

CODE OF PRACTICE ON ENVIRONMENTAL HEALTH



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INTRODUCTION

The Code of Practice on Environmental Health (COPEH) provides the guidelines to address environmental health concerns in the design of buildings. The Code spells out the objectives to be met and stipulates only the minimum basic design criteria. In this way, Qualified Persons (QPs: Architects or Professional Engineers) may exercise flexibility and creativity in the design to meet the stated requirements without compromising functional and maintenance needs. So long as design outcomes satisfy the stated objectives, the building plans will be deemed to have complied with the COPEH. Notwithstanding this, the QP shall be fully responsible for safety, effectiveness and all other aspects of the design.

**Director-General of Public Health
National Environment Agency
Singapore**

1 REFUSE STORAGE AND COLLECTION SYSTEM

1.1 Objective

The refuse storage and collection system shall be mechanised where possible and designed so as not to cause nuisance to occupants and neighbouring premises, and to prevent pollution to the environment. All facilities provided shall be adequately sized to meet the anticipated refuse output.

1.2 Refuse Output

- (a) The refuse output for the various categories of premises shall be computed as follows:

Category of Premises	Refuse Output (litres/day)
Office	15 per 100 sq m gross floor area
Hotel / dormitory	10 per 100 sq m gross floor area
Shop / trade premises	30 per 100 sq m gross floor area
Supermarket / market /department store	100 per 100 sq m gross floor area
Restaurant / eating house /food centre / canteen	200 per 100 sq m gross floor area
Residential premises	20 per dwelling premises
Petrol station	300 per premises

- (b) Where a proposed development has a combination of different types of premises (for example, a shopping complex with offices, residential premises and a food centre), the total refuse output shall be the sum of the outputs of each category of premises.

1.3 Refuse Chute

Refuse chutes shall be provided for residential buildings and buildings with residential component taller than four (4) storeys so that occupants need not have to bring their refuse into lifts or walk down the stairs with it. Refuse chutes shall meet the following requirements:

- (a) The refuse chute shall be made of reinforced concrete with cross-sectional area of at least 0.3 sq m.
- (b) The chute shall terminate at the roof of a building. The chute shall be ventilated at the top with at least two openings of not less than 0.1 sq m each. This top section of the refuse chute shall be accessible from the common area to facilitate maintenance.
- (c) If the roof is to be used as a roof terrace/garden, particular attention shall be paid to the siting of the refuse chute, the location of its openings and the maintenance requirements so as not to cause any smell nuisance. Ventilation openings shall be located at least 2.1 m above roof level.

- (d) There shall be a system to wash and flush the whole length of the chute. The control valve for the flushing system is preferably located at the chamber level. The system shall be designed for manual activation of flushing and automatic de-activation.
- (e) Where a centralised refuse chute is provided, the hopper shall be sited as far away as possible from residential dwelling units and not be facing the entrance of the units. The hopper shall be screened when this requirement cannot be achieved.

A refuse chute chamber or room shall be built at the bottom of the refuse chute. As the refuse chambers are smaller than refuse room, a refuse bin point or refuse bin centre with additional storage for the refuse shall be provided within the development. The refuse collection vehicle collects the refuse from the bin point or bin centre. Conversely, refuse rooms are larger than refuse chamber and designed with the full refuse storage capacity, and refuse is collected directly from the refuse rooms by refuse collection vehicle.

1.4 Refuse Chute Chamber

The refuse chute chamber shall be suitably located to facilitate easy and nuisance-free conveyance of refuse. The refuse chute chamber shall meet the following requirements:

- (a) The chamber shall be designed to house a SS EN-840 standard wheeled refuse bin which can contain at least one (1) day of refuse output from all the premises connected to the chute. The refuse bin shall have a maximum capacity of 660 litres. In the event where it is not possible to provide storage for one day of refuse output even with the largest 660-litre bin, the refuse in bin shall be cleared more frequently as required to prevent spillage of refuse within the refuse chamber. However, the total daily refuse output from all the premises connected to the chute shall not exceed 1,980 L.
- (b) The refuse chute chamber's walls shall be lined with tiles or other smooth, impervious materials.
- (c) The refuse chute chamber's floor shall be recessed at least 100 mm below the apron area and graded towards a gully connected to a sewer.
- (d) The maximum gap between the termination point of the refuse chute and the top of the refuse bin shall be 200 mm.
- (e) An airtight non-corrosive flap door shall be provided for access to the refuse chute chamber.
- (f) A refuse bin point or refuse bin centre shall be provided. The combined refuse storage capacity of the bin point or bin centre and all the refuse chute chambers shall be sufficient for at least two (2) days of refuse output of the development.

1.5 Refuse Room

The refuse room shall house a mechanical refuse handling equipment, e.g. a dust-screw or any other enclosed fixed system. Refuse collected in the refuse handling equipment

is conveyed directly into a refuse collection vehicle, which backs up into the refuse room. The refuse room shall meet the following requirements:

- (a) The refuse room shall be large enough to accommodate two (2) days of refuse output from all the premises connected to the refuse chute.
- (b) The vehicular service road to the refuse room shall be free from obstruction and such that the refuse collection vehicle can make a three-point turn within the premises to back up into the refuse room. To facilitate this, the refuse room floor and vehicular service road shall be of the same level with a setback distance of at least 13 m in front of the refuse room. The swept path of the refuse collection vehicle shall meet the minimum required turning radius of 9 m and the distance required to reverse into the refuse room shall also be minimised.
- (c) The refuse room's walls shall be lined with smooth tiles or other smooth impervious materials.
- (d) The refuse room's floor shall be graded towards a gully/floor trap connected to the sewer.
- (e) A water tap shall be provided in accordance with the latest Public Utilities (Water Supply) Regulations and Singapore Standard 636: Code of Practice for Water Services. The water tap shall be securely locked to prevent unauthorised use.
- (f) The refuse room shall be rendered pest-proof against birds, rodents and insects.
- (g) The refuse room shall be provided with a roller shutter door with a clear width of 3.4 m and clear height of 4 m.

1.6 Refuse Bin Point and Refuse Bin Centre

Developments not adopting the Refuse Room system i.e. those with or without refuse chambers shall be provided with either a bin point or a bin centre within the premises. Refuse collections shall be carried out only from within the premises. A bin centre shall be provided if refuse output exceeds 1,000 litres/day.

For developments adopting the Refuse Chute Chamber system, the combined refuse storage capacity of the bin centre or bin point and the refuse chute chambers shall be sufficient for at least two (2) days of refuse output of the development. For developments without refuse chute chambers, the bin centre or bin point capacity shall be sufficient for at least two (2) days of refuse output of the development.

The bin centre shall meet the following requirements:

- (a) The bin centre shall be sited so as not to cause a nuisance to neighbouring premises, and be accessible to a refuse collection vehicle. An adequate turning area shall be provided where necessary to accommodate the various sizes of refuse collection vehicles available in the market. Refuse collections shall be carried out only from within the premises.

- (b) The bin centre shall be designed for access of SS EN-840 standard wheeled bins from within the development. Sufficient space shall be provided for washing and manoeuvring of refuse bins within the bin centre.
- (c) The bin centre's walls shall be lined with smooth tiles or other smooth, impervious materials.
- (d) The bin centre's floor shall be graded towards a gully/floor-trap connected to the sewer.
- (e) The bin centre shall be provided with a roof with no gutters. The roof shall have an adequate gradient to prevent water stagnation and mosquito breeding.
- (f) The bin centre shall be adequately ventilated and rendered pest-proof against birds, rodents and insects.
- (g) The bin centre's entrance and ventilation openings shall face away from any residential premises in the vicinity. Aesthetic screening shall be provided where practical, so as not to cause a nuisance to neighbouring premises.
- (h) An access walkway of at least 1 m clear width around all items in the bin centre shall be provided.
- (i) Where the daily refuse output of the premises is less than 4,000 litres, SS EN-840 wheeled bins can be used for storage of refuse in the bin centre.
- (j) Where the daily refuse output of the premises is 4,000 litres or more, an enclosed roll-on roll-off (RORO) compactor/container, dust screw compactor or a rotary drum system shall be provided. The type of system to be provided depends on the refuse composition and the amount of refuse output from the premises. The RORO compactor/container provided shall be designed in accordance with DIN 30722. The following additional design requirements of the bin centre shall apply:
 - i. The required roller shutter opening of the bin centre shall be 4 m (clear width) by 5 m (clear height).
 - ii. A 5 m clear height shall also be provided in front of the entrance when a RORO compactor/container or any other refuse storage system that requires haulage is provided.
 - iii. A setback distance of at least 13 m shall be provided to ensure that the bin centre is accessible to refuse collection vehicles. The swept path of a refuse collection vehicle from the main or service road to the bin centre shall meet the minimum required turning radius of 9 m and also be free of obstructions.
 - iv. The bin centre floor level shall be at the same level as the vehicular access road and the RORO compactor/container shall be resting on the bin centre floor.
 - v. The distance for refuse collection vehicles to reverse into the bin centre shall be minimised. A guide of the layout of a bin centre is shown **Appendix 1A**.

- vi. If bin lifter is used, there shall be sufficient space to enable the bin lifter to operate the bin properly.
- vii. When there are more than 1 RORO compactor/container in the bin centre, the minimum separation between the adjacent compactor/containers shall be 0.5 m.
- viii. The orientation of RORO compactor/container's tail gate shall face the inside of the bin centre.
- ix. Floor markings shall be provided in front of the entrance of the bin centre to guide the refuse collection vehicle when reversing during operation.

Where a bin point is provided, washing points and water taps are not required and the bin point need not be connected to the sewer. The bin point shall have a pleasant architectural appearance and be sited so as not to cause a nuisance to neighbouring premises.

1.7 Pneumatic Waste Conveyance System (PWCS)

All new strata-titled properties with 500 or more residential dwelling units for which development applications are submitted to URA from 1 April 2018 onwards shall be provided with a PWCS. Applicants shall provide a copy of URA's Provisional Permission in their DC application to NEA.

Where a PWCS (i.e. stationary vacuum system or vacuum truck system) is provided, the following requirements shall be complied with:

- (a) For refuse chute which are square, the cross-sectional area of the chute shall be not less 0.3 sq m. For refuse chute which are round, the minimum internal diameter of the chute should not be less than the diameter of 600 mm. The refuse chute shall be made of reinforced concrete material.
- (b) The opening of the chute hopper is to be fully volume-controlled to restrict large or long items from entering the chute (see **Appendix 1B**). The chute hopper shall be adequately sized to accommodate bagged waste of size 300 to 350 mm measured in any angle. These features will allow the disposal of bagged waste of typical sizes, and prevent oversized waste from choking the hopper and the chute.
- (c) Sensors and monitoring equipment shall be provided to monitor the refuse collected at the refuse chute and activate the discharge cycle to convey the refuse to the bin centre to prevent excessive piling of refuse within the refuse chute.
- (d) Inspection openings shall be provided at intervals of not more than 50 m along straight sections, and at locations of the PWCS conveyance pipe network where refuse is likely to accumulate and block the conveyance pipe, including, but not limited to, pipe connections and bends in the conveyance pipes.
- (e) The ventilation, air intake and air outlet units shall be sited so as not to cause any noise or smell nuisance to neighbouring premises or residents of the premises served by the PWCS.

- (f) The system shall be designed so as not to cause any noise nuisance to residents of the premises served or neighbouring premises when it is operated.
- (g) Dust and odours shall be removed from the air that conveys the refuse before the air is discharged into the atmosphere. Measures to remove dust and odours include, but are not limited to the following:
 - i. Dust and deodorising filters shall be provided to filter dust and foul odours from the air conveying the refuse before the air is discharged to the atmosphere.
 - ii. The type and quantity of filters provided shall be appropriate and sufficient to treat all air exhausted from the PWCS system.
 - iii. The filters shall efficiently filter the air without affecting system performance and in an energy efficient manner.
 - iv. All filter media shall have a life span of no less than six (6) months between replacements.
 - v. In addition to the filters, an Odour Treatment System shall be provided to treat the air such that the discharged air from the exhaust air outlet or bin centre does not cause smell nuisance to residents.

The discharge point shall also be located at the highest level possible and pointed away from residential dwelling units and commercial spaces within and surrounding the development.

- (h) A PWCS bin centre shall be provided for stationary systems. The PWCS bin centre shall be designed to meet the same requirements stated in **Section 1.6**. The refuse storage capacity in the bin centre shall be sufficient for storage of at least two (2) days of refuse output of the development. The PWCS refuse container shall be designed in accordance with DIN 30722.
- (i) For vacuum truck systems, the size of the intermediate storage area shall be sufficient for the storage of at least two (2) days of refuse output. The requirements stated in **Section 1.6** shall still apply so that a proper storage facility within the development is available in the event that the vacuum truck is not available for collection.
- (j) The bin centre shall be accessible to refuse collection vehicles, and be so sited so as not to cause nuisance to neighbouring premises. The design requirements for the bin centre as stated in **Section 1.6 (j)** shall still apply.
- (k) A communications system shall be incorporated into the system to automatically and immediately alert the management and appointed service provider of any faults or breakdowns detected in the system so that repair work can be promptly arranged.
- (l) The complete system including the exhaust air treatment system shall be designed for ease of maintenance.

- (m) The electrical and electronic components (including the Programmable Logic Controller) shall use Original Equipment Manufacturer (OEM) parts.
- (n) The design of the PWCS shall comply with the latest Singapore Standard SS 642: Code of Practice for Pneumatic Waste Conveyance System.

1.8 Mandatory Waste Reporting Scheme

Developments required to report their waste data may make their own provisions to weigh their refuse by installing in-house weighing systems e.g. by fitting their dust drum system with load cells and weighing system. Alternatively, they may engage the services of general waste collectors who may provide weighing records from on-board truck weighing systems or weighbridge records from incineration plants.

1.9 Location of Grease Trap

- (a) Grease trap shall be installed and sited at suitable location that allows for easy access to facilitate maintenance, not give rise to public health, noise and hygiene problems during operation and maintenance, and be accessible for the transfer of greasy waste directly into Class C waste collection trucks without double transfers. Road access and vehicle parking shall be made available within the development for the Class C waste collection trucks so that the collection trucks are not more than 10 m away from the grease traps to facilitate suction of the greasy waste into the trucks' waste collection tanks.
- (b) For food shop located in development with no internal access roads, the grease traps shall be located close to external road access with vehicle parking for the temporary stationing of Class C waste collection trucks not more than 10 m away from the grease traps.
- (c) Where portable greasy trap is permitted and installed within the food shop, road access and vehicle parking shall be made available for the Class C waste collection trucks to be not more than 10 m away from the building in which the food shop is located.

1.10 On-Site Food Waste Treatment System

All new commercial and industrial premises that meet the thresholds stated in the table below are required to allocate space for on-site food waste treatment system. The requirements shall apply to new development applications submitted to URA from 1 January 2021 onwards. Applicants shall provide a copy of URA's Provisional Permission in their DC application to NEA.

Types of premises		Thresholds (Gross Floor Area)
Commercial	Shopping Malls	F&B Area ¹ > 3,000 sq m
	Hotels	Function + F&B Area >3,000 sq m
Industrial	Single User Factories (SUFs)	Large food manufacturers ² (i.e. Operation area > 750 sq m) <i>Premises which are solely used for specific trade activities³ can be excluded from the requirement. An exemption request along with the necessary documents shall be submitted to NEA for checks. Elaboration shall also be provided to support their request when required by NEA.</i>
	Multi-User Factories (MUFs)	At least 1 large food manufacturer (i.e. Operation area > 750 sq m) Or GFA > 20,000 sq m and > 20 food tenants (i.e. food manufacturers and food caterers)

Building plans of all affected premises shall be submitted. The plans shall clearly demarcate the allocated area for on-site food waste treatment system.

Premises where homogenous food waste is segregated for recycling into animal feed may be exempted from the requirement to set aside space for on-site food waste treatment. An exemption request along with the necessary documentations shall be submitted to NEA for verification.

The space set aside for on-site food waste treatment must meet the following requirements:

- (a) The space shall be sited in the building or within the premises on which the building is situated. Possible areas include the refuse bin centre or a dedicated food waste treatment room.
- (b) The size and layout of the space set aside shall be designed to support the implementation of the on-site food waste treatment system including:
 - i. For mandated premises (i.e. premises that meet the respective thresholds stipulated in the Resource Sustainability Act), the minimum space required for the on-site system, including space for service and maintenance works of the treatment system and access of SS EN-840 standard wheel bins is 25 m² (e.g. 5.0 m by 5.0 m for a square space). For all other premises, the space to be set aside will depend on the specific on-site system to be installed.

¹ Gross floor area set aside for supermarkets located in shopping malls will count towards the computation of F&B area of said shopping malls.

² As licensed under Singapore Food Agency's Licence to operate a food processing establishment

³ Manufacturer of spices, dried foodstuffs, additives, bottled water, high pressure processing

- ii. If a bin lifter system is employed, there shall be sufficient height clearance to enable the bin lifter to handle the bin properly.
- (c) Where the space is located within the refuse bin centre, the space set aside for said food waste on-site system shall concurrently comply fully with requirements outlined in **Section 1.6**.
- (d) Provisions shall be made for the effluent (if any) from the food waste treatment system to be discharged into the sewer through a grease trap.
- (e) Where a dedicated food waste treatment room is provided, the following additional design requirements shall apply:
 - i. The floor shall be graded towards a gully connected to the sewer.
 - ii. The room shall be adequately ventilated and rendered pest proof against birds, rodents and insects.
 - iii. The room shall not pose any pest or odour nuisance or any pollution concerns to occupants, neighbouring premises and/or the public.
 - iv. Additional space for a washing point to wash refuse bins. The water tap provided for washing shall be in accordance with the latest Public Utilities (Water Supply) Regulations and Singapore Standard 636: Code of Practice for Water Services.
 - v. The entrance and ventilation openings/exhaust discharge shall face away and be aesthetically screened from any neighbouring premises in the vicinity.

2 PUBLIC TOILET

2.1 Objective

The public toilets shall be designed to withstand heavy usage. Ventilation is therefore important. The design shall also take into consideration ease of maintenance and should facilitate proper toilet use and personal toilet hygiene. There shall be adequate provision of toilet facilities for premises provided with public toilet. Owners/occupiers should ensure that sanitary and water fittings, amenities and ventilation systems are adequately maintained.

2.2 Definition of Public Toilet

2.2.1 A public toilet is defined as a toilet within premises which the general public has free access, regardless of payment/ non-payment to access the premises. The general public is free to access the public toilet without having to be a resident, student, staff, member or a guest, or a regular client. Toilets in the following places are classified as public toilets:

shopping mall or centre, including the floor in commercial buildings with shops;
supermarket and wet market;
eating establishment and food centre (restaurant, coffeeshop, hawker centre, food court)/ bar/ nightclub/ discotheque/ pub;
conference hall/ cinema/ theatre/ convention hall/ exhibition hall;
park/ park connector;
bus terminal/ interchange;
petrol station;
MRT station;
stadium; and
public swimming pool.

QPs are also encouraged to adopt the guidelines stipulated within, for toilets within premises without free access to the general public (e.g. condominiums, terraced workshops, places of worship, etc.).

2.2.2 Although construction sites are not freely accessible to the public, sanitary facilities in a construction site shall be provided in accordance with the requirements stipulated in **Appendix 2**.

2.3 General Design Criteria

The general design requirements for public toilet shall be as follows:

- (a) Wall finishes shall be of materials which are impervious and durable such as ceramic tiles and phenolic panels to facilitate cleaning.
- (b) Floors shall be constructed of waterproof non-slip surfaces like ceramic tiles, natural stone, homogeneous tiles or other impervious materials to facilitate cleaning.
- (c) The toilet's main entrance shall preferably have no door and with a labyrinth entrance, and the cubicles, urinals and mirrors shall be away from the line of sight

from the main entrance. Toilets with sufficient space that are unable to incorporate labyrinth entrances are recommended to install hands-free or sensor-operated doors.

- (d) The minimum lighting level shall be 300 lux to ensure that areas with water closets, wash basins and urinals are sufficiently illuminated. QPs should incorporate the usage of natural lighting where feasible, e.g. outdoor venues, top floor of buildings with open concept, etc.
- (e) All toilet cubicles shall be at least 900 mm wide and 1500 mm deep.
- (f) Cubicle partitions shall be of rigid design and wall or ceiling hung, where practical, without leg support for easy cleaning of the floor.
- (g) Design symmetrical layout concept for toilet, where space is available, so as to reduce disruption to toilet usage during cleaning maintenance e.g. allow half of the toilet to be closed for maintenance while keeping the other half open for use.

2.4 Sanitary and Water Fittings Required in Public Toilet

Sanitary and water appliances and fittings installed in public toilets shall be of heavy-duty classification and quality and shall be easily-cleaned. Water fittings shall comply with the relevant standards and requirements stipulated under the latest PUB S&R*, and their installation shall be in accordance with the latest Public Utilities (Water Supply) Regulations and Singapore Standard 636 – Code of Practice for Water Services. For water fittings and appliances covered under PUB’s Mandatory Water Efficiency Labelling Scheme, only models which are registered under the Scheme shall be installed. The PUB S&R and list of registered MWELS products can be found in PUB’s website at www.pub.gov.sg. This includes the amount of water per flush in urinals and water closets, waterless urinals, flow rate for self-closing delayed-action sensor type taps etc.

Where sanitary and water provisions are to be made for persons with disabilities and families with young children, such provisions shall be in accordance with the requirements stipulated in BCA's “**Code on Accessibility in the Built Environment**”. Sanitary facilities for premises are to be provided in accordance with the requirements stipulated in **Appendix 2**. These facilities provided are over and above the BCA's requirements with regard to the provisions of accessible toilet, family toilet, child-friendly toilet and child-friendly wash basin.

A glossary of the terms used in this section is given in **Appendix 5**.

*PUB’s Stipulation of Standards & Requirements for Water Fittings for Use in Potable Water Service Installations.

2.4.1 Number of sanitary fittings

- (a) The number of public toilets and sanitary fittings to be provided in buildings accessible to the general public is given in **Appendix 2**. The numbers of facilities provided are minimum requirements and QPs should design the toilets to ensure sufficient facilities are provided based on the expected toilet use during peak hours.

- (b) Owners/occupiers should also provide sufficient sanitary facilities based on anticipated usage, for toilets that fall out of the categories of places mentioned in **Appendix 2**.
- (c) Where there are public toilets within the building where a food shop is located, the provision of a toilet within the food shop is not necessary. Otherwise, the number of toilets and sanitary fittings provided shall be in accordance with the requirements in **Section 2** and **Appendix 2**.

2.4.2 Water closets

- (a) Pedestal type water closets shall preferably be wall hung, without leg support, so as to facilitate cleaning.
- (b) Each water closet shall be fitted with a sensor-operated flush valve and coupled with manual by-pass and manual override.
- (c) A water closet with a bidet fixture shall be provided within at least one cubicle of the toilet.
- (d) For cubicles where water closets with bidet fixtures or water tap points with spring loaded nozzle are provided, the cubicle floor shall be properly graded towards the gully/floor trap within the cubicle. Scupper drains with metal grating shall preferably be installed within the cubicle to facilitate the draining off of water. For such cubicles, there shall be signage on the cubicle door indicating the provision of the water closet with a bidet fixture. Signage is not required for toilets where all cubicles are provided with the water closet with a bidet fixture.

2.4.3 Urinals

- (a) Each urinal shall be fitted with a sensor-operated flush valve with manual override feature.
- (b) Where a waterless urinal is installed, it shall be maintained in accordance with manufacturer's instructions and not cause any odour nuisance.
- (c) There shall be a scupper drain underneath the urinals along the wall where urinals are installed, to facilitate the removal of dripping during cleaning of the floor. The width of the scupper drain should not be more than 150 mm.
- (d) Individually wall-hung full length urinal units shall be installed to facilitate use for different users and to reduce urine drip onto floors. It shall be at least 300 mm wide and the lip of the collection area shall project from the wall by at least 300 mm.

2.4.4 Wash hand basins and taps

- (a) Wash hand basins shall be installed such that there is sufficient gradient to allow dirty and debris to be effectively washed into the drain pipes. Flat-bottomed basins should not be installed.
- (b) Wash hand basins shall be under-counter. Other designs are allowed, provided that they can minimise the problem of water spilling over from the basin to the

counter. For basins that sit on top of the counter or are stand-alone, these shall be deep enough to prevent water splashing out of the basins when in use. The water discharge point from the wash hand basin tap shall also be of a sufficient height above the bottom of the wash hand basin to prevent contact of hands with the basin.

- (c) All wash hand basin taps shall be sensor taps with self-closing delayed-action feature with flow rate of 2 litres/min (with tolerance of ± 0.2 litre/min) and a fixed pre-set flow timing of 60 seconds (with tolerance of ± 5 seconds) and water supply shall be automatically cut-off when hands are moved away from beneath the tap, whichever is earlier. To ensure that one tap remains functional during power supply outage, one tap per toilet block shall be a battery-operated or chargeable battery-operated sensor type tap.

For toilet block provided with only one wash hand basin, only a self-closing delayed-action mechanical type tap shall be installed.

- (d) Wash hand basins should also be provided for public toilets located at common areas.
- (e) In food retail outlets where toilet facilities are provided, wash hand basins shall preferably be provided outside the toilet. Wash hand basin taps shall comply with the requirements in clause c of **Section 2.4.4** of the COPEH.

2.5 Amenities to be Provided

- (a) Liquid soap or foam soap dispenser

One soap dispenser shall be provided for every two count of wash hand basins, subject to a minimum of one. The dispenser shall be positioned directly above and at least between every two wash hand basins. The dispenser shall have a transparent window so that the level of soap in the dispenser is clearly visible. The soap dispenser shall be filled with liquid or foam soap at all times.

- (b) Hand-dryer blower or paper towel dispenser

One electronic hand-dryer or paper towel dispenser shall be provided for every two count of wash hand basins, subject to a minimum of one. The electronic hand-dryers shall be positioned immediately next to the wash hand basins where practical, and located away from toilet cubicles. Where paper towel dispensers are provided, they shall be positioned directly above and at least between every two wash hand basins. Paper towel dispensers are recommended in toilets frequented by immuno-deficient persons and where infection control is critical.

- (c) Litterbins

A minimum of one litterbin shall be provided directly below or in close proximity to the wash hand basins. A separate sanitary bin for the disposal of sanitary pads shall be provided in each WC cubicle in the female and unisex toilets. Bins shall always be covered and operated without hand contact e.g. foot pedal or electronic motion sensor devices.

- (d) Toilet paper holder
A jumbo paper toilet roll holder or a toilet tissue dispenser of similar capacity shall be installed in each WC cubicle.
- (e) Cleaner's sink with tap-point
A dedicated sink with tap-point for maintenance personnel to clean public toilets shall be provided within or in close proximity to each toilet block, where practical.

2.6 VENTILATION

- (a) The toilet shall be well-ventilated by natural or mechanical means to remove odours and to keep floors dry. Where mechanical means are used (i.e. extractor/exhaust fan), the air exchange rate shall have a minimum of 20 air changes per hour. Service access ducts, if fully enclosed, shall be connected to the mechanical ventilation system. Ventilation for toilets with natural ventilation shall be provided by means of one or more openable windows or other openings with an aggregate area of not less than 5 % of the floor area of the toilet.
- (b) The exhaust system shall dispel the air directly outdoors without causing any nuisance to neighbouring premises.

Note: While this Code stipulates the minimum basic design criteria, QPs are encouraged to refer to Restroom Association (Singapore)'s publication <A Guide to Better Public Toilet Design and Maintenance> for further reference on good examples of toilet design.

3 VENTILATION, DUCTING AND KITCHEN EXHAUST SYSTEMS FOR FOOD SHOP

3.1 Objective

This section addresses the design criteria for kitchen exhaust ducting and systems of foodshop(s) at building plan and pre-operation (pre-licensing) stages.

3.2 Design Requirements

Qualified Person(s) shall adopt the following design siting requirements at building plan stage.

- (a) The fumes from the kitchen exhaust system shall be exhausted above the roof and not face in the direction of adjacent buildings. Where it is not practical to exhaust the fumes at or above the roof, an alternate location of the discharge point in the outdoors may be selected, and not face in the direction of adjacent buildings.
- (b) Consideration shall be given to aesthetic aspect of the exhaust outlets, particularly when it is sited near residential premises. Suitable aesthetic screen design shall be provided to screen off the kitchen exhaust duct and exhaust outlets from view of nearby neighbouring premises and the public.
- (c) Kitchen exhaust outlets shall be sited more than 5 m from all edges or structures of cooling towers.

3.3 Operations Requirements

Licensee(s) shall ensure the following requirements are met in accordance to the pre-licensing requirements, prior to operations.

- (a) All fumes from the cooking range shall be extracted immediately and treated with an air cleaning system. The air cleaning system shall capture particulate matters, grease, oil and water vapour with no visible smoke and fumes exhausting.
- (b) The treated air is to be exhausted outdoors by a hood and flue or other extractor fan system above the roof and not face in the direction of adjacent buildings. Where it is not practical to exhaust the fumes at or above the roof, an alternate location of the discharge point in the outdoors may be selected, and not face in the direction of adjacent buildings.

3.4 Other Requirements and Guidelines

The following are references(*) for Qualified Persons and licensees to refer to.

- (a) Singapore Civil Defence Force's Code of Practice for Fire Precautions in Buildings: The entire (interior and exterior) exhaust duct and kitchen hood shall be degreased and cleaned at least once every 12 months. The work shall be carried out by a specialist and the records of cleaning and degreasing shall be kept by the owner/operator for verification by the authority having jurisdiction.

- (b) Singapore Standard's SS 553: Code of Practice for Air-Conditioning and Mechanical Ventilation in Buildings: Guidelines on kitchen ventilation and maintenance of kitchen exhaust system.

(*): As the descriptions/requirements/guidelines may be subjected to change, the Qualified Person(s) and licensees should always refer to the prevailing regulatory requirements, code of practices, standards and guidelines.

4 COOLING TOWER

4.1 Objective

This section serves to provide the minimum design criteria for siting of cooling towers at building plan submission.

4.2 Design Requirements

A qualified person (QP) shall ensure the following design siting requirements are complied with.

- (a) The cooling tower shall be located at least 5 m from any air circulating and ventilating inlet, openable window and occupied area, pedestrian thoroughfare, trafficable area and any other areas of public access.
- (b) The cooling tower shall also be located at least 5 m from any kitchen exhaust discharge outlet, air handling system or other areas where nutrients conveyed from these systems could assist in the growth of Legionella bacteria in the cooling tower system.
- (c) On the measurement point for the minimum 5 m setback distance, this 5 m distance shall include measurement from the nearest edge or structure of the cooling towers, including the base/basin/sump, packing exhaust and outlet point of exhaust hood, if any is installed. Please see **Appendix 4** for a typical example showing the 5 m setback measurement.
- (d) All access routes such as doorways leading to the areas that is within the 5 m setback distance of the cooling towers, should have a clear signage to inform and deter public from entry and accessible only by cooling tower maintenance staffs who understand the risk of *Legionellosis* and will work in accordance to their safe work procedures based on their risk assessment done.

5 AQUATIC FACILITY

5.1 Objective

This section serves to provide the minimum design criteria to address public health concerns for regulated aquatic facilities (AF). The AF shall be designed such that the water quality will always comply with regulated limits at all times. The AF include:

- (a) **Swimming Pool:** An artificial pool which operates with a water recirculation system, intended primarily for swimming, diving, wading, or dipping but does not include a reservoir or a pond.
- (b) **Water Playground (including interactive water fountain):** A recreation area installed with artificial water features that operate with a water recirculation system designed for play and interaction.
- (c) **Multi-use Spa Pool:** An artificial pool which operates with a water recirculation system, and utilises hydrojet circulation or air induction bubbles. This includes hydrotherapy pools, hot tubs, Jacuzzis and onsen pools where water is recirculated after use each time, and is not drained out.

As AF users' safety components do not form part of the Minimum Design Criteria, please refer to Singapore Standard SS 556: Code of Practice for the Design and Management of Aquatic Facilities for guidance on the safety components for AF.

5.2 Minimum Design Criteria

The AF system shall be sized in accordance to the volume and estimated maximum bather load. Water in the AF shall be circulated through a filtration system which produces water that comply with regulated limits prior to its return to the AF.

The minimum design criteria for AF (Swimming Pools, Water Playgrounds (including Interactive Water Fountains) and Multi-use Spa Pools) can be classified into the following 2 categories:

- (a) Minimum design requirements to be declared by QP to comply with on building plan (BP), and
- (b) minimum design requirements to be considered by QP to allocate and indicate the space on BP to install required equipment and declared by QP that they will adhere to requirements for equipment specifications.

5.2.1 Aquatic Facilities

The minimum design criteria that QP should take note are:

- (a) The AF system shall consist of pumps, filters, automated chemical feeders, perimeter overflow systems/skimers, valves, pipes, connections, fittings and appurtenances. These systems shall treat the water in the AF in accordance with the relevant regulatory requirements. Space shall be catered for installation of these equipment at building plan stage. If a development has multiple types of

- AF, the AF shall have filtration and water treatment systems to meet the required turnover rate of each AF.
- (b) AF edges and landscaping shall be of such design and materials to facilitate easy maintenance and minimise the contamination of water (e.g. accumulation of debris, etc.). The landscaping to enhance the appearance of the AF shall not be done to an extent that it can contaminate the water in the AFs or create a problem for the maintenance of the AF. The design of planting strip(s) close to the edge of AF shall incorporate measures to ensure no overflow of water or run-off from the planting strip(s)/ area(s) into the water. A space of at least 1 m along the perimeter of AF shall be buffered to facilitate maintenance.
 - (c) For balancing/surge tanks of AF, the following conditions shall apply:
 - i. Any overflow pipes and air vents installed on the balancing/surge tanks shall be properly screened with non-corrodible, corrosion-resistant stainless-steel mosquito-proof netting of aperture size not exceeding 0.65 mm.
 - ii. For the makeup water supplied from PUB mains to the tanks, the water fittings shall not allow any backflow.
 - (d) Rinse showers shall be situated adjacent to each of the AF to encourage users to use the rinse shower before entering the AF.
 - i. For premises with one AF, a minimum of two rinse showers shall be provided for the AF. Premises with multiple AF shall have a minimum of two rinse showers for the largest AF (based on pool/splash zone area of AF), and a minimum of one rinse shower for each additional AF.
 - ii. A minimum of one rinse shower shall be provided for each standalone water playground within a premises. Standalone water playground refers to water playground that does not share the filtration system with any other types of AF.
 - iii. The rinse shower water shall drain directly into the sewer system and not into the AF and the overflow perimeter flow system or splash zone of AF.
 - iv. It is strongly encouraged to provide signages to direct users to use the rinse showers before entering the AF.
 - (e) Surfaces surrounding the AF (e.g. deck, ramps, etc.) shall be free of stagnant water at all times.
 - (f) The automated chemical feeder shall be capable of supplying the required amount of disinfectant to disinfect the AF based on the capacity and maintenance frequency of the AF. A device to determine rate of flow shall be provided for each disinfectant feeder and it shall not allow the back flow of water from AF into the disinfectant container.
 - (g) Flow meters shall be installed on all recirculation systems and shall be capable of measuring water flow of 1.5 times the designed flow rate.

- (h) The water-circulation pumps and motors shall be of adequate sizes to turn over the entire AF pool water capacity as below:

Type of AF	Max Permissible Turnover Time
Swimming Pool (designed mainly for young children's use*)	2 h
Swimming Pool (designed for all other uses)	6 h
Multi-use Spa Pool	2 h
Water playground (including interactive water fountain)	30 min

* individuals up to age of 5

- (i) The filtration plant shall be either the rapid sand, diatomaceous earth, glass, zeolite or any other filtration system approved by the Director-General of Public Health. Individual filters shall be designed with necessary valves and piping to permit isolation of individual filters for repairs or backwashing while other units are in service.
- (j) There shall be at least one standby pump unit and motor to supplement the duty pump provided in each of the filtration system. Sampling taps shall be provided at the inlet and outlet pipes of the filter for checking filtration efficiency.
- (k) Design of indoor AF and equipment rooms shall be adequately ventilated to control the level of moisture and trapped chemicals. The minimum ventilation rate shall be in accordance with the relevant guidelines available within SS 556 Code of Practice for The Design and Management of Aquatic Facilities on ventilation in indoor aquatic facilities.
- (l) There shall be easy and safe access to the tanks to allow for maintenance and inspection of the tanks.
- (m) A non-corrosive removable catch screen or overflow strainer shall be installed at all discharged points before the water enters the balancing/surge tank to prevent large debris from collecting within.
- (n) Linkways and bridges across the pool are allowed. Care must be taken in the design to ensure no overflow of water or, runoff from planting strips on the linkways and bridges into the pool water.
- (o) All materials should be of non-toxic nature, corrosion-resistant, both externally as well as internally, and able to withstand the water pressure and resistant to chlorine/bromine content in the system.
- (p) If a submerged facility such as a bar is constructed or placed in the pool to provide food or drinks, a sink connected to a sewer shall be provided.

5.2.1.1 Swimming Pool

The minimum design criteria that QP should take note are:

- (a) A swimming pool system consisting of pumps, piping, perimeter overflow system, strainer(s), balancing/surge tank, return inlets, filters, automated chemical feeder and other necessary equipment shall be provided for complete circulation of the water through all parts of the pool.
- (b) Each pool shall be provided at least 2 recirculation system inlets for the first 15,000 gal or 57,000 L capacity and one additional inlet for every additional 15,000 gal or 57,000 L or less capacity. Locations of inlet fittings shall be arranged in a way which will allow for uniform circulation.
- (c) A perimeter overflow system shall be provided for at least 50% of the perimeter of the pool and designed such as to avoid water stagnancy. Design of a perimeter overflow system shall take into consideration the following:
 - i. It shall allow ease of inspection, cleaning, and repair.
 - ii. It shall be designed and provided with sufficient drains and piping which will not allow backflow of water into the pool, and flooding of the overflow channel.
 - iii. Water that overflows from the pool shall be recirculated for reuse.
 - iv. A deck level channel design can be adopted for the perimeter overflow system. An illustrated example of deck level channel can be found in **Appendix 3**.
- (d) Surface skimmers can be used where the water surface area is less than 450 m². Surface skimmers shall be located in an appropriate position in relation to inlets to maintain effective skimming action and avoid water stagnancy in the pool. At least 1 surface skimmer is provided for every 13.5 m² of water surface area to maintain effective skimming action throughout the pool. The skimmer system shall be equipped with auto water top-up devices.
- (e) The number of toilets and sanitary fittings provided shall be in accordance with the requirements in **Section 2** of the COPEH.

5.2.1.2 Water Playground

The minimum design criteria that QP should take note are:

- (a) A water playground system consisting of pumps, piping, perimeter overflow system, strainer(s), balancing/surge tank, return inlets, filters, automated chemical feeder and other necessary equipment shall be provided for complete circulation of the water through all parts of the water playground.
- (b) The splash zone shall be sloped in a way such that only water from the water playground will flow back to the balancing/surge tank. Areas adjacent to the splash zone shall be sloped away and downwards from the spray ground to deck drain or other surface water disposal system.

- (c) All foggers or misters shall be supplied directly from a potable water source and not recycled from the balancing/surge tank.

5.2.1.3 Multi-use Spa Pool

The minimum design criteria that QP should take note are:

- (a) A multi-use spa pool system shall contain filters, pumps, automated chemical feeders, pumps or such other systems or devices, to treat the water, aerator/jet system and other equipment (e.g. heater, etc.).
- (b) The perimeter overflow system shall be designed and constructed so that the water level in the multi-use spa pool is maintained at the operation level of the rim or weir device.
- (c) If surface skimmers are used as the sole overflow system, one surface skimmer shall be provided for every 13.5 m². The skimmer system shall be equipped with auto water top-up devices. When 2 or more skimmers are used, they shall be located in such a way to maintain effective skimming action over the entire surface area of multi-use spa pool.
- (d) The inlets and outlets shall be arranged in such a way to allow a uniform distribution of disinfectants throughout the multi-use spa pool.
- (e) Multi-use spa pool shall have outlets to drain the water completely for thorough cleaning purpose (e.g. bottom drains, drain plug, circulatory system, etc.).
- (f) The air intake source of air induction system shall be positioned or designed to minimise contamination of the multi-use spa pool.

(a)

6 STORAGE AND COLLECTION SYSTEM FOR RECYCLABLES AT STRATA-TITLED PROPERTIES WITH RESIDENTIAL UNITS

6.1 Objective

A recyclables storage and collection system shall be installed for strata-titled properties with residential units so that residents can conveniently recycle their waste. The design and layout of the system shall not create a nuisance to residents and neighbouring premises or cause pollution to the environment. A recyclables storage and collection system can comprise designated recycling points for placing recycling receptacles and/or a recyclables chute system. The recyclables storage and collection system shall be adequately sized to meet the anticipated recyclables output without compromising the refuse storage and collection system.

6.2 Recyclables Output

- (a) "Recyclables" is defined under the First Schedule of Environmental Public Health (General Waste Collection) Regulations as follows: -

Recyclables	Examples
Paper products	Newspaper, computer printouts, writing paper, envelopes, car park coupons, brochures/pamphlets, magazines, books, cardboard and paper packaging (such as cereal boxes and drink cartons) and other paper products but excluding tissue paper and paper food wrappers
Metal products	Cans or containers made of metal such as soft drink cans, beer cans, milk powder tins and food cans.
Plastic products	Bottles or containers made of plastic such as detergent containers, milk containers, mineral water bottles, soft drink bottles, juice bottles, plastic bags, plastic packaging and other plastic products but excluding styrofoam, disposable cutleries and crockeries.
Glass products	Jars, wine bottles and beer bottles but excluding light bulbs, window glass, porcelain, ceramic and fish tanks.

- (b) The daily recyclables output shall be computed to be either **an additional** 30 % by volume of the daily refuse output estimated under **Section 1.2** or 240 L/d of recyclables, whichever is higher.

6.3 Designated Recycling Points for Recycling Receptacles

All premises shall be provided with a designated recycling point for each residential block to allow residents to deposit recyclables. The recycling system within the premises shall meet the following requirements: -

- (a) Arrangements shall be made for the consolidation and storage of the recyclables from the recycling points to a main recycling point. The main recycling point shall be accessible to a recyclables collection vehicle. The main recycling point shall allow the placement of bulk bin(s) or container(s) to accommodate the collection and storage of the minimum daily recyclables output specified in **Section 6.2(b)**. The main recycling point shall be separate and independent from, and also not compromise the refuse storage and collection system.
- (b) If an enclosed RORO compactor/container, dust screw compactor or a rotary drum system is provided for storage of recyclables, a setback distance of at least 13 m shall be provided to ensure that the main recycling point is accessible to recyclables collection vehicles. The main recycling point floor level shall be at the same level as the vehicular access road. The distance for recyclables collection vehicles to reverse into the main recycling point shall be minimised.
- (c) The capacity of the intermediate recycling receptacles at intermediate recycling points shall not be deducted from the required capacity (as calculated under **Section 6.2(b)**) of the recycling receptacles that are placed at the main recycling point.
- (d) The designated collection point shall not cause any pest and odour nuisance to estate occupants and occupants of neighbouring premises.

6.4 Recyclables Chute System

All new formal development applications submitted to URA from 1 April 2018 onwards that are taller than four (4) storeys and for which refuse chutes are required shall also be provided with separate chutes for recyclables. Applicants shall provide a copy of URA's Provisional Permission in their DC application to NEA.

The recyclables chute system shall meet the following requirements: -

- (a) A recyclables chute shall be provided next to every refuse chute in the premises. The recyclables chute shall comply with the same requirements for refuse chutes stated in **Section 1.3**. A signage shall be provided above the recyclables chute hopper to inform users of suitable recyclables to be disposed into the chute. An example of the signage is shown in **Appendix 1C**.
- (b) A recyclables chute chamber shall be provided. It shall be connected to a recyclables chute and house a recycling bin. The recyclables chute and its chamber shall be suitably located to facilitate easy and nuisance-free removal of recyclables and shall be designed to meet the same requirements as those for the refuse chute chamber stated in **Section 1.4**. Its capacity shall be sufficient for at least one day of recyclables output (as specified in **Section 6.2(b)**) from all the premises connected to the recyclables chute. Recyclables deposited in the recyclables chute chamber shall be consolidated and stored main recycling point

for collection. The main recycling point shall comply with the same requirements stated in **Sections 6.3(a) and 6.3(b)**.

- (c) A recyclables collection room shall be built at the bottom of a centralised recyclables chute to house a large container. Recyclables collected in the container are transferred to the recyclables collection vehicle. The recyclables collection room shall comply with the same requirements as those for refuses room stated in **Section 1.5** and a minimum capacity to accommodate two (2) days of recyclables output.
- (d) A pneumatic recyclables chute conveyance system shall comply with the same requirements that apply to pneumatic waste conveyance systems stated in **Section 1.7**. The capacity of the pneumatic recyclables chute conveyance system shall be sufficient for a minimum of two (2) days of recyclables output.
- (e) The complete recyclables chute system shall be designed to minimise pilferage and/or damage of recyclables.

7 ANTI-MOSQUITO BREEDING

7.1 Objective

During the design of any building or structures, the QPs should take into consideration and avoid features that may result in water stagnation and become potential breeding habitat for mosquitoes. Any part of a building where water stagnation may occur should be provided with permanent and safe access for maintenance purpose.

7.2 Roof Gutter

- (a) With effect from 1 November 2005, no roof gutters should be installed for any new developments.
- (b) With effect from 1 September 2016, existing roof gutters should be removed or sealed up in all building works involving roof structures which are also A&A or reconstruction works, where such building works are as defined under the Building Control Act.
- (c) QPs are advised to consider alternative designs/solutions to ensure effective conveyance and drainage of rain water.

Note: Waiver requests for the above may be assessed and approved on a case-by-case basis. From 1 November 2017, QPs are no longer required to submit roof gutter waiver applications for flat roofs (including balconies) if QPs assess that the entire length of the roof gutters (including rainwater outlets, scupper drains and rainwater downpipes) can be inspected and maintained safely by the occupier from a permanent space on the roof (or balcony).

7.3 Air-Conditioning Tray

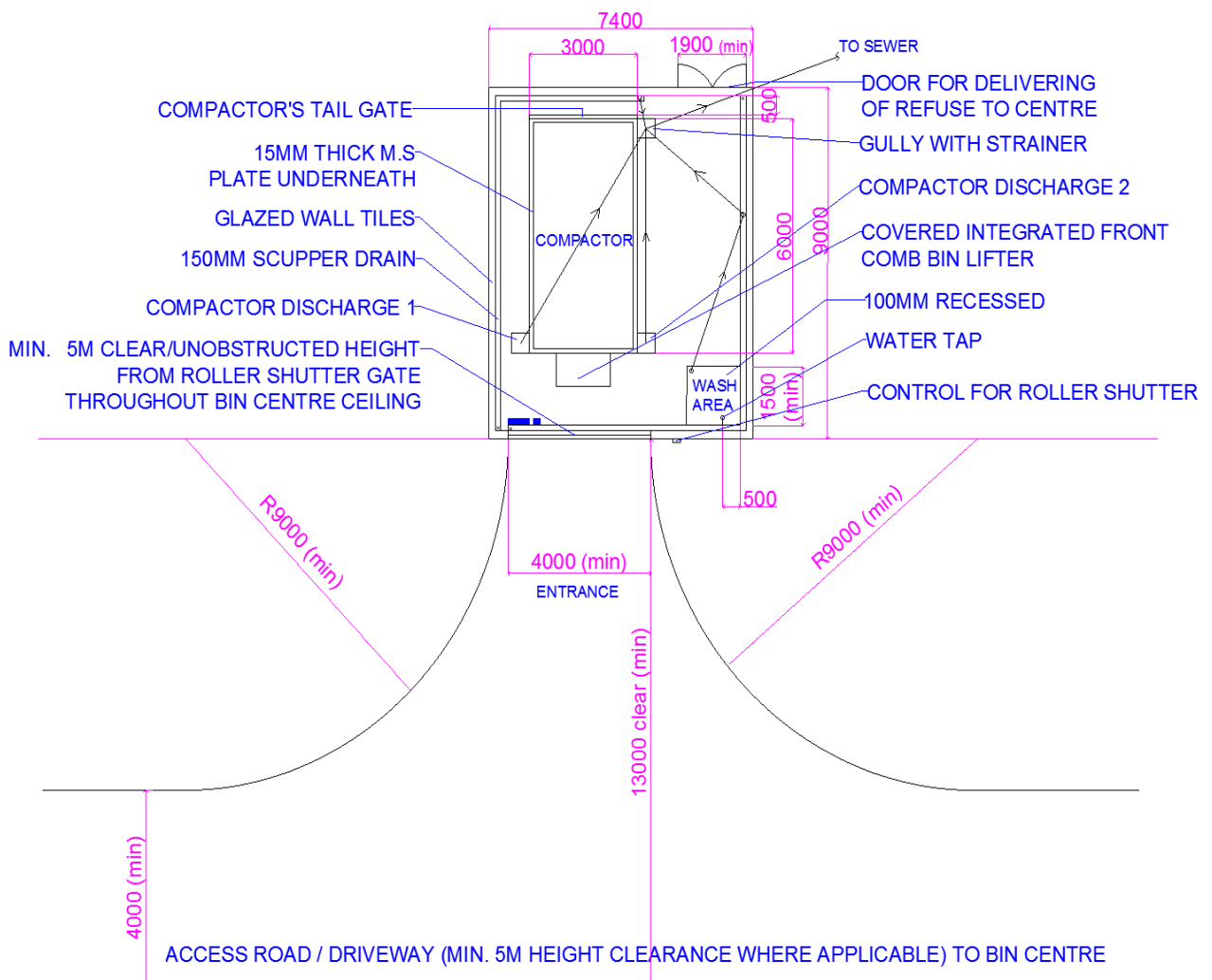
Trays or receptacles should not be placed beneath or on top of any air-conditioning unit as they may create conditions favourable for mosquito breeding. If there is a need for installation of such trays to address other issues, premises owners should ensure that they install HDB's patented air-conditioner trays. Regular checks and maintenance of the tray is still necessary to ensure there are no chokages at the drainage point that could result in water ponding. Premises owners are liable to be penalised under the Control of Vectors and Pesticides Act (CVPA), should NEA find the trays creating conditions favourable to the breeding and propagation of mosquitoes.

7.4 Floor Trap

Adequate measures, such as installation of anti-mosquito devices at the floor trap, should be taken to prevent mosquitoes from breeding in the water seal of the floor trap.

APPENDIX 1: Example of Layout of Bin Centre

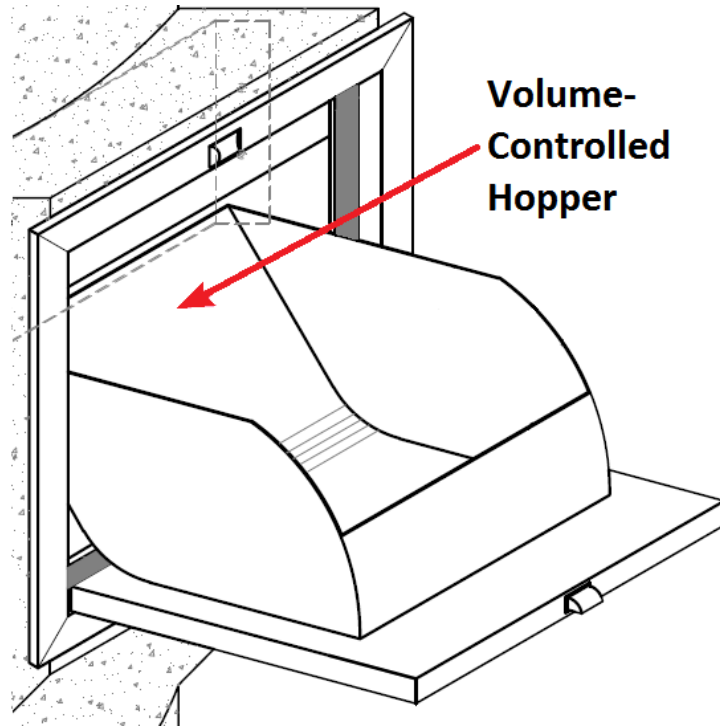
APPENDIX 1A: TYPICAL LAYOUT OF BIN CENTRE



NOTES:

- No enclosed room within bin centre
- Only critical dimensions are indicated on plan in mm unless otherwise stated
- For PWCS, the bin centre room space is for the storage system only: all other ancillary equipment shall be stored in a room adjacent to the bin centre

APPENDIX 1B: TYPICAL FULLY VOLUME-CONTROLLED REFUSE HOPPER



APPENDIX 1C: TYPICAL SIGNAGE FOR RECYCLABLES CHUTE HOPPER



The signage can be downloaded from NEA website below:
<https://www-nea.gov-sg-admin.cwp.sg/docs/default-source/our-services/waste-management/recycling-bin-label.pdf>

APPENDIX 2: Provision of Sanitary Facilities

- (a) Sanitary facilities shall be provided in accordance with the requirements listed below. The numbers stated are meant for concurrent usage.

Note: These facilities are over and above the provisions of accessible toilet, family toilet, child-friendly toilet and child-friendly wash basin as stipulated in BCA's Code on Accessibility in the Built Environment.

- (b) Owners/occupiers should provide sufficient sanitary facilities based on anticipated demand and usage, for toilets that fall out of the categories of places mentioned in **Appendix 2**.
- (c) Where there are public toilets within the building where a food shop is located, the provision of a toilet within the food shop is not necessary. Otherwise, the number of toilets and sanitary fittings provided shall be in accordance with the requirements in **Section 2** and **Appendix 2**.
- (d) The floor area for Category (1) to (3) refers to the **gross floor area**.
- (e) For male sanitary facilities, WC can be used to replace UR.

Categories of Places	Number of Sanitary Facilities				
	Female		Male		
	WC	WHB	WC	UR	WHB
(1) SHOPPING MALL (EACH FLOOR)					
Not more than 350 sq m	1*	1*	-	-	-
351 sq m to 700 sq m	3	2	1	1	1
701 sq m to 1,000 sq m	5	3	1	2	1
1,001 sq m to 1,500 sq m	7	4	1	3	2
1,501 sq m to 3,000 sq m	8	4	2	3	3
3,001 sq m to 5,000 sq m	12	6	3	4	4
Every additional 2,000 sq m or less in excess of 5,000 sq m	3	2	1	1	1
Toilet facilities shall be provided on every floor of shopping malls. The number of sanitary facilities provided shall be based on the gross floor area of each floor.					
(2) SUPERMARKET/WET MARKET					
Not more than 350 sq m	1*	1*	-	-	-
351 sq m to 700 sq m	2	1	1	1	1
701 sq m to 1,000 sq m	3	2	1	2	1
1,001 sq m to 1,500 sq m	4	3	1	3	2
1,501 sq m to 3,000 sq m	5	3	2	3	3
3,001 sq m to 5,000 sq m	7	4	3	4	4
Every additional 2,000 sq m or less in excess of 5,000 sq m	2	1	1	1	1

Categories of Places	Number of Sanitary Facilities				
	Female		Male		
	WC	WHB	WC	UR	WHB
(3) EATING ESTABLISHMENT/FOOD CENTRE/BAR/NIGHTCLUB					
Not more than 250 sq m	1*	1*	-	-	-
251 sq m to 500 sq m	2	1	1	1	1
501 sq m to 750 sq m	3	2	1	2	2
751 sq m to 1,000 sq m	5	2	2	3	2
1,001 sq m to 1,500 sq m	6	3	2	4	3
1,501 sq m to 2,000 sq m	8	4	3	5	4
2,001 sq m to 3,000 sq m	9	5	3	6	4
3,001 sq m to 4,500 sq m	11	6	4	7	5
Every additional 1,500 sq m or less in excess of 4,500 sq m	2	1	1	1	1
The gross floor area of the premises refers to the gross floor area within the Eating Establishment/ Food Centre/ Bar/ Nightclub and does not include the Outdoor Refreshment Area (ORA) of the premises, if any.					
(4) CONFERENCE HALL/ CINEMA/THEATRE (seating capacity) CONVENTION HALL/ EXHIBITION HALL (capacity)					
Not more than 150 persons	5	3	1	2	1
151 to 300 persons	8	4	2	3	2
301 to 450 persons	10	5	3	4	3
451 to 600 persons	13	7	3	5	4
601 to 900 persons	17	9	3	7	5
Every additional 100 persons or less in excess of 900 persons	1	1	-	-	-
Every additional 150 persons or less in excess of 900 persons	-	-	1	1	1

Categories of Places	Number of Sanitary Facilities				
	Female		Male		
	WC	WHB	WC	UR	WHB
(5) PARK AND PARK CONNECTOR Note: 2 shower rooms each shall be provided for the female and male public toilet block when the Park is abutting a beach.	2	2	2	2	2
(6) BUS TERMINAL/INTERCHANGE Not more than 20 bus parking lots	5	3	1	2	1
21 to 50	10	5	2	4	2
51 to 100	15	8	3	6	3
More than 100	18	9	4	7	4
(7) PETROL STATION	1	1	1	1	1
(8) MRT STATION TOILET (CONCOURSE)					
(a) Station without Retail Shops, or with retail space not more than 1,000 sq m	7	4	2	2	2
(b) Station with Retail Shops, with Retail space of					
1,001 to 1,500 sq m	12	6	3	4	4
Exceeding 1,500 sq m	17	9	4	6	5
(9) STADIUM Capacity					
Not more than 2,000 persons	10	6	3	7	6
2,001 to 5,000 persons	15	8	5	10	8
5,001 to 10,000 persons	26	14	8	18	14
10,001 to 20,000 persons	40	20	12	28	20
20,001 to 50,000 persons	60	32	18	42	32
50,001 to 100,000 persons	100	46	30	70	46
Sanitary facilities within the stadium shall be uniformly distributed.					

Categories of Places	Number of Sanitary Facilities								
	Female				Male				
	WC	WHB	BR	BH	WC	WHB	UR	BR	BH
(10) PUBLIC SWIMMING POOL									
Up to 250 sq m	2	1	2	2	1	1	1	2	2
251 sq m to 500 sq m	4	2	3	3	2	2	2	3	3
501 sq m to 1,000 sq m	6	3	4	3	3	3	3	4	3
1,001 sq m to 1,500 sq m	7	4	5	4	3	4	4	5	4
Exceeding 1,500 sq m	9	5	8	6	4	5	5	8	6
(11) CONSTRUCTION SITE									
Construction site without living quarters:									
Every 25 male workers or less, up to 500 male workers	-	-	-	-	1	1	1	1	-
Every 25 female workers or less, up to 500 female workers	2	1	1	-	-	-	-	-	-
<i>Provision of bench in bathroom is not mandatory.</i>									

Notation:

*: To be used by both male and female

WC: Water Closet

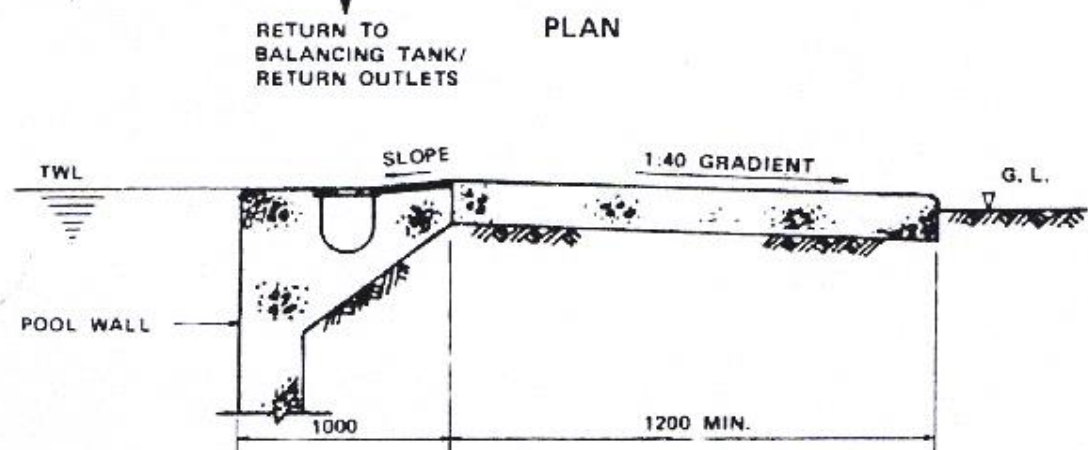
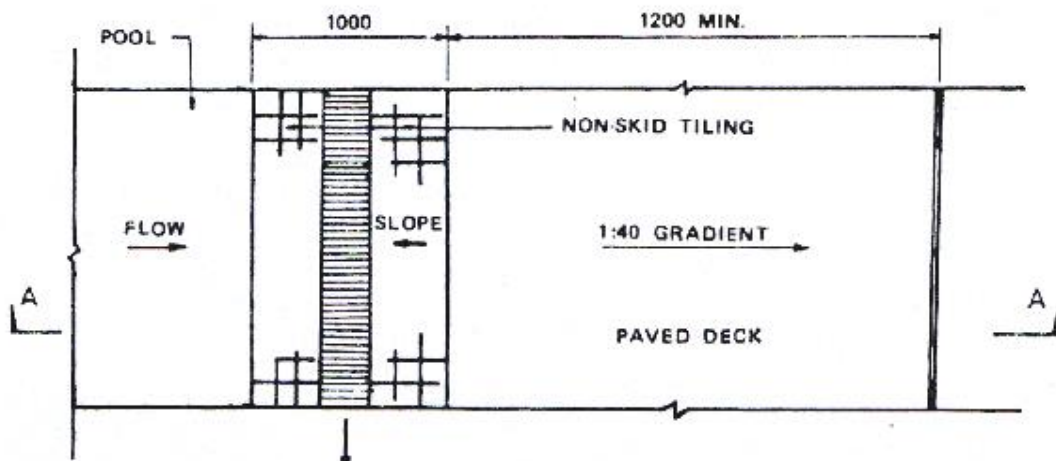
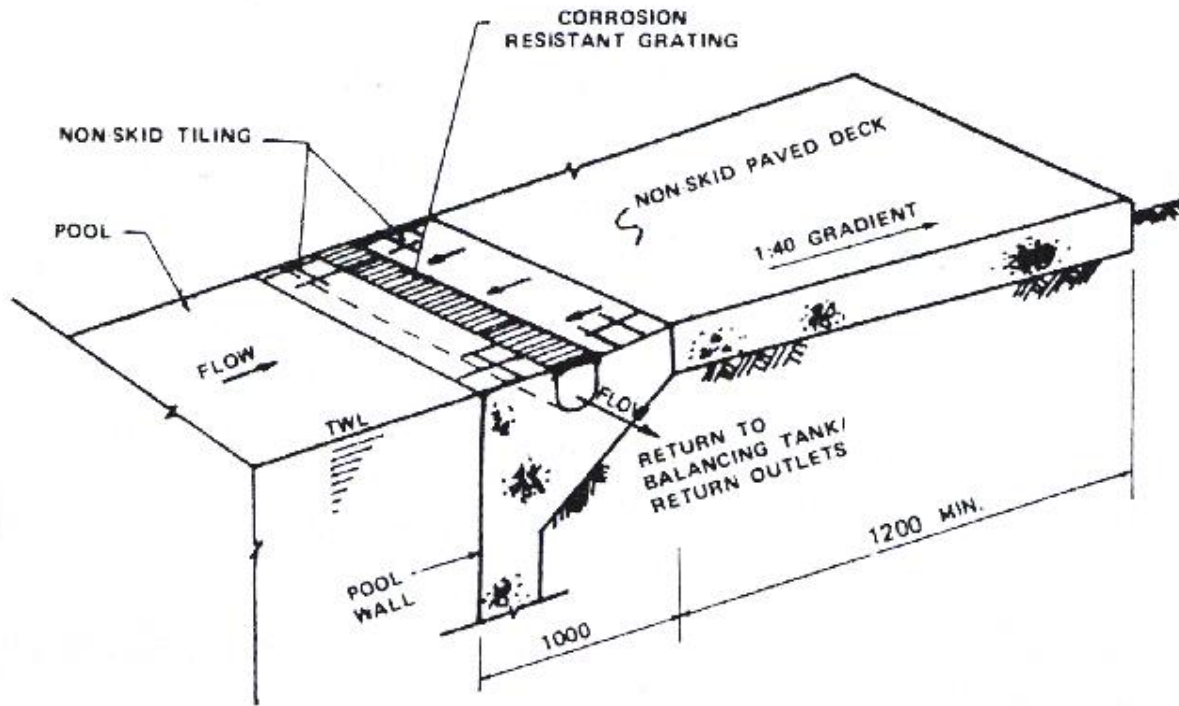
WHB: Wash Hand Basin

UR: Urinal

BH: Bench with Hanger

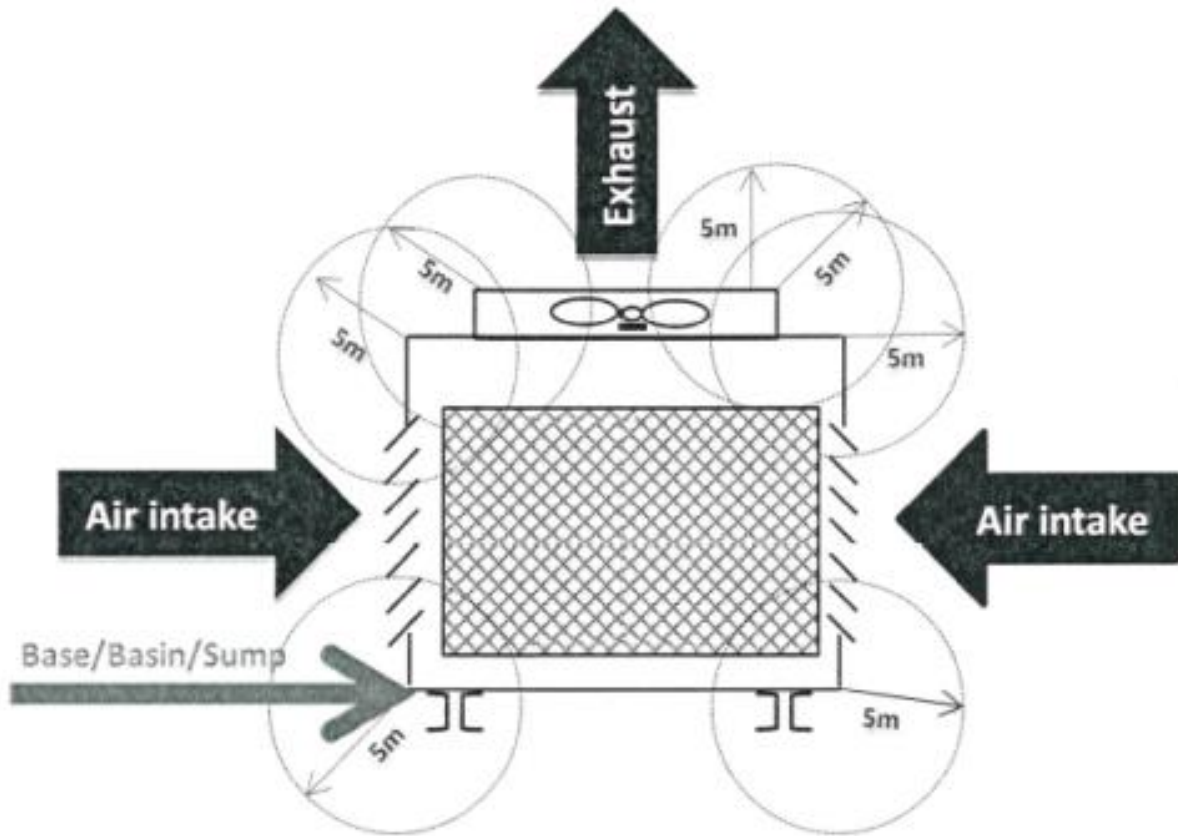
BR: Bathroom with bench

APPENDIX 3: Details of Deck Level Channel



NOTE:
ALL DIMENSIONS
ARE IN MILLIMETRES

APPENDIX 4: Example of 5 m Setback Measurement of a Cooling Tower



APPENDIX 5: GLOSSARY OF TERMS

The definitions of the following terms apply in this document:

1. Sensor-operated flush valves

A valve with an electronic control device that is automatically actuated to supply a predetermined quantity of water (not more than 4.5 and 1.0 litres of water per flush for WC and urinal respectively) to a WC or urinal for the purpose of flushing after each use.

2. Manual override

A built-in feature in the urinal sensor-operated flush valve to allow the user to manually actuate an immediate flushing of the urinal by pressing a button. The sensor and the manual override will not function in the event of a power supply failure.

When the override button is used, the manual override feature overrides the sensor operation and discharges only a preset volume of water (not more than 1.0 litres of water per flush) even if the button continues to be held actuated. No second flush shall be activated when the user leaves the urinal.

3. Manual override cum by-pass

A built-in feature in the WC sensor-operated flush valve to allow the user to manually actuate an immediate flushing of the WC by pressing a button. The sensor and the manual override will not function in the event of a power supply failure. The manual by-pass feature will enable the flush valve to continue to function manually in the event of a power supply failure.

When the override cum by-pass button is used, the manual override and by-pass features override the sensor operation and discharge only a pre-set volume of water (not more than 4.5 litres of water per flush) even if the button continues to be held actuated. No second flush shall be activated when the user leaves the WC.

4. Waterless Urinals

A urinal made of urine repellent vitreous china or acrylic and requiring no flush valves (i.e. water free). The fixture's drain outlet includes an immiscible liquid sealant that floats on top of the urine layer. This combination seal blocks out sewer gases, and blocks out urine odors. Also includes waterless urinals of mechanical cartridge (membrane or sealant) and microbial types.

Address of the National Environment Agency

**40 Scotts Road
Environment Building
Singapore 228231**