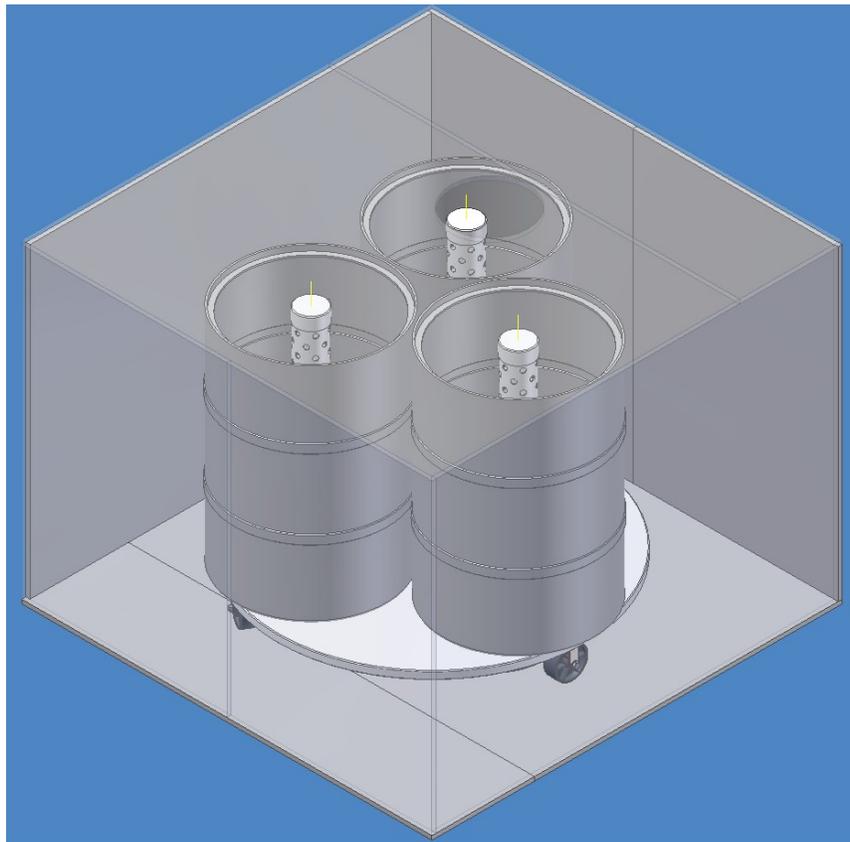


Composting Toilet Construction Manual

A Step-by-Step Illustrated Guide to
Building a Low Cost, Large Capacity
Composting Toilet System



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1. Introduction

There is tremendous worldwide demand for safe, reliable, affordable sanitation systems, particularly in locations where water supplies and wastewater disposal options are limited. Depending on a variety of site-specific conditions, dry composting toilets can provide an excellent solution to the problem. But not all composting toilets are created equal. There is wide variation in size, capacity, materials, features, effectiveness, cost, maintenance, energy requirements and safety.

Existing commercially available units can be divided into two general categories: units sized for small families and/or weekend cottage use, costing about \$1,000-\$1,500 (e.g. Sun-Mar, BioLet, Envirolet, etc.); and larger, full capacity units sized for larger families and full-time residential use (e.g. Clivus Multrum, Phoenix, AlasCan, etc.). These units typically start at about \$5,000, and go on up from there, with installed costs reportedly running as high as \$20,000. Neither option provides a satisfactory solution to the general problem. The smaller units tend to be inadequate for full time residential use (manufacturer's claims notwithstanding) and often require more energy to operate and more time and effort to maintain, while the larger units are generally priced beyond the reach of those who need them the most.

This book provides detailed instructions for building a simple, large capacity composting toilet system for less than the cost of many typical smaller units, while providing performance and features not found on systems costing far more.

Features include:

- **Batch feed:** There is no contact between fresh waste and the finished compost. All material removed from the unit is fully aged and can be handled safely.
- **Modular:** Modules can be added or removed as desired to accommodate any requirement, from single family, to multi-family, to institutional.
- **Minimum maintenance:** There are no moving mechanical parts to fail. Only non-corroding materials are in contact with wastes. Annual maintenance requires removing, emptying and replacing a plastic drum - which can be done off site. Removed material is completely aged, light, odor-free humus. Modules can easily be handled by one person, and will fit through a 24" opening.
- **Simple Design:** Can be locally built, using commonly available materials. Does not require specialized tools or skills to build, lends itself to local self-help solutions, creation of local jobs, small business opportunities.
- **Low energy use:** Aeration/evaporation system uses exhaust air from existing household ventilation system (If none exists, one can/should be added, which would also address other health issues - i.e. indoor air quality). No other energy input is required.

Benefits of Urine Separation:

Keeping urine and feces separated from each other is a primary feature of the design, key to its success. By itself (or with vegetable scraps) human fecal matter is far easier to compost aerobically than when it is combined with urine.

Urine comprises the largest fraction of total volume of wet waste material. It also contains most of the nutrients in human waste—about 80% of the nitrogen and 50-60% of the phosphorus and potassium. It is sterile (in healthy individuals), salty and does not contain pump-clogging solids. The highest and best use for urine is to dilute it with water and to immediately apply it to the root zone of plants before the nitrogen is lost to the atmosphere. It is pure liquid gold.

But when it is combined with feces, the extra liquid greatly complicates the problem of keeping the compost pile aerobic, and of treating and disposing of the excess moisture. The extra nitrogen upsets the optimum carbon-to-nitrogen balance required for composting. The extra salt kills earthworms, preventing their use for stirring, homogenization and aeration of the pile. Having to deal with each of these problems is what makes most conventional composting toilets more complicated and expensive than they would otherwise need to be.

Caveat: The design presented here is based on over 20 years of trial and error, design and redesign. During that time we have explored a wide variety of options and gained some definite ideas about what works and doesn't work for us. If you absolutely cannot live without a water flush toilet, and/or can't locate a waste chute directly above the composter, this design isn't for you. By the same token, however, if you can find a way to separate urine from feces, and eliminate the extra water required to flush a toilet, you will greatly simplify both installation and maintenance requirements.



Figure 1.1: Completed composter. Hose from urine-separating seat to bucket in front.