

# clivus

**The Natural Solution**

# **M54 Trailhead Planning Manual**

**clivus**multtrum  
INCORPORATED

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# Table of Contents

<b>Introduction</b>	
<b>Overview</b>	<b>3</b>
<b>Process Description</b>	<b>3</b>
<b>Planning and Design</b>	
<b>Composter Capacity</b>	<b>4</b>
Projected Usage	4
Ambient Temperature	4
Liquid Storage Tank	4
<b>Site Requirements</b>	<b>4</b>
Drainage and anchoring	4
Access	4
<b>Composter Requirements</b>	<b>4</b>
Fresh Water	4
Liquid End-product	5
<b>Fixtures</b>	<b>5</b>
Toilet, Chute and Optional Urinals	5
<b>Electricity</b>	<b>6</b>
Ventilation	6
Solar exposure	6
<b>Maintenance</b>	<b>6</b>
Regular	6
Periodic	6
<b>Offloading</b>	<b>6</b>
Packaging	6
Equipment	6



## 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.

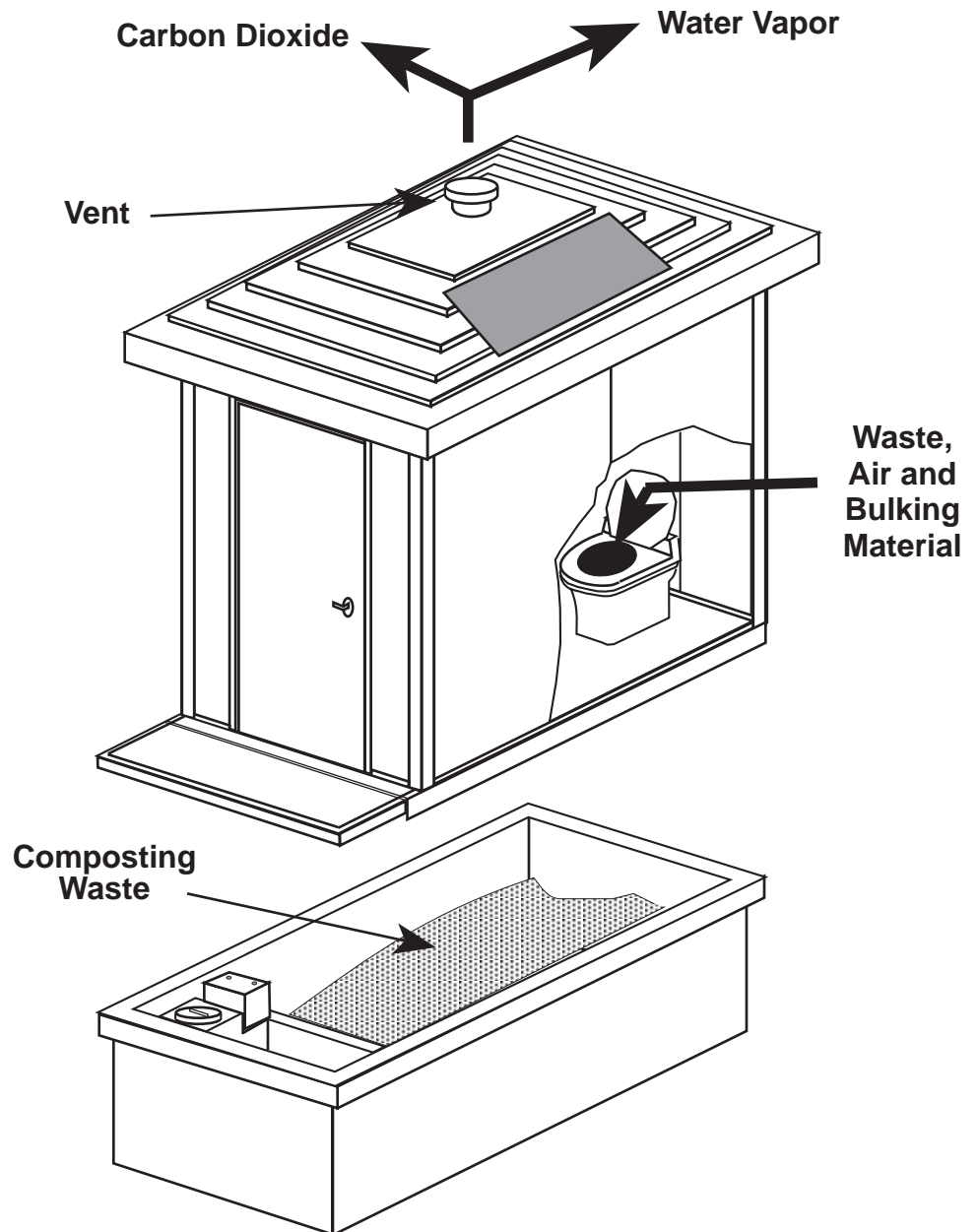
The following pages outline planning for the inclusion of the composting toilet within outdoor design projects. Although all general considerations are discussed in this manual, we recommend that you contact your Clivus representative to ensure that the particular characteristics of your design properly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

## Process Description

The Clivus compostor uses natural biological decomposition to convert human wastes into reusable end-products. The compostor 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

### Projected Usage

To estimate usage levels, follow these guidelines:

- Obtain visitation records (e.g. admission ticket sales, etc.) for the area that the toilet facility will serve. (This is the most reliable method for estimating how many uses the restroom may have to accommodate.)
- If records are not available, estimate visitation based upon information such as number of parking spaces, number of bus-loads, foot traffic, etc.
- Estimate the weekday, weekend and peak attendance levels using Figure 1 as a guide. Account for seasonal variations, holidays, periods of closure, etc. and for duplication of peak days vs. weekday or weekend. This is the estimated number of visitors annually.

- Estimate the average length of stay at the site.
- Calculate the annual number of uses of the restroom facility based on an average of three uses per person per eight hour stay or five per 24 hour period.

The Model M54 Trailhead is rated for an average of 60 uses per day or 22,000 uses annually.

### Ambient Temperature

The composter usage rating is based on an ambient temperature around the tank of at least 65°F. Higher temperatures will accelerate decomposition. If the composter is to be subjected to temperatures below 65°F on more than an occasion-

al basis, the decomposition rate will slow or cease until the temperature rises again.

In many instances, several compost tanks will be required to accommodate total expected usage. It is recommended that at least 10% additional capacity be allowed beyond the rated use level to account for inaccuracies in the estimation of overall facility use. Also to be considered is whether the facility will experience a growth in visitation in the foreseeable future.

### Liquid Storage Tank

The Clivus system generates a liquid end-product that requires storage pending re-use or disposal. The M54 Trailhead has an integral 300 gallon liquid storage capacity.

Figure 1

	<u>Attendance Level</u>	X	<u>Number of Days</u>	=	<u>Annual Total</u>
<b>Weekday</b>	_____		_____		_____
<b>Weekend</b>	_____		_____		_____
<b>Peak Days</b>	_____		_____		_____
<b>Total Number of Visitors to the Site in One Year</b>					_____

## Site Requirements

### Placement and Anchoring

The M54 Trailhead can be placed on grade, or buried to within 4 inches of the floor surface. When placed in-ground, it is imperative that the site chosen be well drained and not subject to flooding. The M54 Trailhead comes with an anchor system that is sufficient to keep it in place where soil is well drained. To achieve greater anchoring, plans should be made to pour a concrete pad in the bottom of the hole to which to anchor the Trailhead. Clivus can provide an engineered drawing.

When the unit is to be placed on grade, anchoring devices must be used to keep it stable. Helical anchors are suitable for this purpose.

Berming up to within 4 inches of the floor surface or fencing around the compost tank may be done to improve appearance and reduce possible vandalism.

### Access

Positioning of the Trailhead base must take into consideration ramping for wheelchair accessibility. When the floor is at grade, a ramp built up to the door must allow the maintenance hatch to remain operable. Ramp construction material and water must be kept out of the maintenance area. If the unit is standing on the ground, the ramp must still allow the maintenance hatch to open freely.

## Composter Requirements

### Fresh Water

A small amount of fresh water is needed in the composter to create the optimal environment for proliferation of the organisms responsible for decomposition. In most circumstances, this amount of water is no more than one to three gallons per day (or the equivalent over longer periods between maintenance) and can be applied with a hose or by hand. The level of usage and maintenance interval are the primary factors affecting the moisture content of the waste mass. Where site visits are infrequent, plan to have water available.

Moistening is the best insurance against accidental fire in a composter.

## Fixtures

### 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. In temperate climates, the liquid will accumulate at the rate of approximately one gallon per 25 uses, allowing 7,500 uses between emptyings of the reservoir. This liquid has a useful nutrient content and should, where allowed, be used on ornamental plantings, trees, shrubs and lawns. Consult local codes and regulations for allowable disposition of this material.

An AC or DC submersible pump may be used to empty the liquid storage reservoir as necessary.

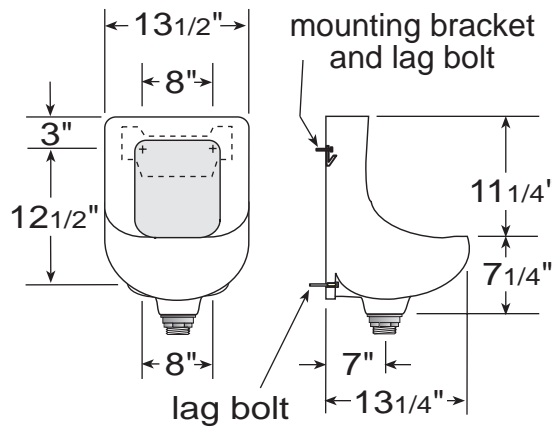
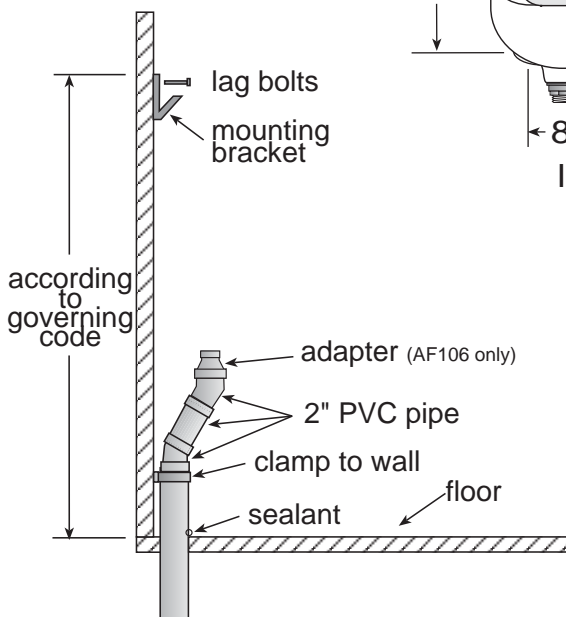
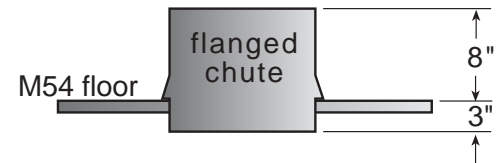
### Waterless Toilet, Chute and Optional Urinals

The toilet is handicap height and uses one flanged, 14" diameter chute to connect to the compost tank. Both toilet and chute are included in the M54 Trailhead package.

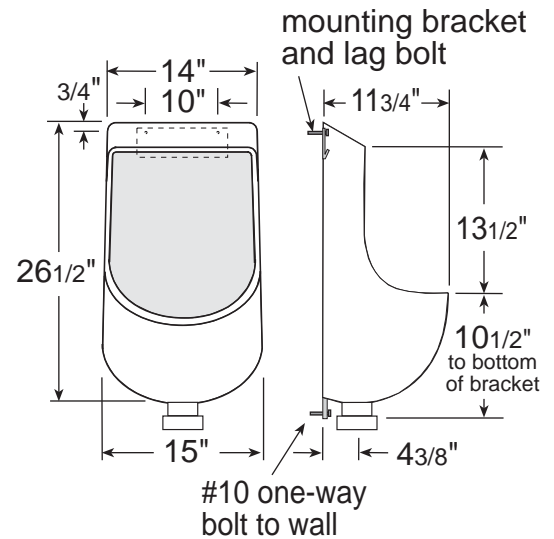
The optional waterless urinals utilize a 2" PVC connection to the composter with NO TRAP. The urinal is vented through the composter by the ventilation fan. Installation of a urinal may interfere with handicap accessibility.

The fiberglass model weighs 14 pounds and is suitable for the standard model Trailhead.

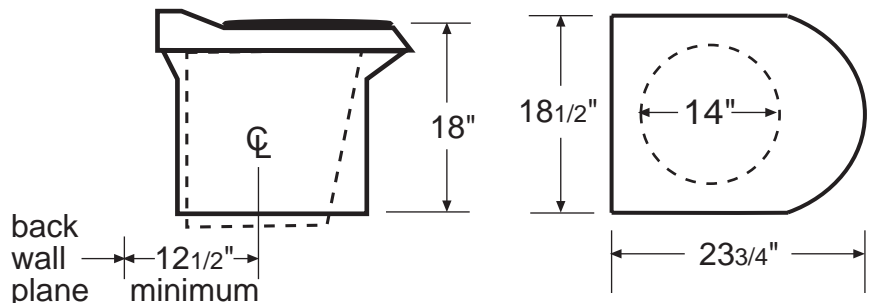
The vitreous china model weighs 25 pounds and is suitable for both the standard and wood model Trailheads.



Vitreous china urinal



Fiberglass urinal



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## Electricity

### Ventilation

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. Each system comes with its own AC or DC fan which will carry out the function of a conventional bathroom exhaust fan. The AC fan is 115 volts, 20 watts; the DC fan is 12 volts and uses .8 amps per hour. There must be no other exhaust fan or other competing air flow.

The electricity required for the fan and optional AC or DC liquid removal pump should be brought to the vicinity of the compost tank. Clivus can supply solar or other power-producing equipment.

### Solar Exposure

One face of the M54 roof should be open to a 120° arc of sunlight to maximize collection when roof-mounted DC power is utilized. This may mean trimming branches or trees to allow greater exposure. Pole-mounting of collectors is possible.

## Maintenance

### Regular

Regular maintenance consists of the addition of bulking material to the compost chamber, compost pile raking and moistening.

### Periodic

Periodic maintenance includes cleaning the fan and ventilation ductwork and the occasional removal of liquid end-product and solid compost.

## Offloading

### Packaging

The M54 comes with small components and fixtures nested inside the composter base. The floor, wall panels and roof are stacked on top of the base and the entire package is banded and shrink-wrapped. It is shipped without a pallet.

Package:

M54 118"L X 84"W X 92"H; 1800 pounds.

M54W 118"L X 84"W X 92"H; 2400 pounds

### Equipment

If a loading dock is available, a pallet jack and Johnson bar can be used to slide the unit off the truck trailer. In situations where there is no dock, or the platform is significantly lower than the trailer bed, a fork lift with extra-long tines, a backhoe, or some other lifting device, will be needed to remove the unit from the trailer. Several people should be present to assist in offloading.

The unit may be unpacked for transport to a remote site. The largest single-piece dimensions and weights are:

M54 Base—116"L X 66"W X 48"H; 1000 pounds.

Roof--106"L X 84"W X 38"H; 200 pounds.

Floor—118"L X 66"W X 2"H; 300 pounds.

M54W Base—116"L X 66"W X 48"H; 1000 pounds.

Floor—118"L X 66"W X 2"H; 300 pounds.