Randwick City Council
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Localised Automated Waste Collection Systems Using Mobile Vacuum Vehicles

Design and Implementation Guidelines

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Randwick City Council
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This document is prepared by

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for

Randwick City Council

CONTENTS

GLOSSARY OF TERMS

Term	Definition
Discharge Pipework	The pipework from the storage tank to the outlet point
Docking Station	Point of connection between Mobile Vacuum Collection Vehicle and Localised Automatic Waste Collection System
Inlets	Garbage Disposal Point
LAWCS	Localised Automatic Waste Collection System
MVCV	Mobile Vacuum Collection Vehicle
Outlet Point	The point in the pipework system where the Mobile Vacuum Collection Vehicle connects to for waste collection
PLC Control Panel	A programmable logic controller designed to perform the logic functions executed by electrical hardware including relays, switches and mechanical timers/counters
RCC	Randwick City Council
Waste Storage Tank / Storage Screw Tank	Waste storage vessel with integrated screw feed to push waste to the end of the tank to maximise the space for waste storage

1 Executive Summary

A Localised Automated Waste Collection System (LAWCS) is an alternative method from conventional waste collection methods.

LAWCS comprises of a vacuum system and a network of pipes that transport waste at high speeds from above-ground disposal locations (known as "inlets") to vehicle docking points and then into a collection vehicle. Waste disposed of into the inlets is stored in an underground storage tank until a specialised truck connects to a vehicle docking point and generates vacuum conditions in the pipe system which empties the tanks.

Waste is placed into the system by the user at the inlet point and is transported through a gravity chute to storage screw tanks located within building plant areas or underground, directly at the base of the gravity chute. The waste is held in the storage screw tank until the mobile vacuum vehicle connects to the system via a dedicated outlet point at a docking station. When the mobile vacuum vehicle is connected, the waste stream being collected is transported through a pipe network to the vehicle. Within the vehicle the waste is collected, compressed and transported offsite. The transport air is filtered within the vehicle and discharged to atmosphere.

Inlets can be located internally within buildings at the lobby or on each floor, or externally in private courtyards and public areas. The overall convenience for users, cost, spatial impact and aesthetics should be considered when determining the inlet locations. The outlet and docking points are strategically located considering the vehicle travel and swept paths, overall vehicle travel distances, pipework length from inlets to the docking point, odour emitted from the collection vehicle at the docking point and noise transmission.

There are significant logistic, environmental, health, safety, flexibility and cost benefits of implementing a LAWCS when compared to traditional waste collection methods. Most waste including general waste, organic waste and recyclable waste can all be disposed of in a LAWCS. Food waste can also be disposed through this system if a separate dedicated waste stream is provided, however some waste types such as highly hazardous, flammable or viscous materials, and waste which exceeds 300mm in any direction in size cannot be and alternative methods for collection of this waste, including spatial provision for storage within the development, must be provided.

These guidelines are intended to assist developers with spatial requirements and system design to allow adequate provisions to be incorporated into a development to accommodate a Localised Automated Waste Collection System.

2 Overview of Localised Automated Waste Collection System

Solid waste collection has modernised significantly overtime, but it was not until the 1960s that it took a momentous leap in technology and automated waste collection systems were developed. Automated waste collection systems were developed to transport waste from waste disposal areas through pneumatic vacuum pipework to a centralised waste separation and collection location.

In the late 1980s, the mobile vacuum system was developed to collect waste from storage containers located in buildings. Since then, over one thousand area-wide and localised automated waste collection systems (LAWCS) have been installed worldwide. As sustainability, wellness and efficiency continue to remain priorities in design for new developments and cities, it is anticipated automated waste collection systems will replace traditional waste collection methods in the future.

A Localised Automated Waste Collection System (LAWCS) is an alternative method from conventional waste collection methods. A LAWCS collects waste and transports it through pneumatic pipework at high speed (approximately 60-70km/hr) to a mobile vacuum vehicle via a vacuum built in to the vehicle. Localised collection systems focus on serving one building or a small number of nearby buildings.

The main components of a LAWCS system using a mobile vacuum vehicle include and supplied by the developer:

1. Inlet points: outdoor or indoor disposal station, comprised of inlets, where waste is placed into the system by the users. Typically in a multi storey building, the inlet point is the gravity chute (s).
    - Separate, dedicated inlet points and chutes are provided for different types of waste including food/organic waste, recyclable waste and general waste.
    - Food/organic waste streams must be provided with only one inlet (rather than one inlet per floor typical for recycling and general waste streams in high rise buildings). The food/organic waste inlet point must be located one level above the level which the food/organic storage tank is located. E.g. if the storage tank is located on Basement 1, the inlet point must be located on Ground Floor.
2. Gravity chute: ventilated vertical pipe which transports waste from the inlet point to a lower floor.
3. Storage tank (waste storage tank): The tank is located directly at the base of the gravity chute where the waste is held until it is collected by the mobile vacuum vehicle. The gravity chute is typical the gravity waste chute and access by residents on a floor by floor basis. Separate tanks are required for each waste stream.
4. Piping network: interlinked, connected pipes from all waste inlets and storage tanks to the outlet point.
5. Outlet point: The point in the pipework system where the mobile vacuum vehicle connects to for waste collection.
6. Docking station: Location where the mobile vacuum collection vehicle (MVCV) parks for connection to the outlet point and waste collection.
7. Air compressor and dryer for operating isolation valves. The dryer is required to keep the compressor free of moisture and prevent condensate and rust problems from occurring.
8. Power supply , controllers and all associated works

Each waste stream is provided with a separate storage tank to ensure no mixing of waste streams. There are no fans or air filters installed within the system, rather these components are located within the mobile vehicle which connects into the system at the docking point via a dedicated outlet. The waste is vacuumed out of the storage tanks, through the pipework distribution system and into the mobile vehicle where it is compressed.

The storage tank rooms and chutes are mechanically exhaust via a roof mounted exhaust fan as per conventional waste room and chute exhaust systems.

The air which is transported into the vehicle is filtered within the mobile vehicle, before it is discharged to atmosphere. The exhaust air shall ideally discharge vertically to open air at high velocity via an angled cone fitted to the exhaust point.

RCC will purchase and operate the Mobile Vacuum Collection Vehicles. A control interface is required between the Collection vehicle and the LAWCS controller. Details of the required control interface will be provided once RCC has determined their supplier of the MVCV.

An overview of the LAWCS main components and integration (in principle) is provided in the figure below.

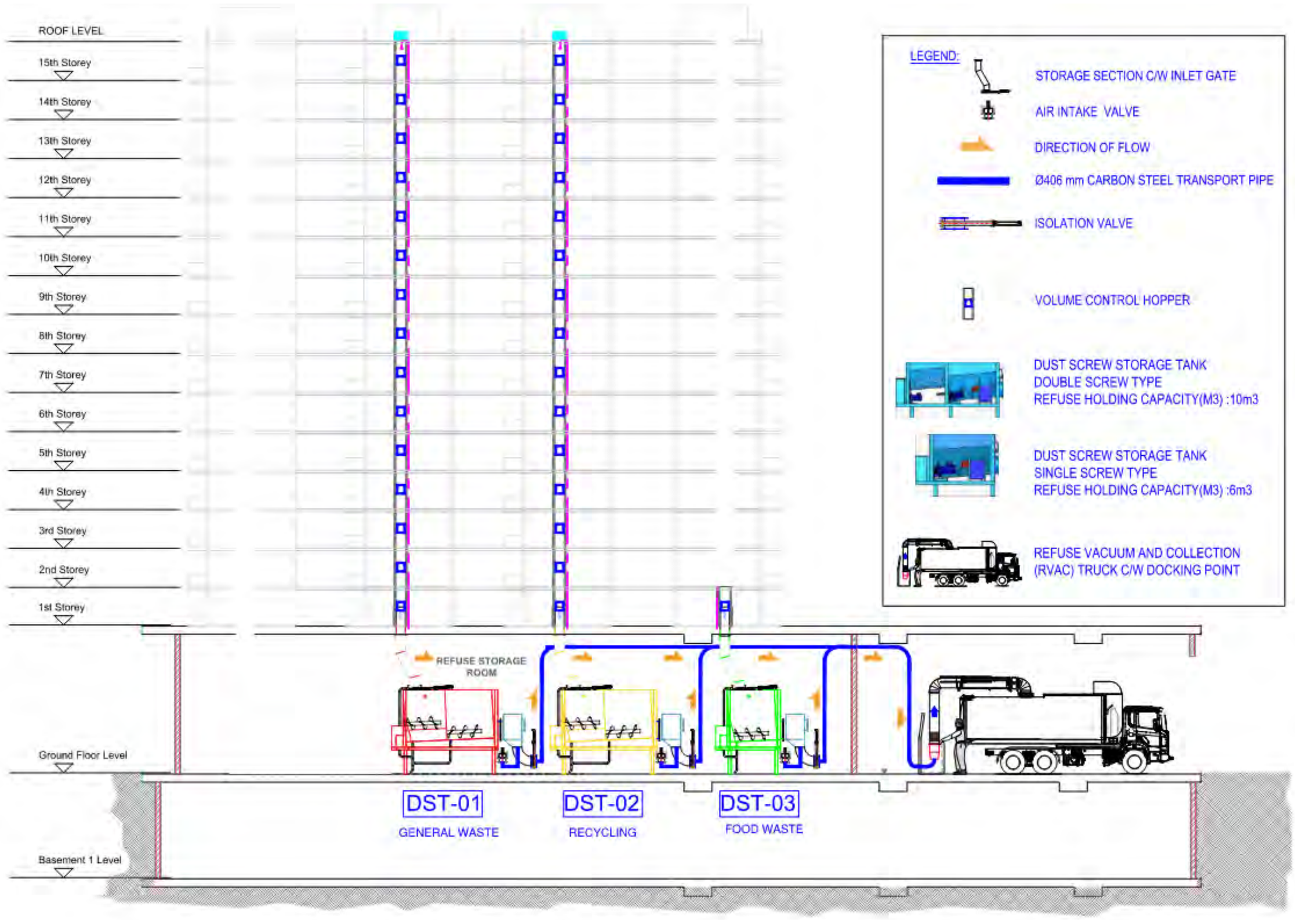


Figure 2.1 LAWCS System Overview

3 Randwick City Council Requirements

The K2K Development Control Plan requires a LAWCS is implemented in all new developments (other than in developments where proposed works are alterations and additions, or development that are minor or ancillary in nature) in accordance with Council's Automated Collection System Guidelines.

This document is a guideline only and has been prepared to assist developers in preliminary spatial planning to incorporate a LAWCS and provide a description of how the system works and main system components. The final LAWCS design including all spatial requirements, power and controls should be confirmed and endorsed by the developer's LAWCS supplier.

The below table summarises what needs to be completed by the developer at each stage of the project.

Table 3: LAWCS Requirements at each Design Stage

Stage	Requirement
Pre-Lodgement	• Consider general requirements from this guideline • Prepare waste management plan • Engage LAWCS experts to prepare LAWCS spatials • Ensure the LAWCS spatials have been incorporated into the architectural layouts
Lodge Plans	• Lodge plans including waste management plan and LAWCS spatials demonstrating how it is incorporated into the development • Waste management plan should be endorsed by a LAWCS system supplier • Clarify which LAWCS expert is liaising with the developer and system provider
DA Approval	• The waste management plan should meet Council's requirements as per Development Control Plan for Kensington and Kingsford Town Centres 2020 and this guideline
System Operation and Maintenance	• Developer to specify which supplier will undertake maintenance in the waste management plan

4 Preferred System Suppliers

There a number of suppliers for the LAWCS:

- Aerbin
  - Website: https://aerbinaustralia.com/
  - Contact 1: natalie@aerbinaustralia.com
  - Contact 2: info@aerbinaustralia.com
- RVAC – based in Singapore and India
  - Website: https://www.rvac.com.sg/singmatic-mobile/
  - Contact 1: rvac.info@ramky.com.sg
  - Contact 2: amos.ho@resustainability.com.sg

The developers nominated LAWCS supplier must be involved in the detailed design process to ensure the system design is compatible with their products at the time of design. The system supplier should be engaged for maintenance for the systems during the ongoing operation period for the life of the building.

System suppliers with LAWCS experience and credentials not listed above can be used with Council's consent.

5 System Components

The Developer is responsible for the supply and installation of the following system components. All components are provided and maintained by the LAWCS specialist Suppliers excluding the gravity chute which may be provided by conventional gravity waste chute suppliers and the mobile vacuum collection vehicle which will be supplied and operated by RCC. All costs associated with the LAWCS (excluding the MVCV) and maintenance in the development will be covered by the developer.

The table below summarises the main LAWCS system components and who is responsible for the supply, installation and maintenance.

Table 5: LAWCS Components

LAWCS Component	Provided By	Install By	Maintenance
Inlet points	Developer (as per conventional waste chute inlets)	Developer (as per conventional waste chute inlets)	Developer*
Gravity chutes	Developer (as per conventional waste chutes)	Developer (as per conventional waste chutes)	Developer*
Gravity chute connection to storage screw tanks	Developer	Developer	Developer*
Storage screw tanks	Developer	Developer	Developer*
Transport pipe from storage screw tank to outlet point	Developer	Developer	Developer*
Outlet point	Developer. Location to be approved by Council.	Developer	Developer*
Docking station	Developer. Location to be approved by Council.	Developer if docking station is within property boundary	N/A
Mobile vacuum vehicle	Council	N/A	Council

Power and controls	Developer	Developer	Developer*

*Note: maintenance to be undertaken by the Developers preferred LAWCS supplier specialists.

5.1 Storage Tank Room

The Storage Tank Room houses the waste storage tank and is located directly under the garbage chutes. The tank room shall be constructed to withstand negative pressure up to 2,000kPa(2KN/m^2). An Air Intake Louvre (typically 1.2m^2) is located in the room wall with access to make up air from the basement or from outside. A fire damper is provided in the wall behind the damper to maintain the fire rating integrity of the room. The tank rooms shall be provide with a hosecock for wash and floor waste. A 32 amp power supply is required to power the screw drive motors on the storage tanks.

The storage tank room shall be ventilation to the requirement of AS1668.2. Lighting shall be provided with sealed fixtures suitable for a moist environment.

The floor area of the Storage Tank Room is dependent upon the chute locations, the amount of waste storage required and what the pipework route from the tank to the outlet is i.e. whether the pipe goes directly through the outer wall, rises to high level of the floor the tank is located on, or drops to high level of the floor below. Note each LAWCS supplier has different acceptable configurations for the pipework connection, for example Aerbin permit the suction pipe travels horizontally out of the tank whereas RVAC does not. The height of the Storage Tank Room is dependent upon the overall storage tank heights, the minimum clearance required above the storage tanks as per the manufacturers requirements, chute location relative to the pipework connection point on the tank and which level the pipework reticulates from the tank to the outlet point (on the floor below the level storage tanks are located or on the same level).

To minimise the room height required, the storage tanks should be located directly below the associated waste chute.

The LAWCS pipework may reticulate at high level of the floor below where the storage tanks are located, or may bend upwards and reticulate at high level of the same floor where the storage tanks are located. Each of these configurations may require different clearances around the tank depending on which manufacturer is pursued. For RVAC tanks, the tank needs to be raised by minimum 800mm for pipework to reticulate at high level of the floor the storage tanks are located. The final room dimensions and heights need to be coordinated based on the nominated LAWCS supplier's requirements.

LAWCS Project Example

Below is an example of how the storage tank room sizes and heights are calculated for an RVAC system. Note this varies for each development as the chute locations, tank sizes and pipework routes differ. The below example is based on a development which has three storage tanks (one per waste stream) located in the same storage tank room.

Step 1: Determine quantity and size of storage tanks

Based on the Waste Management Plan for this development, the storage tank sizes for each waste stream are as follows:

- *General waste: 7.89m^3*
- *Recycling: 3.15m^3*
- *Food waste: 1.47m^3*

One storage tank per waste stream can accommodate the above waste generation rates based on the RVAC system.

Step 2: Select tank types required

The following RVAC tank sizes are required to accommodate these waste volumes:

- *General waste: 1 x Type A tank*
- *Recycling: 1 x Type D tank*
- *Food waste: 1 x Type F tank*

Step 3: Select storage tank room location/s

For this development the storage tank plant room is located on Ground Floor directly below the chutes, in place of the residential garbage room.

Step 4: Lay out the storage tanks including all clearances required and considering the maximum pipework angle from the chute to tanks

Based on the architectural layouts and structure, the total height clearance available in the storage tank room is 4.2m. To ensure a 35 degree pipework angle from the chute to the storage tank is not exceeded, the maximum horizontal distance from the chute to the storage tank pipework connection point must be maximum 900mm as shown in the detail below. Note this assessment was done for the highest storage tank in the room which is 2.6m high. The distance could increase for tanks which are lower in height but this tank was assessed as a "worst case".

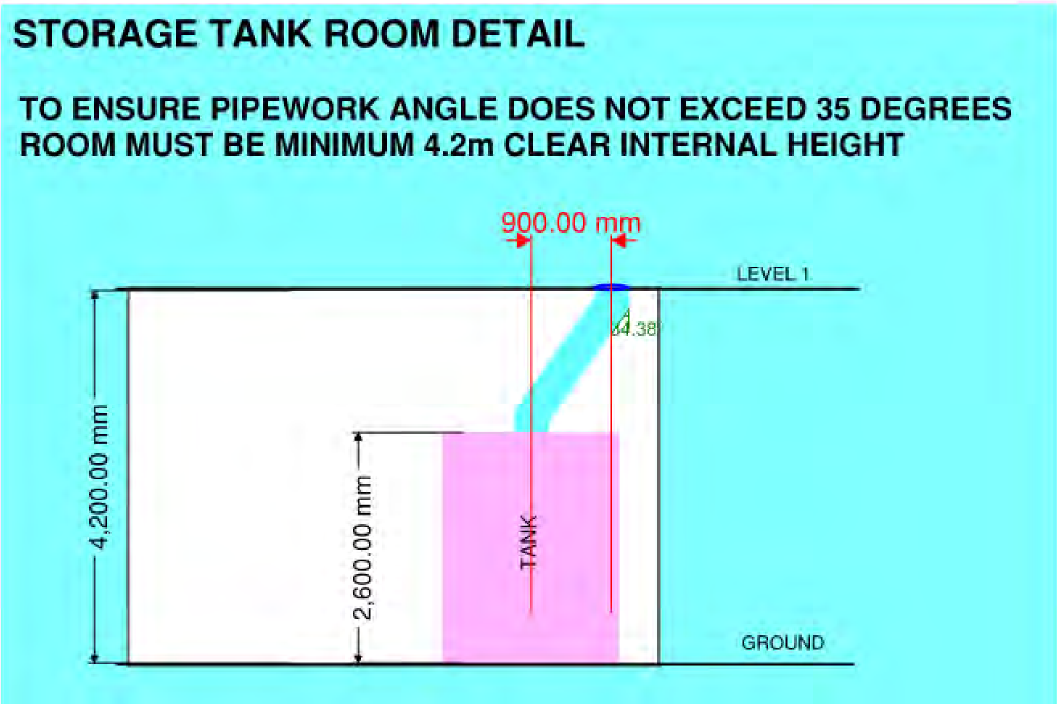


Figure 5.1.1 Storage tank plant room section

The location of chutes for each waste stream is shown below. Laying out the storage tanks including all clearances (shown green) and ensuring the pipework angle from the chute to the storage tank does not exceed 35 degrees resulted in the following layout. ***Note below the length of the room has been driven by the general waste tank which is the longest, however this could be reduced around the recycling and food waste tanks, provided 2.5m clearances from the tank is provided.***

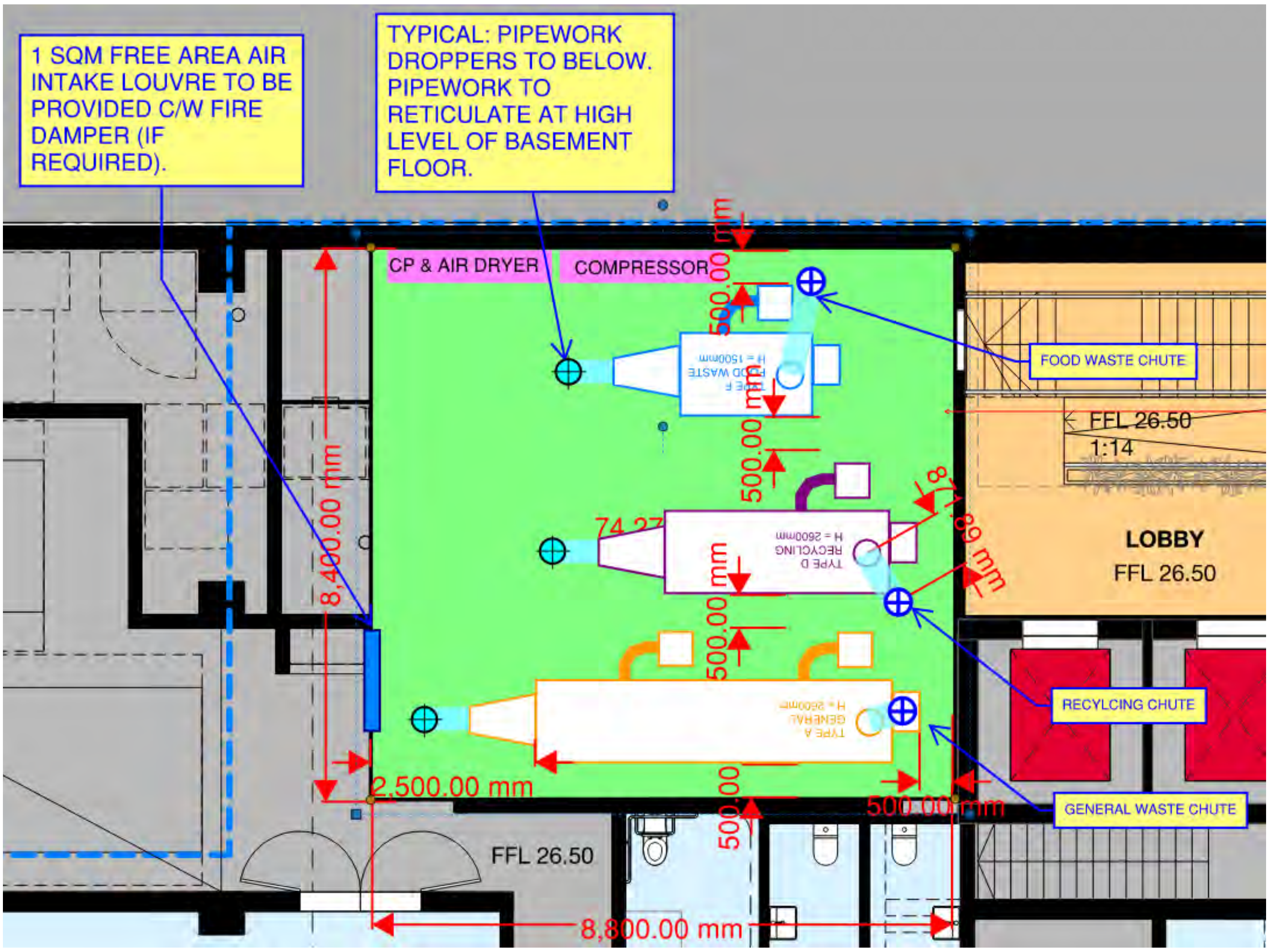


Figure 5.1.2 Storage tank plant room plan view

<u>*Step 5: Locate the outlet point based on the docking station*</u>

The location of outlet point and docking station is to be agreed with RCC considering traffic matter, system supplier requirements (the maximum length of pipework from the tanks to the outlet point, etc.) and collection truck accessibility issues. For this development the location of the outlet point is on the street adjacent to the building property boundary. Below is the location of the outlet point for the development.

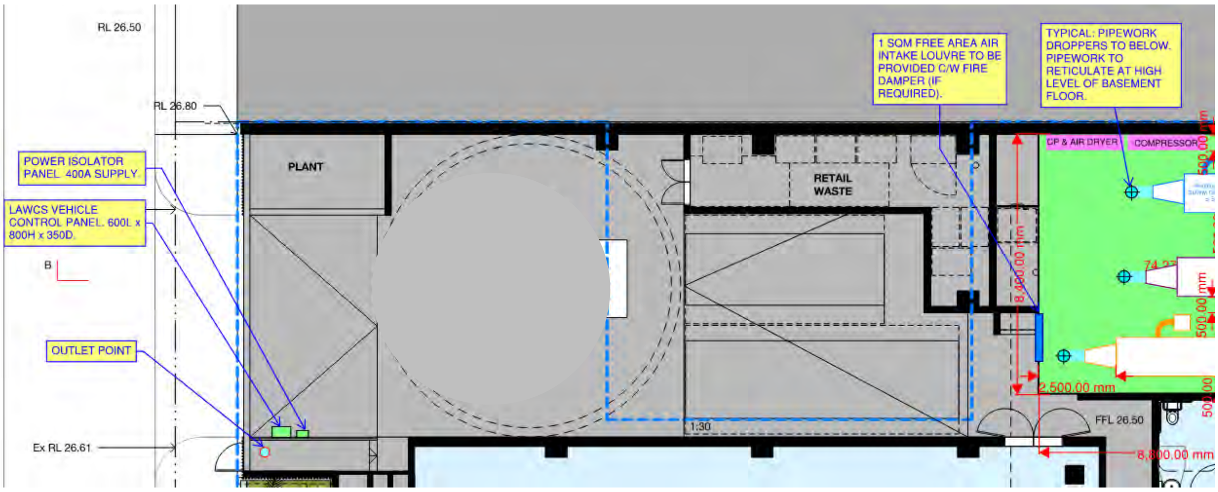


Figure 5.1.3 Location of outlet point

<u>Step 6: Determine based on spatial availability and height clearance what the pipework route from the storage tanks to the outlet point will be:</u>

To minimise the footprint and height of the storage tank room, the pipework from the storage tank to the outlet point reticulates at high level of Basement 1 (the floor below). Where pipework reticulates from the storage tank to high level of the floor below, 2.5m clearances is required for the discharge pipework and clearances (refer to Section 5.5 for details).

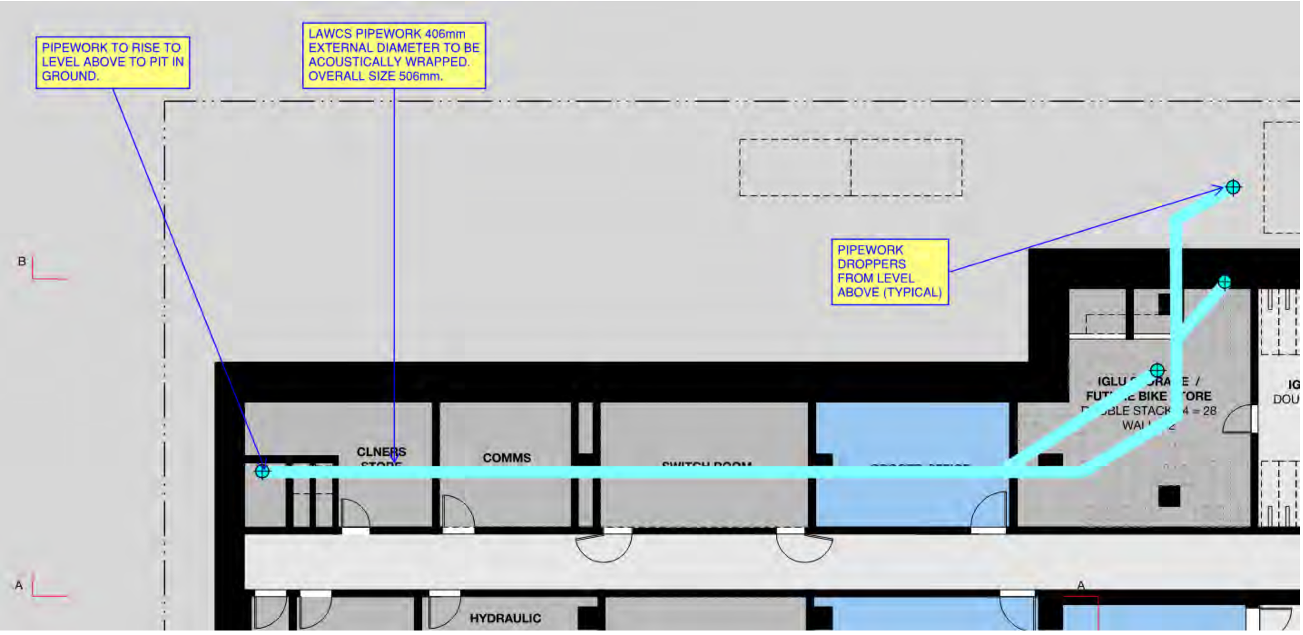


Figure 5.1.4 Pipework reticulation on Basement 1

<u>Step 7: Endorsement by the supplier</u>

The developers nominated LAWCS supplier must undertake a final review and endorse the design and spatial provisions.

<u>Step 8: Modify the LAWCS provisions based on supplier feedback (if required)</u>

If the suppliers requirements have not been met, the developer must make all modifications required to accommodate the LAWCS. The developer shall work with the supplier to coordinate the requirements to suit the spatial constraints of the development.

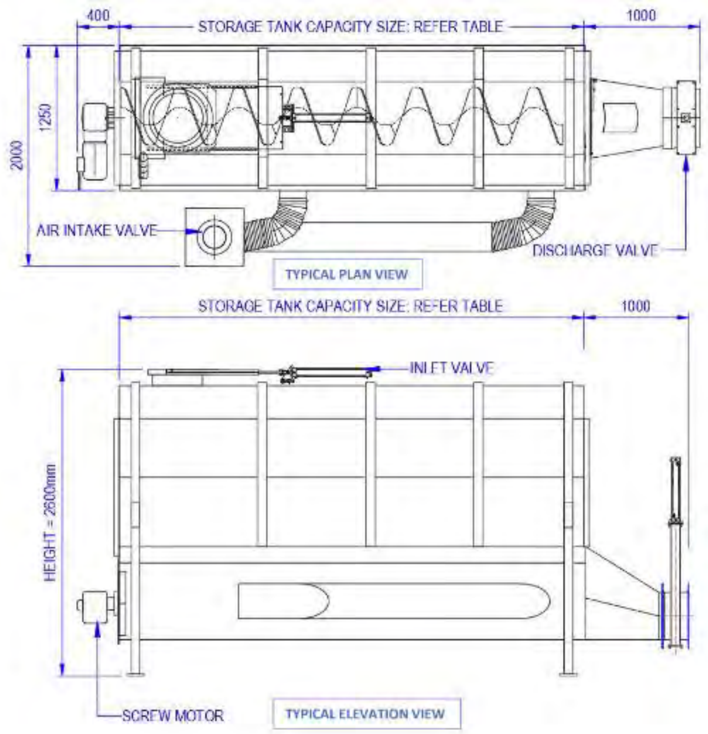
5.2 Waste Storage Tank(s)

The storage tanks come either as screw tanks or non-screw tanks. For RVAC, all tanks over 0.6m^3 are screw tanks, only the smallest tank (Type G) is not a screw tank. Aerbin also have screw tanks and non-screw tanks, the screw tanks can accommodate 4.5m^3 – 7.5m^3 waste.

Inside screw tanks is a motorised rotation screw feed to push the waste into the tank so that the maximum volume of the tank can be employed for waste storage. Refer to diagrammatic provided by RVAC in the below. Power is required for the motor of the screw.

Separate waste storage tank are required for each separate waste stream.; i.e. 3 waste streams of 1. general waste; 2. Recyclables and 3. Organic Food waste, will require 3 separate storage tanks. The storage tanks are available on multiple sizes depending on the manufacturer. Some manufacturers will provide customised tank sizes. Waste storage tank sizes shall be selected based on weekly collection for waste and food organics, and fortnightly collection for recycling.

Standard tank sizes for the RVAC System are provided below:



STORAGE TANK CAPACITY SIZING

SCREW TANK CAPACITY	TYPE	DIMENSION SIZE
8m3	A	5400 X 2000 X 2600 (mm)
6m3	B	4400 X 2000 X 2600 (mm)
5m3	C	3900 X 2000 X 2600 (mm)
4m3	D	3400 X 2000 X 2600 (mm)
2m3	E	2600 X 2000 X 1800 (mm)
1.5m3	F	2000 X 2000 X 1500 (mm)
0.6m3 NO SCREW	G	1350 X 2000 X 1500 (mm)

Figure 5.2.2 – RVAC Tank Details (Source RVAC)

Typical Clearances around the Tanks is nominated as follows as provided by RVAC in Figure 5.2.3 below

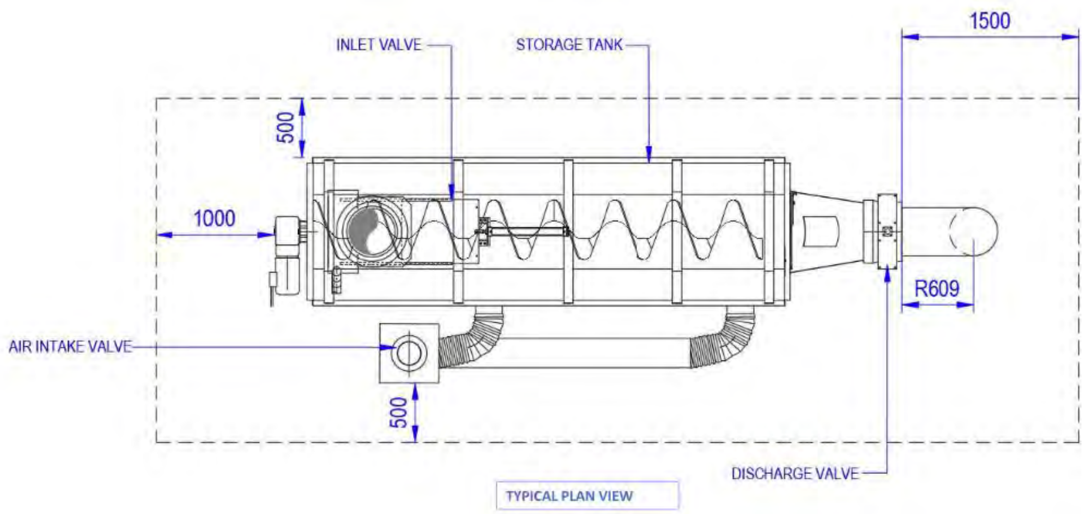


Figure 5.2.3 – RVAC Tank Details (Source RVAC)

Aerbin have various types of tanks including horizontal round/cylindrical tanks, vertical cylinder tanks and screw tanks. The tanks are available in the following capacities:

- Horizontal round/cylindrical tank: 1.7m^3 – 5m^3
- Vertical tank: 1m^3 – 3.5m^3
- Screw tank: 4.5m^3 – 7.5m^3

Tank sizes for the Aerbin System are provided in the tables below. For screw tank dimensions and installation dimensions contact Aerbin.

Table 5.2.2 Aerbin Horizontal Round/Cylinder Tank Sizes (Source Aerbin)

Tank type	Volume m³	TB	TH	TL
12x15	1.7	1350	1295	2395
12x15M	2.2	1350	1495	2395
13x15	2.1	1450	1395	2395
13x15M	2.5	1450	1595	2395
14x15	2.4	1550	1495	2395
14x15M	2.9	1550	1695	2395
14x19	2.8	1550	1495	2795
14x19M	3.0	1550	1695	2795
16x23	4.0	1750	1695	3195
16x23M200	5.0	1750	1895	3195

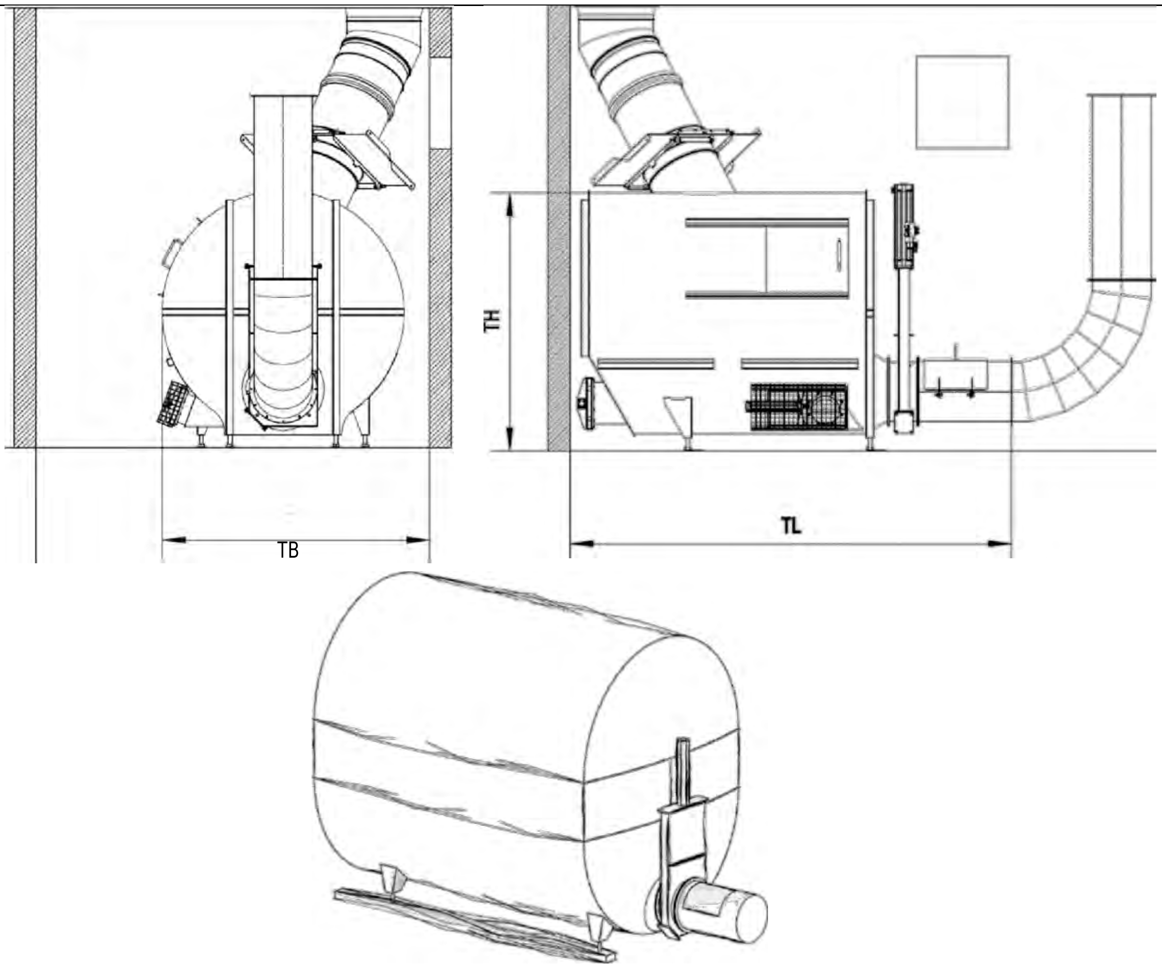


Figure 5.2.4 – Aerbin Horizontal Tank Details

Table 5.2.2 Aerbin Vertical Tank Sizes (Source Aerbin)

Volume m ³	TB	TH	TL
1.0	1190	1570	2732
1.5	1290	1860	2832
2.0	1590	1860	3132
2.5	1690	1975	2232
3.0	1890	2040	2432
3.5	1890	2190	2432

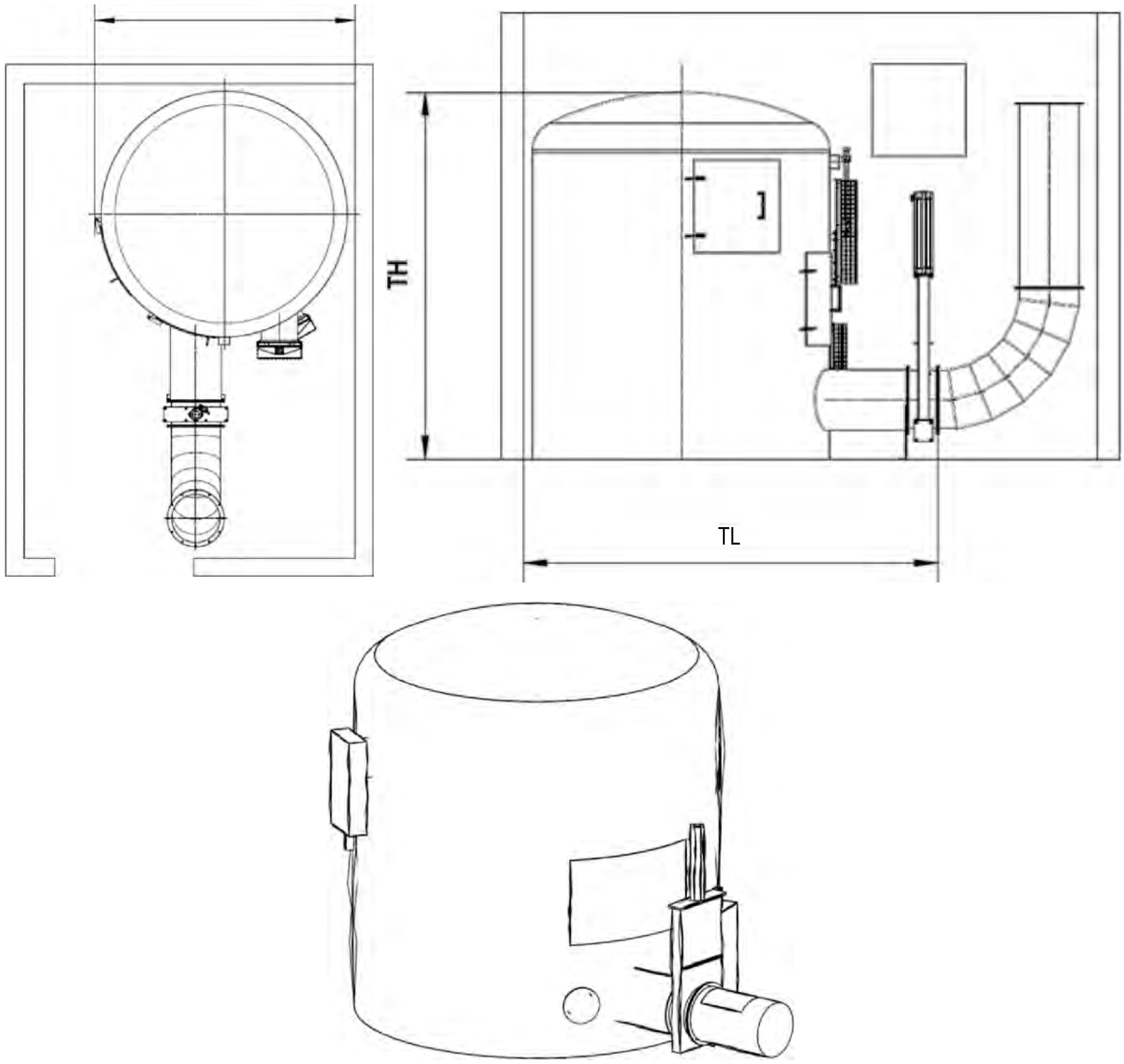


Figure 5.2.5 – Aerbin Vertical Tank Details

Tanks sizes shall be reconfirmed with the Suppliers as these may change due to Suppliers' updates and manufacturing requirements.

5.3 Tank Air Intake

The tank is provided with an air intake with an open and close valve to enable make up air for the vacuum operation. The air inlet valve shall be pneumatically operated (open/close actuation). The valve housing/frame and valve plate shall be of mild steel construction. The valve plate shall be provided with suitable sealing gasket to ensure that the valve remains airtight when closed. The air inlet throttle disc shall be sized to provide the required air flow in the refuse pipe net.

5.4 Tank Discharge and Inlet Valves

A discharge and isolation valve is located on the discharge of the tank to open and close in accordance with vacuum operation. In a system with multiple tanks, only one (1) tank is connected to the mobile collection vacuum operation at a time. The tank, which is being emptied, shall have its discharge valve open and the other tanks will have their discharge valve closed to isolate the tanks from the vacuum operation.

An inlet valve is provided on the top of the tank at gravity chute connection to the tank. The inlet valve is normally open but is closed when the tank is being emptied under vacuum operation.

5.5 Waste Chute Connection to Storage Tank

A separate gravity chute is required for each waste stream (general waste, recycling and food waste). A separate connection from each gravity chute to the associated storage tank is required. The gravity chutes for the LAWCS will be as required by the system.

A pipe from the top of Storage Tank connects to the waste chute to allow waste to drop into the Storage tanks. It is recommended that a maximum angle of 30 degrees from vertical is used to ensure smooth flow of rubbish from chute to the storage tank. The pipe is installed from the lower edge of the slab in the waste room to the waste tank. The pipe is attached with a transition that is bolted to the slab. The pipe diameter all through the system including transition points and angles is 400mm.

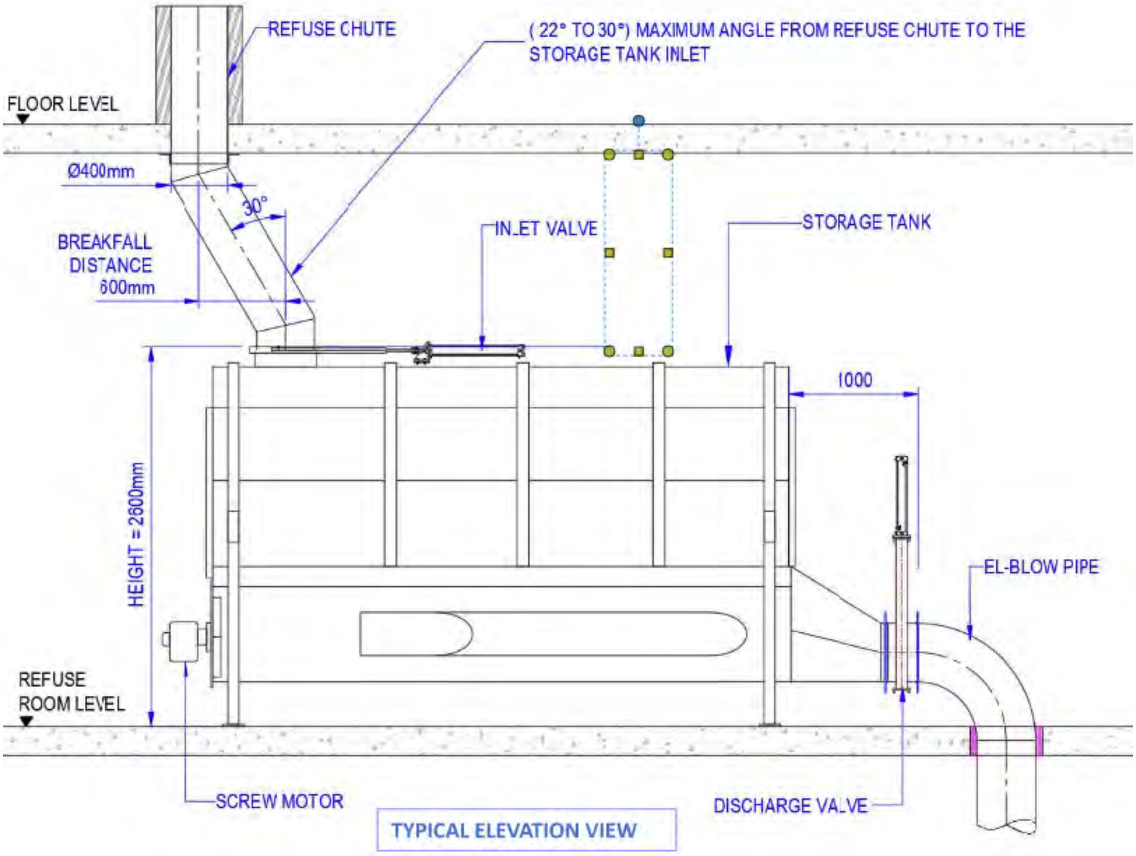


Figure 5.5.1 Waste Chute Connection to Storage Tank and Inlet and Discharge Valves with pipework reticulating at high level of floor below storage tanks (Source RVAC)

The pipework out of the storage tank (discharge pipework) shown on the right hand side of the figure above may bend downwards and reticulate at high level of the floor below (as per Figure 5.5.1), or may bend upwards and reticulate at high level of the same floor where the storage tanks are located (as per Figure 5.5.2).

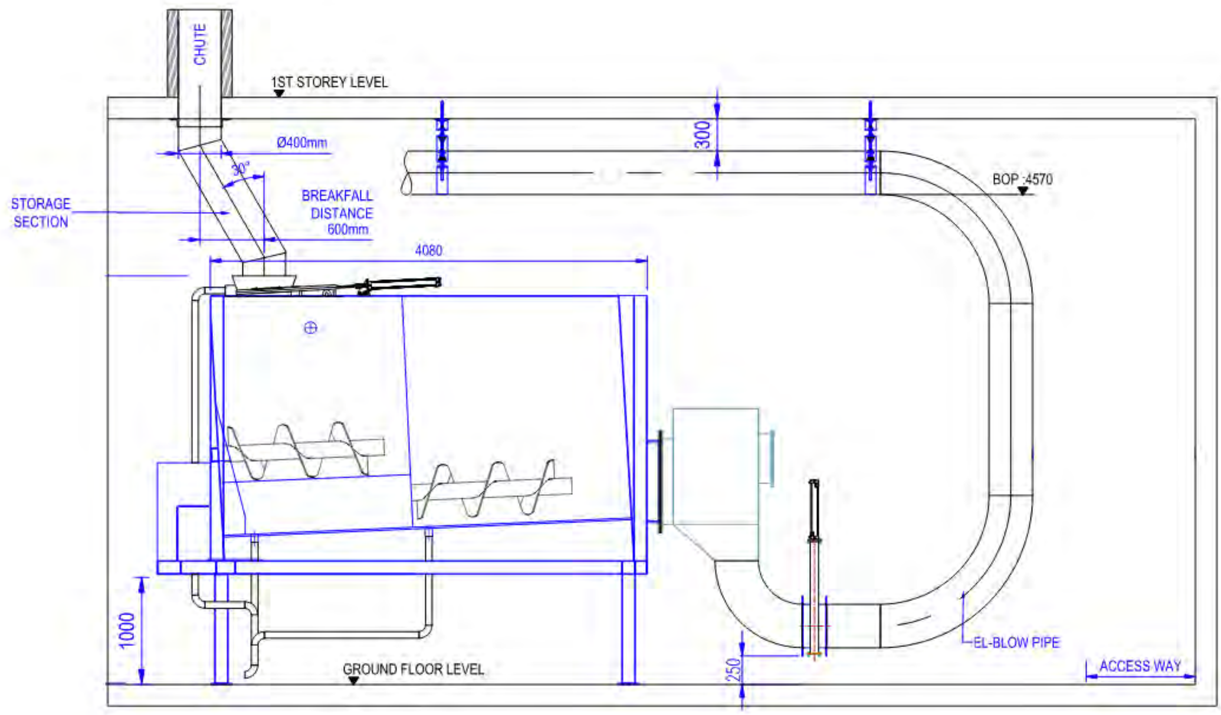


Figure 5.5.2 Waste Chute Connection to Storage Tank and Inlet and Discharge Valves with pipework reticulating at high level of same floor storage tanks are located (Source RVAC)

Where pipework reticulates from the storage tank to high level of the same floor the storage tank is located on, 4.2m clearances is required for the discharge pipework and the storage tank needs to be raised by 800mm – 1000mm. This is an RVAC specific requirement and for other systems this may not be required.

5.6 Air compressor

An air compressor and dryer is provided to pneumatically open and close the isolation valves and air intake valve. A space allowance of 2m x 0.5m is required in one of the Storage Tank Rooms to accommodate the compressor. Only one air compressor and dryer are required for the development, even if there are multiple chute locations/storage tank rooms.

5.7 Power Distribution Board

A power distribution board is provided to provide power to the air compressor, screw drive and the Controller are located in the Storage tank Room.

5.8 Power Requirements

The overall power required to be provided by the Developer is outlined in Table 5.8

Table 5.8 LAWCS Power Requirements

No.	Area Served	Equipment	Power Requirement	Quantity
1	Mobile Refuse Collection Vehicle	Collection Point Contactor Panel E-Rose Docking Station	400A TPN Isolator	1
2	Tank Storage Room	Air Compressor & Dryer	60A TPN Isolator	1

3	Tank Storage Room	Screw Feed Motor	32A TPN Isolator Per Tank	1

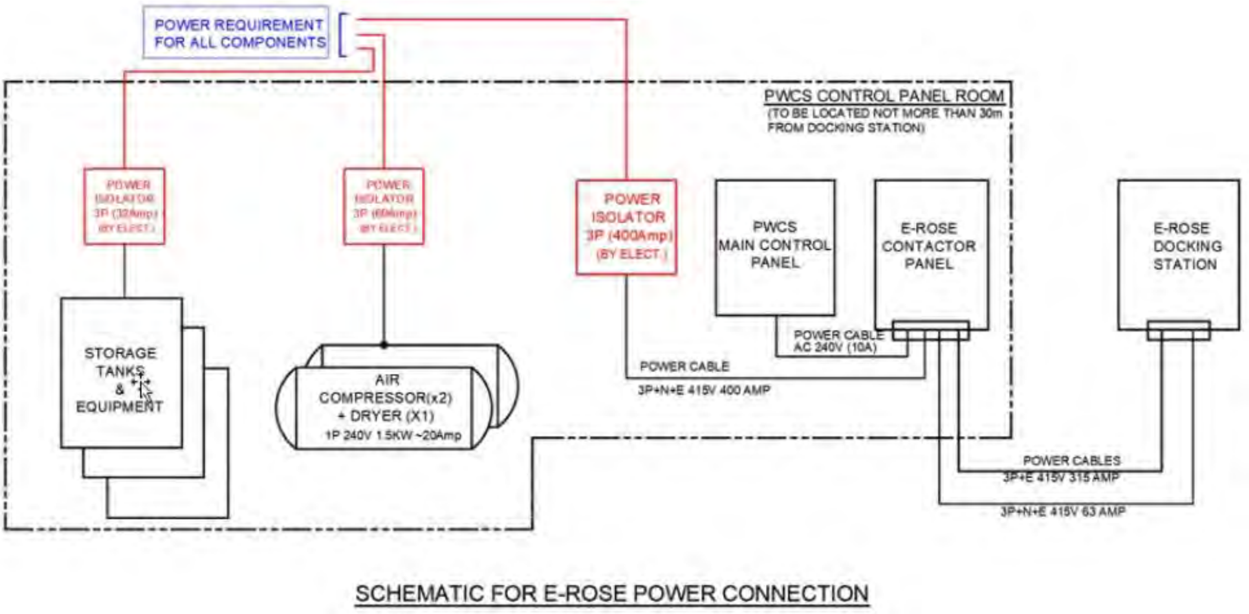


Figure 5.8 Power Schematic (Source RVAC)

5.9 PLC Control Panel

A PLC Controller is provided to operate the screw drive and open and close the isolation valves and air intake valve. The nominal dimensions of the Control Panel are 1000mm (W) x 300mm (D) x 1200mm (H)

5.10 Screw Feed Control Panel

The screw feed control panel is located typically on the side of the storage tank. The nominal dimensions of the Screw Feed Control Panel are 800mm (W) x 300mm (D) x 800mm (H).

5.11 Vacuum Pipework

The pipework will be installed in the basement adjacent to the Storage Tank Room. The pipes are typically 406mm external diameter. Pipe thickness shall be minimum 6.35mm (minimum) on straight sections and 9mm on bends, final thicknesses shall be selected to ensure reliable operation of the system under the expected loads and ambient temperatures for the full design life of the LAWCS. The pipework is constructed of carbon steel and the tube bends are typically constructed of boron steel due to their sensitivity. The pipework system must connect to all inlets via linking pipework.

Horizontal waste pipes shall be either:

1. buried underground at a depth of 50cm or more,
2. fixed at the basement ceiling level or
3. installed in a suitable alternative location which allows for correct system operation and protection from physical damage.

Pipe supports shall be provided as a minimum at every three to four metres and at changes of direction, or as considered necessary by a structural engineer. All seismic restraints in accordance with AS1170.4 requirements shall be provided to the pipework.

The pipework bend radius should be 1200mm for 400mm diameter pipes to reduce risk of obstructions and blockages. The number of pipework bends in the system shall be minimised to reduce pipework pressure drop thus affecting vacuum suction . For corrosion prevention the pipework must be treated with suitable corrosion prevention paint. Underground pipes must be coated with three layers of PE pipe coating in accordance with the following:

- For a straight pipe: KSD 3562 (KSD 3607) or equivalent,
- For a bend pipe: KSD 3607 or equivalent.

The material tensile strength for pipes shall be greater than 330MPa for a straight pipe and greater than 370MPa for a bend pipe. Inspection openings must be provided for all horizontal pipework to allow maintenance access. Openings shall be located away from sharp bends and discharge valves, and must be water tight to prevent water ingress and damage to the pipework. Inspection openings must include an inspection panel on the top side of the enclosed pipe for maintenance, and internal ladder for access in accordance with Australian Standards, and a 2 metre high internal chamber for adequate maintenance access. The inspection manhole shall be constructed of waterproof, steel reinforced concrete, with epoxy sealed penetrations. Pipework section details are provided in Figure 5.11 below.

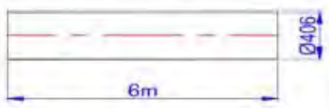
SL.No	Description	2D Drawing	3D Drawing
1	Straight pipe Dia 406mm Carbon steel X 6m length X 9mm Thk		
2	EL-Blow Fitting - 2D (R 609) Dia 406mm Carbon steel X 9mm Thk		
3	EL-Blow Fitting - 3D (R 1218) Dia 406mm Carbon steel X 9mm Thk		
4	90 Deg Fitting - 2D (R 609) Dia 406mm Carbon steel X 9mm Thk		
5	30 Deg Fitting Dia 406mm Carbon steel X 9mm Thk		

Figure 5.11 Vacuum Pipework Details(Source RVAC)

5.12 Waste Collection Vehicle Collection Point – Docking Station

The duration of waste collection depends on the amount of waste being collected but is typically around 20 minutes.

Spatial provision for the mobile vacuum vehicle must be made. This includes a docking station where the vehicle can connect to the outlet point of the system and a clear travel path to and from all docking stations in the precinct. The truck spatial dimensions and outlet point locations are described further in Section 5.2.

The truck weight is 40 tonnes, this must be coordinated with the design team when coordinated the final docking point and locating the outlet.

The maximum suction distance for waste streams is 300 metres, excluding organic waste streams which are limited to 250m. These parameters determine the furthest distance storage tanks may be located relative to the outlet point. The system can cope with waste bags up to 60 litres in volume.

The maximum lift (height difference between the lowest pipe and the outlet point) is 7 metres. Should a greater height be required this shall be coordinated with the preferred supplier to determine what impacts this has on the system (if any) and coordinated with RCC to ensure compatibility with the mobile vacuum collection vehicle.

The outlet point can be located up to 5 metres away from the docking station from the RVAC systems. For the Aerbin system the outlet must be located no more than 3 metres away from the docking point. The diagram below shows the maximum clearances required (green) at the docking station based on an outlet point 5 metres away from the mobile vacuum vehicle (RVAC systems).

Clearances on the front, left hand side and rear of the vehicle are to provide a safe path for the vehicle operators to travel around the vehicle for manual/PLC connection of the vehicle arm to the outlet point and to allow for a clear distance from other traffic and pedestrians. The overall footprint required for the docking station is 12.12m (W) x 4.55m – 8.55m (D), depending on the outlet point location.

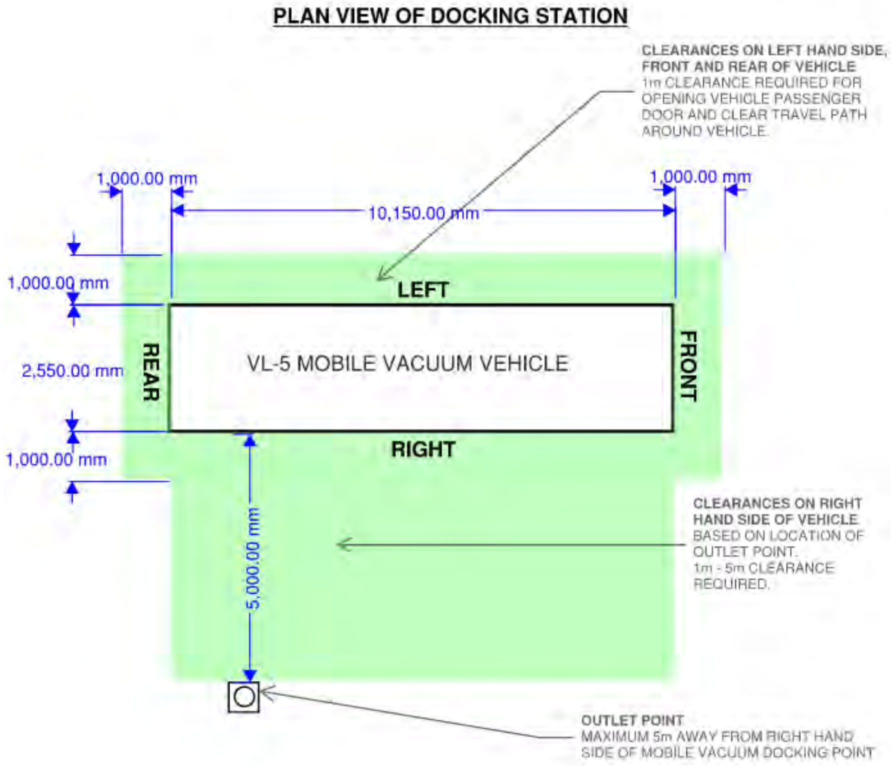


Figure 5.12.1 Dimensional Setout of RVAC Docking Station

Purpose built outlet points are provided for the mobile vehicle to connect in to the LAWCS. The outlet points can be raised, located at ground level as shown in the figure below or below ground level based on the location of the site.

If the outlet point cannot be placed within the site boundary it may be located on public land if approved by RCC. All outlets shall have a lockable cover.

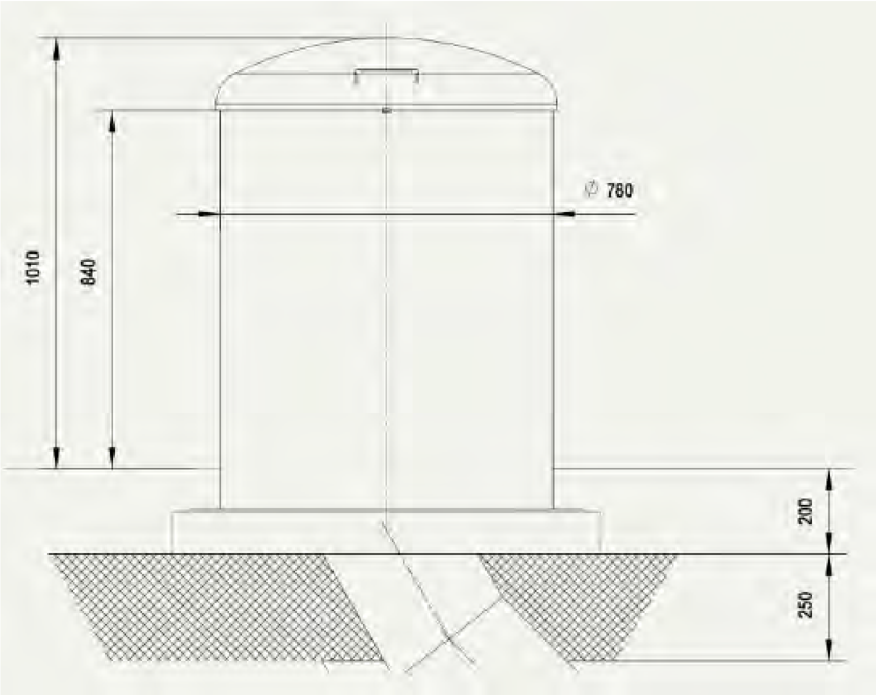


Figure 5.12.2 Typical Outlet Point Dimensions (Source Aerbin)

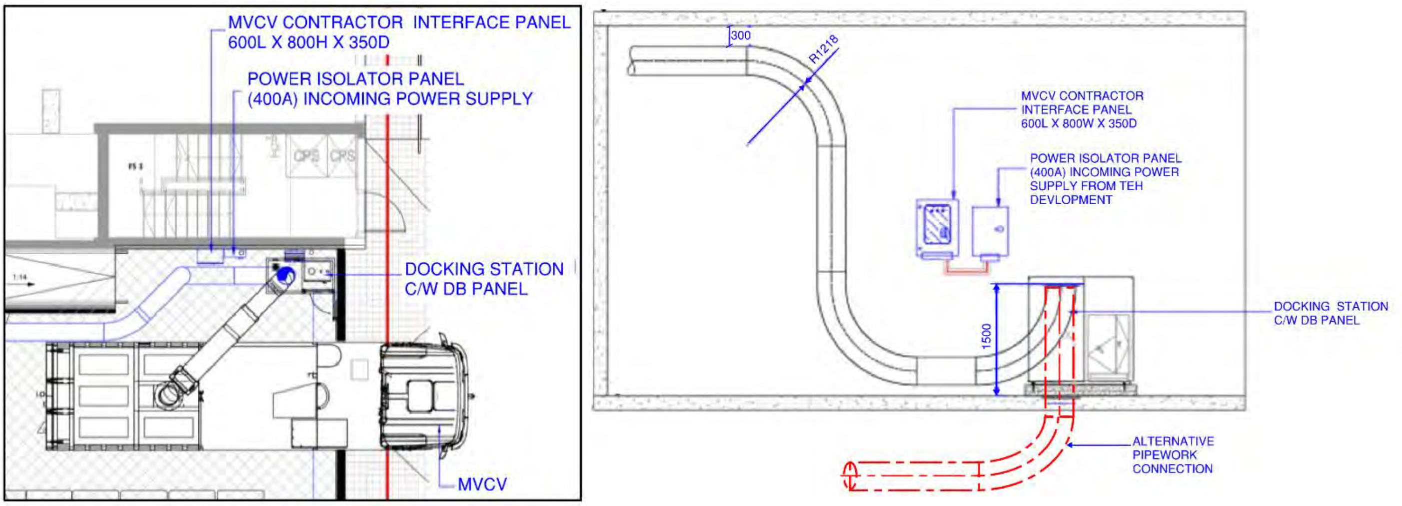


Figure 5.12.3 Connection for MVCV to Docking Station (Source RVAC)

The dockings points are strategically located considering the following:

1. Adequate spatial provision for vehicle and associated clearances.
2. Mobile vacuum vehicle travel and swept paths. The vehicle must be able to drive through and turn around at the docking point locations. Narrow alley ways or courtyards are not suitable docking point locations.
3. Reducing vehicle travel path leading to reduced carbon emissions and reduced traffic. Location of multiple docking points served by the same vehicle should be assessed to ensure efficient travel paths.

4. Maximum pipework length from storage locations to outlet point. The maximum suction distance of the vehicle is 200m.

5. Safety. Location of docking points should be away from high traffic and busy pedestrian areas. Locating docking points away from main roads allows for reducing risk of accidents with other motor vehicles and pedestrians.

6. Odour and noise from the mobile vehicle. Proximity to residents and other building occupants should be assessed.

7. Vehicle weight at full capacity. The travel path must be able to accommodate the vehicle weight at full capacity at all locations.

8. The number of developments which can be served by one docking point, which depends on the property type, number of waste streams, number of households per tank and other site specific constraints.

The location of the docking point must be agreed with RCC.

5.13 Mobile Vacuum Collection Vehicle and Clearance Requirements

The Mobile Vacuum Vehicle dimensions are provide as follows:

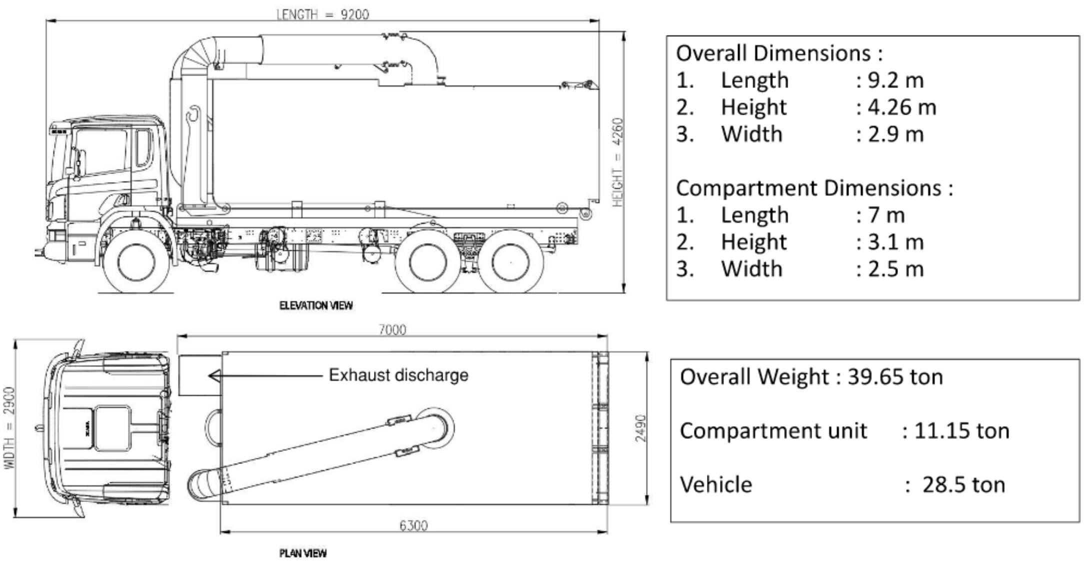


Figure 5.13 Mobile Vacuum Collection Vehicle Dimensions (Source RVAC)

During operation a height clearance of 5 metres shall be provided to allow movement of the connection from the vehicle to the outlet point.

5.14 Collection Frequency

Waste storage tank sizes shall be selected based on weekly collection for waste and food organics, and fortnightly collection for recycling.

6 System Operation

The operational sequence for a LAWCS is as follows:

1. Waste disposal at inlet points

2. Waste falls into storage tanks
3. MVCV controlled collection
4. Airflow is generated by opening the air intake valve at the upstream of the pipeline
5. Discharge valve for each tank of the waste stream being collected opens (1 tank at a time)
6. Waste sucked into MVCV
7. Odour from transport air treated by filtration system built into the MVCV
8. Exhaust air discharge from MVCV to surroundings

The control signals for a LAWCS is as follows:

1. All inlet points on all floors for each waste stream are able to be openable for disposal of waste by users. A green light signal is displayed indicating the inlet is available for disposal of waste.
2. An ON signal is sent to the system prior to the emptying of the waste stream. This signal locks all loading doors associated to the waste stream being transported, shuts off the exhaust fan and displays a red light signal on each inlets of the associated waste stream. If any inlets are open, the system will wait until they are closed to begin the emptying process.
3. The waste stream is emptied from the system.
4. Once the emptying process is completed, the valves of the waste stream open, and a signal is sent back to all the inlet points of that waste stream.
5. 5 seconds after the signal is sent, the exhaust fan operation resumes and a green light at the inlet is displayed, indicating the inlet is available for use.

The LAWCS supplier and the Developer's electrical contractor shall provide the required relay signals to achieve system operation described about. The electrical contractor shall complete all the system interfacing.

7 LAWCS vs Business As Usual

Table 7 Comparison of conventional waste collection and LAWCS

	Conventional Truck Collection Method	LAWCS With Mobile Vacuum Vehicle
Main system components	- Inlets, waste chutes, garbage rooms within building or externally.	- Inlets, waste chutes, storage tanks within building or below ground externally, underground pipe network.
Building requirements for garbage collection	- Bin collection areas in basement ,ground level or kerbside and in reasonable proximity to the vehicle entrance. - Truck access to basement level required otherwise bin lifter to ground floor to be provided. - Bins must have a clear path from garbage rooms to kerbside for collection. - Waste room layout to be designed to encourage easy recycling and separation of waste types by users. - A minimum height clearance of approximately 4 metres, width of 3.6m and turning circle for waste collection vehicle. - Minimum garbage room area requirements specified by Council (based on development type and size).	- Storage tank rooms required at lowest floor in building if internal inlets are provided. Access for maintenance to room required but no requirement to remove waste or tanks from the room. - No internal building spatial requirements if inlets are all located externally. - No access by waste collection vehicles required within the property boundary. External docking point serving one or multiple buildings can be provided instead.
Impact on urban image	- Aesthetic impact when bins are located externally on street before/after collection. - Waste collection vehicles will drive through high traffic and public areas as the location of collection points for waste must be located wholly within the boundary of the development. - Bins need to be presented for collection and taken back to storage room after collection	- Aesthetic benefit from having no bins located on street or externally. - Flexibility with docking station location means urban image is improved by strategically locating docking points away from public areas.
Hygiene and odour	- Potential for waste overflow on streets or in garbage areas leading to odour and vermin. - Opening and closing of bins, and transportation of bins to street and truck requires physical contact with bins which is unhygienic and can lead to the spread of bacteria.	- No odour contamination as waste streams are completely sealed and ventilated. - No overflow provided users dispose of waste correctly, as storage tanks and collection frequency are based on actual disposal rates. - Use of a swipe card or hand-wave signal to open up inlets means waste disposal can be contact free. - No contact with bins required during waste collection, only connection from mobile vacuum vehicle arm to system

		outlet is required, therefore improving hygiene and reducing spread of bacteria.
Security	- Risk of vandalism. - Bins can be a terrorist target.	- Reduced security threats having a completely contained system. For additional security inlets can be fitting with automatic locking mechanisms which can be initiated remotely from a control system or by a swipe card.
Relies on users taking bins out	- Relies of users to take out different waste stream bins on certain days and certain times for waste collection. Forgetting to do so may lead to bin overflow until the next collection frequency.	- No reliance on users taking bins out on a certain day at a certain time as the system operates 24/7 with schedule collection frequencies.