clivus

The Natural Solution

Residential Planning Manual

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Overview

For more than fifty years, Clivus Multrum composting toilet systems have been used in homes, parks and commercial buildings as the sole method of treating toilet waste. The composting process is reliable, convenient and safe. Its results are both conservative and productive: water is saved from use as a carriage medium and the fertilizer content in excreta is made available for re-use.

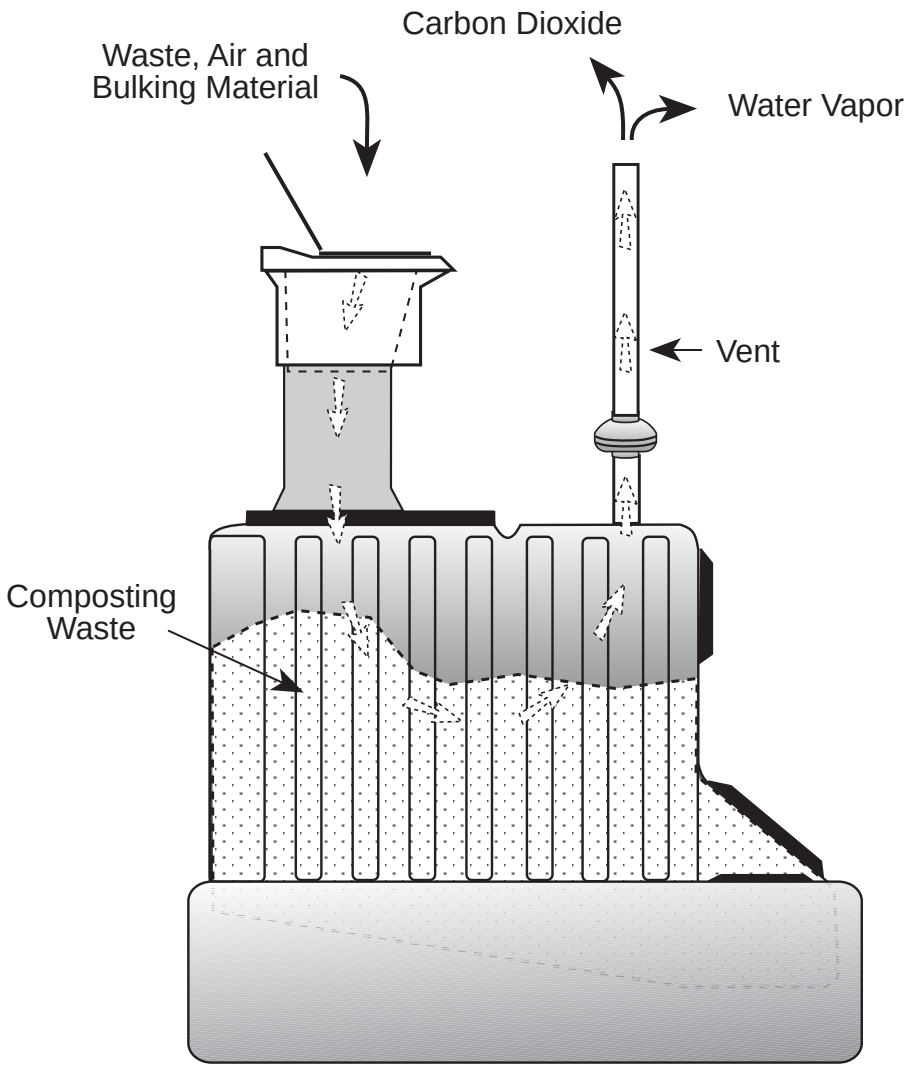
The following pages outline planning for the inclusion of the composting toilet within residential design projects. Although all general considerations are discussed in this manual, we recommend that you contact your Clivus representative to ensure that the particular characteristics of your design properly accommodate the Clivus system.

Process Description

The Clivus composter uses natural biological decomposition to convert human wastes into reusable end-products. The composter is the containment vessel for a living ecosystem: a forest floor in a polyethylene tank.

This ecosystem needs nitrogen, carbon and oxygen to thrive. The mixture of toilet waste (nitrogen) and bulking material (carbon), exposed to a constant flow of air (oxygen), allows bacteria and other beneficial organisms to convert the organic material to safe, usable compost and liquid fertilizer. Nature's way.

The compost end-product is rich in organic matter, with a bacterial composition similar to top soil. The liquid end-product (which begins as urine) becomes a concentrated fertilizer rich in plant nutrients after passing through the compost layers. The system releases two gases, carbon dioxide and water vapor, the same gases humans exhale.



Composter Capacity

Sizing the Composter

To estimate usage levels, follow these guidelines:

- Determine the expected number of full-time users of the system per day.
- Multiply the number of users per day by an average of five uses-per-person-per-day. This gives the average daily usage.
  OR
- Use health department occupancy rates of two persons per bedroom as the guide for sizing.

Ambient Temperature

Composter usage ratings are based on an ambient temperature around the tank of at least 65°F. This may require that the heating system for the bathroom supply the tank area as well, or that the area be heated separately. Higher temperatures will accelerate decomposition. If the composter is to be subjected to temperatures below 65°F on more than an occasional basis and it is not possible to supply heat, the decomposition rate will slow. Call Clivus Multrum for assistance in sizing the tank.

Choice of Model

You can now begin considering which model Clivus composting toilet system is appropriate for your needs. The Model M1 is primarily a vacation/seasonal use model; for full-time, family residences, Models M2, M3, M10 and M12 are appropriate (See Figure 2). Models M1 and M2 accomodate one waterless toilet, while the M3, M10 and M12 are suitable for two.

The waterless toilet must be located directly above the composter; if two toilets will be installed, they should be situated such that they enter the composter as far to the rear as possible. Toilets that will not be vertically aligned should be serviced by separate composters that are sized for the usage expected for each toilet.

In addition to tank capacity, the height of the composter may be a determining factor in the choice process. Available headroom in the proposed tank enclosure may limit options--the minimum is 12" above the tank top when the fan is mounted horizontally and 18" when mounted vertically.

The rated capacity of the composters allows for temporary increases in usage caused by guests, gatherings, etc. Also consider whether there will be a permanent increase in the number of users in the foreseeable future.

Building Design

Composter Enclosure

Sufficient space must be allotted directly under the toilet room to house the composter. The lower level floor must have a solid, stable surface, such as concrete, and would ideally have direct walk-out to the outdoors. The lower level should not be at risk of flooding due to high ground water or entry of water from any outside source. Proper drainage or a sump should be provided.

One foot of clearance on each side of the tank is needed for assembly. Once assembled, the tank can be positioned with its back against a wall and with a minimum of one inch of side clearance. A minimum of four feet should be left clear in front of the composter for general maintenance procedures to be carried out. Pipes, HVAC ducting, lights, etc. should not obstruct the maintenance access door.

For new construction, plan to place the compost tank into the lower level before it is closed up. If this is not possible, it will be necessary to allow adequate access to the composter enclosure area for tank placement after the toilet room floor is in place.

Access Requirements

Access should be directly to the outside. If a standard doorway is not possible, a Bilco-type bulkhead door and stairway can be used, or an existing slope may allow a doorway to be created at the lowest grade. Access from the toilet room via a manway or trap door is not recommended. See Figure 3.

This same opening will allow access for service, maintenance and the removal of finished end-products form the tank. Direct access from the lower level to the outside of the structure allows for routine maintenance and removal of end-products without intruding on the living space.

Headroom

A minimum clearance of one foot is needed above the composter for horizontal mounting of ventilation equipment (18" for vertical mounting) and the installation of toilet chutes. This should be measured to the bottom of any joists or beams supporting the floor above. Make sure that no other building systems (e.g. HVAC, plumbing, lighting) interfere with proper functioning and maintenance of the composter.

Storage Tanks

The Clivus system generates a liquid end-product that requires storage pending re-use or disposal. Models M1, M2 and M3 have liquid storage built into the composter base. For the M10 and M12, provision must be made for a separate storage tank. In temperate climates, twenty-five uses of the system will generate about one gallon of liquid; storage tank size will depend on how long liquid will be held.

Figure 2

Model	Usage Rating		Headroom Required	Opening Width
	Daily	Persons		
M1	10	2	68-74"	34"
M2	15	3	78-84"	34"
M3	50	6	96-102"	34"
M10	60	6	72-78"	37"
M12	80	6	71-77"	38"

In the absence of a pressurized water line, it will be necessary to have a tank located near the composter to hold fresh water for compost pile moistening. See Appendix for tank sizes.

Air Supply

The Clivus compost toilet requires no make-up air in addition to what is conventionally available within the structure. It is important that there be no other exhaust fan in the toilet room that would compete with the composter fan.

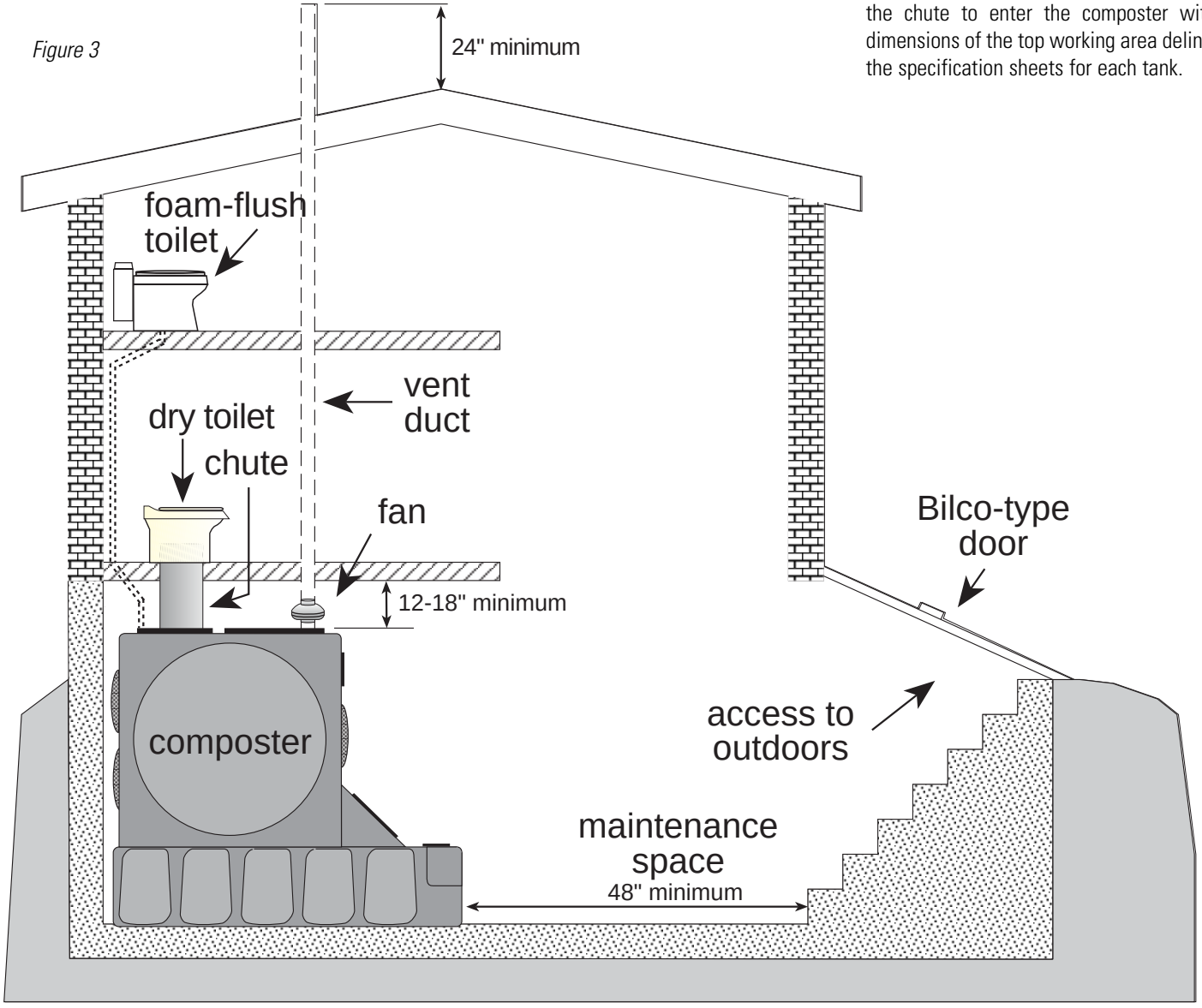
Toilet Room Floor Plan--Dry Toilet

Floor joists or concrete floors should be carefully planned to allow passage of toilet chutes (14" diameter)) and vent ducting (4" diameter, run with as few bends as possible). Additional care should be taken that no other building systems, such as HVAC ducting, interfere with placement or functioning of Clivus components.

During the design stage it is imperative that tank placement and toilet position layout be done together to ensure proper alignment of equipment. Critical dimensions to consider during this process are detailed in Figure 7. Measurements referring to the tank top are from the widest points on the composter body or cradle.

In general, tanks should be positioned relative to toilets such that the chutes enter the top of the composter as far to the rear as possible (Figure 4), with chutes side-by-side across the width of the tank (or length, in the case of the M3 and M10). With the exception of the M1 and M2, two is the preferred maximum number of dry toilets per tank. The toilet(s) may have to be located away from the wall of the bathroom to allow the chute to enter the composter within the dimensions of the top working area delineated in the specification sheets for each tank.

Figure 3



When determining layout, mutiple toilets on one tank can be oriented side-by-side or back-to-back when on the same floor level. If on different levels, the orientation of the toilets to each other is constrained only by the placement of the chutes. See Figure 5.

Figure 6 shows the lengths of the polyethylene chutes which attach the toilet to the tank. Each toilet will have one flanged chute for connection to the top of the tank; extension chutes may also be needed. Chutes are easily cut to custom length.
he total number of chutes needed is determined by adding together the following measurements:

- the distance from the composter top to the enclosure ceiling
- the thickness of the floor between the enclo sure and toilet room
- the protrusion of the chute above the toilet room floor as shown in Figure 6.

Toilet Room Floor Plan--Foam Flush Toilet

The foam flush toilet fixture uses a small amount o soap and water to create a foam blanket in the bowl that moves waste down a 4" drain line to the composter. Since it is similar in look and function to a conventional toilet, it ensures user acceptance while retaining all the environmental benefits of the compost toilet. Each flush uses only three ounces of water.

Toilet drain is 4" diameter and must be Schedule 40 plastic to allow easy movement of waste to the composter. Additional care should be taken that no other building systems, such as HVAC ducting, interfere with placement or functioning of Clivus components (See Figure 5).

The foam flush drain line should be direct as possible. However, a slope of up to 45° is permissible. The drain should enter the top of the composter as far as possible to the rear of the tank in the area for toilet connections (see composter specification sheets). The number of foam toilets that can be connected to a single composter is based upon overall usage. Consult with Clivus to determine the number of fixtures possible.

Figure 5

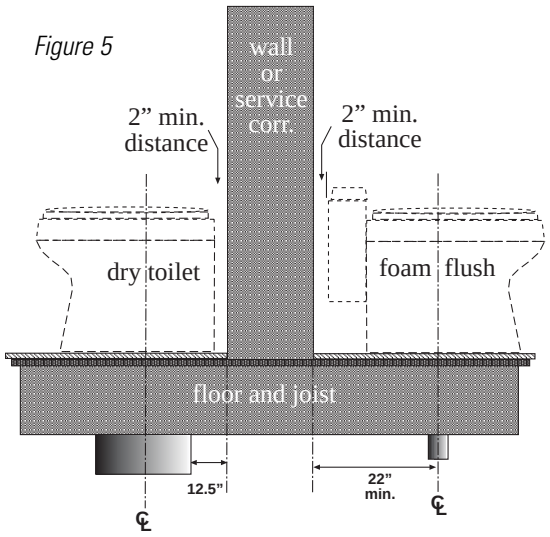


Figure 4

Figure 7

Toilet Model	Inches above floor
AF208 (standard dry)	3
AF209 (HC height dry)	7

Figure 6

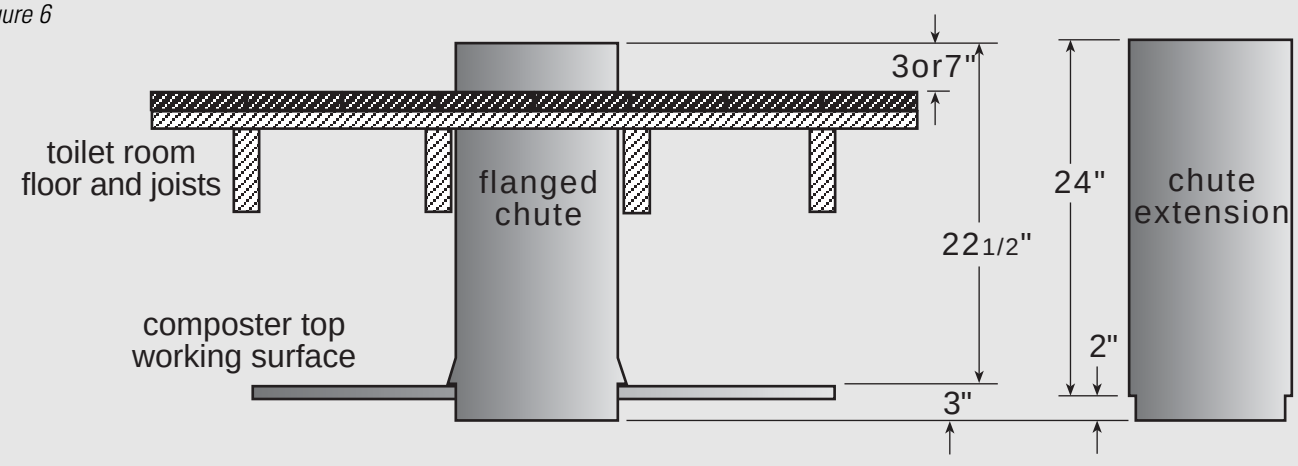


Figure 7

Composter Model	Minimum distance from chute centerline to rear edge of tank	Minimum distance from chute centerline to side edge of tank	Maximum distance between chute centerlines across width of tank	Maximum distance between chute centerlines across length of tank	Minimum distance from chute centerline to finished toilet room wall for toilet placement
M1	15.5"	14.25"	N/A	N/A	12.5"
M2	15.5"	14.25"	N/A	N/A	12.5"
M3	12.25"	12"	N/A	41.75"	12.5"
M10	19"	15.5"	15"	33"	12.5"
M12	16"	14"	33"	42.5"	12.5"

Ventilation System

The ventilation system is designed to oxygenate the compost pile and to keep the toilet room odor free. Air is drawn down the toilet chute, carrying away odor, carbon dioxide and water vapor. The composter fan will carry out the function of a conventional bathroom exhaust fan; there must be no other bathroom exhaust fan or other competing air flow. Consult an HVAC engineer for more detailed assistance.

A separate vent run and roof exit is assumed for each tank, utilizing 4" rigid ducting. The vent should be as straight as possible to eliminate condensation collection points and should extend at least 2 feet above the roof peak. The vent should attach to the composter top as far to the front of the tank and as far from the toilet chutes as possible.

Each system comes with its own AC or DC fan. This fan will be adequate to ventilate the compost chamber in most situations. The fan is mounted in-line and should be kept easily accessible.

Plumbing

Fresh Water

A small amount of fresh water is needed in the composter to create the optimal environment for the proliferation of the organisms responsible for decomposition. In most circumstances, this amount of water is no more than one to three gallons per day. The water is delivered through a misting manifold installed across the inside of the tank top near the front.

Where a pressurized water supply is available, bring a 3/4" line to the composter area for connection to the moistening components. A timer and solenoid valve control the flow of water. In non-pressurized situations, a storage tank can hold the necessary fresh water for moistening and a timer and pump will control the flow. See Appendix for storage tank sizes and volumes.

Liquid End-Product

The liquid fertilizer that results from the composting process is stable, odorless and can be stored indefinitely by the time it reaches the collection area. It has a useful nutrient content and should, where allowed, be used on ornamental plantings, trees, shrubs and lawns. Consult local codes for allowable disposition of this material.

A liquid removal system is standard with Clivus composters and is contained within the device itself. It can be an electric (AC or DC) pump, manual pump or simple gravity drain that directs the liquid fertilizer to a secondary storage tank using standard plumbing hardware. The storage tank will hold the liquid fertilizer until it is to be used according to local codes and should be sized according to toilet use, emptying interval and floor space available. See Appendix for tank descriptions.

The electric liquid removal systems for the M10 and M12 are made up of a Pump Isolation Chamber inside the compost tank, a submersible pump and liquid-level activated float switch inside the PIC, and a check valve to prevent backflow into the pump. The AC pump uses a 1" rigid drain line (supplied by purchaser), the DC pump uses 3/4" vinyl tubing (10' supplied). The M1, M2 and M3 do not require the PIC.

Electricity

Requirements

Electricity is required for the fan, moistening system and liquid removal pump and should be brought to the vicinity of the compost tank. The source of the electricity and the components requiring it can be either AC or DC; Clivus can supply solar or other power-producing equipment. Consult model specification sheets for electrical component power requirements.

Maintenance

Regular

Regular maintenance consists of the addition of bulking material, compost pile raking and, in the absence of automatic devices, compost pile moistening and the removal of liquid end-product. Space must be allocated to store bulking material. Wherever possible, a sink should be installed for cleaning tools and floors.

Periodic

Periodic maintenance includes cleaning the fan and ventilation ductwork and the occasional removal of solid compost. A clear, wide, direct path from the compost tank to the outdoors is preferable.

Auxillary Polyethylene Liquid Storage Tanks

CAPACITY (gallons)	SIZE (dia. X ht. in inches)	ACCESS PORT (diameter in inches)	PART NUMBER
110	35 X 35	8	TC3535IC
130	23 X 76	8	TC2376IC
165	31 X 58	8	TC3158IC
220	35 X 63	8	TC3563IC
300	35 X 78	16	TN3678IC
300	35 X 81	16	TC3581IC
300	42 X 59	8	TC4259IC
300	45 X 60	16	TC4560IC
305	46 X 48	16	TN4648IC
500	46 X 76	16	TC4676IC
500	48 X 71	16	TN4871IC
500	52 X 66	16	TC5266IC
500	64 X 42	16	TC6442IC
550	45 X 94	16	TC4594IC
550	67 X 42	16	TN6742IC

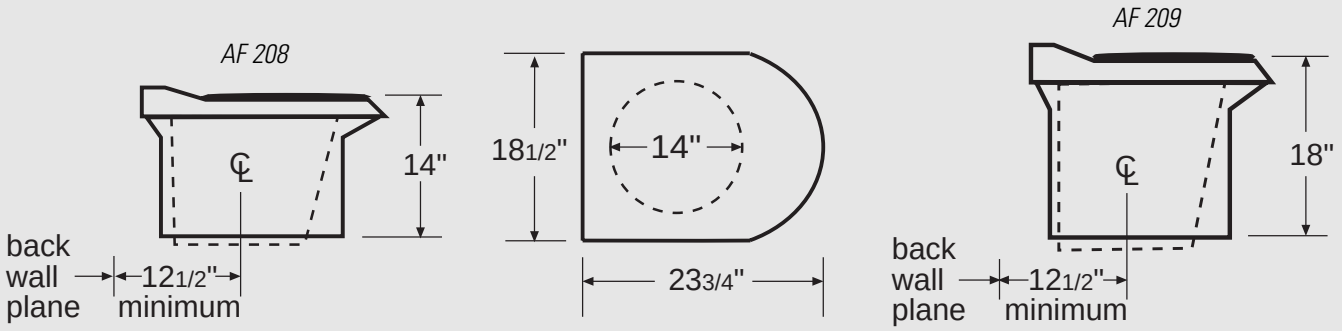
Waterless Toilets

All waterless toilets include: fiberglass stool with sanitary white gel finish for ease of cleaning, white plastic seat and cover, toilet liner.

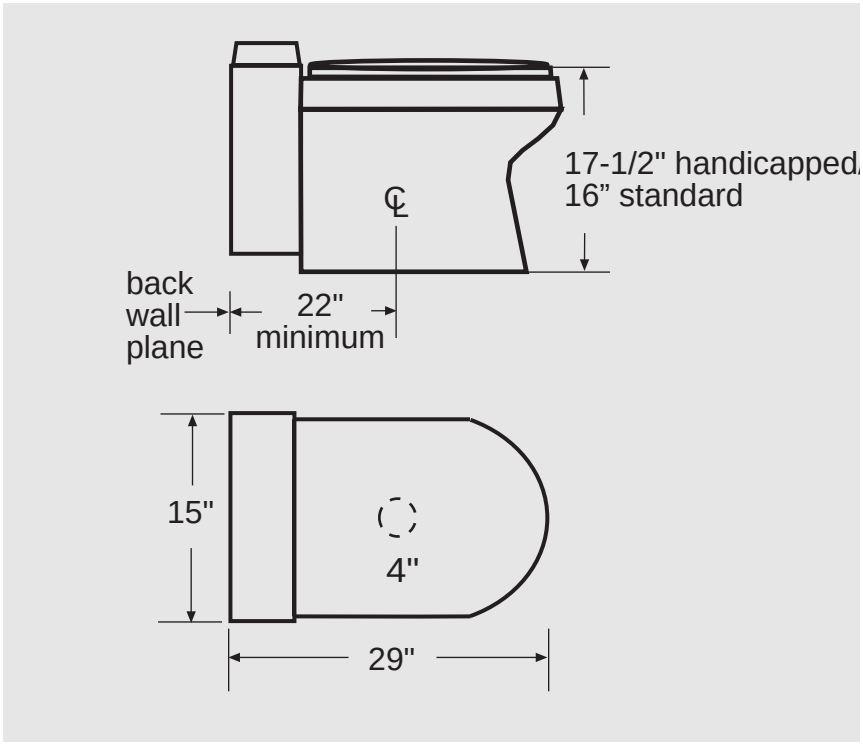
Specifications and materials

STANDARD MODEL
AF208
Liner: polyethylene
Chute opening: 14"
Front to back: 23 3/4"
Width: 18 1/2"
Height of seat: 14"
Weight: 23 pounds

HANDICAP MODEL
AF209
Liner: polyethylene
Chute opening: 14"
Front to back: 23 3/4"
Width: 18 1/2"
Height of seat: 18"
Weight: 26 pounds



Foam-flush Toilet



Specifications and Materials

Toilet body material: vitreous ceramic
Water tank material: vitreous ceramic
Water tank capacity: 9.5 quarts
Toilet seat/lid material: ABS
Front to back: 29"
Width: 15"
Height of seat: 16"; 17-1/2” handicapped
Drain: 4” PVC only
Center line to rear wall: 12 with tank mounted in service corridor, or 22” minimum wtih tank mounted on fixture
Center line to side wall: 15” minimum
Weight: 88 pounds

Power: 120V AC
Consupmption: Continuous--4 watts; flushing--8 watts for 45 seconds
Water consumption: approx. 3oz./flush