-_Summary_Report.pdf">http://www.wrap.org.uk/sites/files/wrap/SME_Recycling_-_Summary_Report.pdf</a>
Resource NSW – NSW Government	<i>Waste Reduction and Recycling in Office Buildings – Fact Sheet</i>	<a href="http://www.environment.nsw.gov.au/resources/sustainbus/spd_ob_wasteofficesheet.pdf">http://www.environment.nsw.gov.au/resources/sustainbus/spd_ob_wasteofficesheet.pdf</a>
Resource NSW – NSW Government	<i>Waste Reduction in Office Buildings - A Guide for Tenants</i>	<a href="http://www.environment.nsw.gov.au/resources/sustainbus/spd_ob_buildtenrecyguideweb.pdf">http://www.environment.nsw.gov.au/resources/sustainbus/spd_ob_buildtenrecyguideweb.pdf</a>
Resource NSW – NSW Government	<i>Office Products - A Guide to Sustainable Purchasing and Use</i>	<a href="http://www.environment.nsw.gov.au/resources/sustainbus/spd_ob_offprodguide.pdf">http://www.environment.nsw.gov.au/resources/sustainbus/spd_ob_offprodguide.pdf</a>

Source	Document	Web
Resource NSW – NSW Government	<i>Waste Reduction in Office Buildings - A Guide for Building Managers</i>	<a href="http://www.environment.nsw.gov.au/resources/sustainbus/spd_ob_buildmgrrecyguideweb.pdf">http://www.environment.nsw.gov.au/resources/sustainbus/spd_ob_buildmgrrecyguideweb.pdf</a>
Sustainability Victoria	Recycling and reusing in your workplace	<a href="http://resourcesmart.vic.gov.au">http://resourcesmart.vic.gov.au</a>
North Carolina Department Of Environment And Natural Resources, Division Of Pollution Prevention And Environmental Assistance	A Fact Sheet For Managing Food Materials	
United States Environment Protection Agency	<i>A Guide to Waste Reduction at Shopping Centers</i>	<a href="http://www.epa.gov/wastes/conserve/tools/rogo/documents/amrguide/amrguide.pdf">http://www.epa.gov/wastes/conserve/tools/rogo/documents/amrguide/amrguide.pdf</a>
ACT Urban Services and ACT NOWaste	Best Practice Waste Management Within ACT Government Buildings	
California Integrated Waste Management Board	<i>Food For Thought – Restaurant Guide To Waste Reduction And Recycling</i>	<a href="http://www.calrecycle.ca.gov/publications/Documents/BizWaste%5C44198016.pdf">http://www.calrecycle.ca.gov/publications/Documents/BizWaste%5C44198016.pdf</a>
University of Western Australia	<i>Green Building Program - Ensuring sustainable work practices on campus</i>	<a href="http://www.uwa.edu.au/__data/assets/pdf_file/0007/1628908/GreenBuilding_booklet_web.pdf">http://www.uwa.edu.au/__data/assets/pdf_file/0007/1628908/GreenBuilding_booklet_web.pdf</a>
Green Hotels Association		<a href="http://greenhotels.com">greenhotels.com</a>
Green Restaurant Association		<a href="http://www.dinegreen.com/">http://www.dinegreen.com/</a>
Green Table Network		<a href="http://www.greentable.net">http://www.greentable.net</a>
Massachusetts Department of Environmental Protection	<i>Supermarket Composting Handbook</i>	<a href="http://www.mass.gov/dep/recycle/reduce/smhandbk.pdf">http://www.mass.gov/dep/recycle/reduce/smhandbk.pdf</a>
Metropolitan Washington Council of Governments Department of Environmental Programs	<i>Recycling Guidebook for the Hospitality and Restaurant Industry</i>	<a href="http://www.mwcog.org/environment/recycling/hotel/mentor/guidebook1.pdf">http://www.mwcog.org/environment/recycling/hotel/mentor/guidebook1.pdf</a>
North Carolina Division of Pollution Prevention and Environmental Assistance	Hotel/Motel Waste Reduction - The Many Returns Of Recycling Waste	
US EPA	Shopping Centers	<a href="http://www.epa.gov/epawaste/conserve/tools/rogo/venues/malls.htm">http://www.epa.gov/epawaste/conserve/tools/rogo/venues/malls.htm</a>
Composting and Anaerobic Digestion Association of Ireland and the Department of Environment, Heritage and Local Government	Shops & Supermarkets information sheet	<a href="http://www.foodwaste.ie/wp-content/uploads/2010/06/Shop-Supermarket.pdf">http://www.foodwaste.ie/wp-content/uploads/2010/06/Shop-Supermarket.pdf</a>
US EPA	Hotel Waste Reduction Recommendation Report	
Sustainability Victoria	Waste Wise Hotels	<a href="http://www.sustainability.vic.gov.au/resources/documents/Waste_Wise_Hotel_Toolkit.pdf">http://www.sustainability.vic.gov.au/resources/documents/Waste_Wise_Hotel_Toolkit.pdf</a>
Zero Waste SA	<i>Waste management and reduction guide for the retail industry</i>	<a href="http://www.zerowaste.sa.gov.au/upload/resources/publications/reuse-recovery-and-recycling/Retailwastemanagementreductionguide_5.pdf">http://www.zerowaste.sa.gov.au/upload/resources/publications/reuse-recovery-and-recycling/Retailwastemanagementreductionguide_5.pdf</a>
Waitakere City Council NZ	<i>The Better Restaurant and Café Guide</i>	<a href="http://www.waitakere.govt.nz/AbtCit/ec/clnprod/pdf/restcafegde.pdf">http://www.waitakere.govt.nz/AbtCit/ec/clnprod/pdf/restcafegde.pdf</a>
Business Online Recycling Directory	NSW Government for PlanetArk	<a href="http://www.businessrecycling.com.au">www.businessrecycling.com.au</a>
Department of Environment and Climate Change NSW	<i>Better Practice Guide for Waste Management in Multi-unit Dwellings</i>	<a href="http://www.environment.nsw.gov.au/resources/warr/0842Contents.pdf">http://www.environment.nsw.gov.au/resources/warr/0842Contents.pdf</a>

## Appendix H

### Sample contract clauses

Some example clauses for waste collection contracts and cleaning contracts are shown below. This information should not be a substitute for professional contract or legal advice. Readers are advised that professional advice should be obtained when preparing, tendering or assessing any contract.

#### Waste collection contracts

##### Provision of service

The Contractor will provide a waste and recycling collection service to the Principal as per the service levels and fees listed in schedule 1.

##### Standard bin colours

All bins will comply with Australian Standard *AS4123.7-2006 Mobile waste containers - Part 7: colours, markings and designation requirement* and the NSW EPA's standard recycling signs<sup>23</sup>.

##### Recycling assurance

Where materials have been separated for recycling, the Contractor will make all reasonable efforts to ensure the material is recycled (according to its highest resource use).

##### Contamination penalty

The Principal agrees to pay a penalty clause for contamination in the recycling as per Schedule 1, on the condition that the Contractor can provide documented evidence of continued contamination above agreed levels in schedule 1.

##### Flexibility

The Principal reserves the right to review the number and size of containers for waste and recycling every three months. The service fee will be altered to reflect the change in service. The new service will be costed according to schedule 1.

##### Collection time

All waste and recycling will be collected between the hours of [12 midnight] and [6 am].

##### Non-scheduled pick-ups

The Contractor will make non-scheduled collections of waste and recycling as requested by the Principal. The fees for non-scheduled collections are as per Schedule 1.

##### Collection point

The Principal will be responsible for placing the waste and recycling bins at the collection point indicated on the site layout in schedule X.

##### Bin labels

The Contractor will ensure that all waste and recycling collection containers are labelled with the appropriate label as per the NSW Government's standard recycling signs which can be found at <http://www.environment.nsw.gov.au/warr/recyclingsigns.htm>.

##### Reporting

The Contractor will provide the Principal with written reports on the waste and recycling service, as per schedule X.

<sup>23</sup> <http://www.environment.nsw.gov.au/warr/recyclingsigns.htm>

## Schedule 1

### Scheduled collections

Material	Containers	Collection frequency	Cost	Contamination penalty
Garbage	1 x 20 m3 compactor	Tuesday and Thursday every week	\$200 per pickup plus \$100 per month unit rental	n/a
Paper	10 x 240 L bins	Monday and Wednesday of every week	\$3 per bin per collection	\$5 per bin per collection
Cardboard	Cardboard baler	Friday of each week	\$100 per pickup plus \$20 per month unit rental	\$100 per pickup

### Non-scheduled collections

Material	Containers	Cost	Contamination penalty
Garbage	1 x 20 m3 compactor	\$400 per pickup	n/a
Paper	10 x 240 L bins	\$3 per bin per collection	\$5 per bin per collection
Cardboard	Cardboard baler	\$100 per pickup plus \$20 per month unit rental	\$100 per pickup

### Cleaning contract

#### Compliance with Waste Management System

The waste and recycling system at the premises is as per schedule 1. All waste and recycling will be collected and removed to a location designated by the Principal. Where materials have been separated for recycling, the Contractor will ensure that each separated recyclable material remains separate from other recyclable materials and general waste. At all times, the Contractor will comply with the Principal's waste management system [and environmental management system].

#### Collections performed as directed

Recycling and waste collections will be performed as directed by the Principal. Recycling and waste collection systems may alter from time to time, at the discretion of the Principal.

#### Recycling contamination penalty

Where the Principal finds that the Contractor is not keeping recyclable materials separate or causing other contamination of the recycling, the Contractor will pay the financial penalty for contamination as specified in Schedule 1.