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**Using Composting Toilets and Greywater Systems in Massachusetts**

**COMPOSTING TOILETS**

**Required Approvals**

*Homes:* Title 5 ([310 CMR 15.000](#)) allows composting toilets for Remedial Use and also certifies them for General Use in new residential construction where a system in full compliance with Title 5 could otherwise be installed. The local approving authority (typically the Board of Health) must also approve installation of a composting toilet through a Disposal System Construction Permit and Certificate of Compliance. Check with your local Board of Health for its approval procedures.

*Commercial or Public Facilities:* Massachusetts General Laws of 2002 (Chapter 176, §3) allow the use of composting toilets for remedial use or new construction of commercial and public facilities without meeting the full compliance requirement of Title 5. As with residential facilities, they must obtain approval from their local approving authority. DEP is the approving authority for state and federal facilities.

*Plumbing Approvals:* Since a composting toilet is a plumbing fixture, the Board of Registration of Plumbers and Gas Fitters must also approve the unit. For a list of approved units, see [http://license.reg.state.ma.us/pubLic/pb\\_product.asp](http://license.reg.state.ma.us/pubLic/pb_product.asp). In addition, the local plumbing inspector must approve any installation of indoor plumbing fixtures.

**Composting Toilet Technology**

Composting toilets use a biological process in which various types of organisms degrade human waste under controlled conditions to a humus-like end product. This process is influenced by environmental factors such as temperature, moisture, pH, aeration and the ratio of carbon to nitrogen:

- Compost temperature must be maintained above 55°C for three days for composting to proceed effectively and kill pathogenic organisms. At lower temperatures, bacterial activity is inhibited, the composting process slows, and pathogens may not be destroyed.

- Moisture must be maintained between 40-60% for best results. All organisms require water, but too much moisture in the compost pile may create anaerobic conditions. On the other hand, very low water content will retard microbial activity.
- Normally, there is no need to influence the pH of a composting toilet. The ideal pH range for most bacteria is from 6 to 7.5. Fresh human excreta are slightly acid (below 6) but after a few days in compost pile the pH usually begins to rise to the optimum range.
- Proper mixing, porosity and maintenance of aerobic conditions are necessary for rapid decomposition and for the destruction of pathogenic organisms. Under anaerobic conditions, the decomposition is slower, heat given off is only a fraction of that from aerobic conditions, and foul-smelling gases are released.
- To achieve rapid decomposition, the optimum range for the carbon/nitrogen balance is 20:1 to 30:1. Human excreta and especially urine are rich in nitrogen. It may be necessary at times to add high carbon materials like sawdust, grass and kitchen wastes to keep the carbon/nitrogen ratio in the optimum range. Manufacturers of composting toilet systems often recommend such materials and provide instructions on how often to use them; they may even sell pre-packaged bulking agents.

### **Types of Composting Toilets**

There are two types of composting toilets generally available:

*Separate Composting Units:* These are toilets connected to a separate, relatively large composting unit located near the toilet. Waterless composting toilets are typically installed in a bathroom directly above the composting unit with a straight chute directly connecting them. A foam flush toilet can be offset from the composting unit and connected to it via a standard pipe.

The composting unit consists of a receptacle and a storage chamber. A properly operating composting process will decompose the pile to less than 10% of the original volume by the time the compost is ready to be removed. Excess liquid is drained to the lowest part of the composting unit where it is either evaporated or collected. This is a slow process, and it may take a few years before the first time there is a need to remove humus from the storage unit. After that, annual removal is generally sufficient.

*Self-contained Units:* These are smaller units in which the toilet seat, receptacle and composting tank are a single self-contained unit. Some designs incorporate heaters and mechanical aeration to maintain a balance of moisture and aerobic conditions necessary for proper composting. Self-contained units are designed to evaporate all excess liquid so that there is no discharge other than the finished compost. Compost has to be removed from these units several times per year; disposal options for the finished compost are described below.

### **Liquid By-product**

If the composting toilet produces a liquid by-product that is not recycled through the toilet, the liquid by-product must be disposed of in one of the following ways:

- a) Discharged through a greywater system on the property that includes a septic tank and leaching system in compliance with Title 5 ([310 CMR 15.100-15.293](#));

- b) Stored properly and removed and disposed of by a licensed septage hauler;
- c) Disposed of using an alternate method specifically approved by DEP.

### **Composted Solids**

Title 5 ([310 CMR 15.289\(3\)\(a\)\(3\)](#)) requires that composting toilet systems be designed to store compostable and composted solids for at least two years, either inside the composting chamber (systems with large separate composting units) or in a separate compost container (smaller self-contained units), unless DEP has specifically approved an alternate system.

Compost from a system may be removed by the owner, a maintenance person, or a licensed septage hauler. Compost has the potential to contain pathogenic organisms, and caution and good hygiene are necessary when dealing with this material. The composted material must be disposed of in one of the following ways:

- a) Burial on the site or in another manner and location approved by the local Board of Health, and covered with a minimum of six inches of clean compacted earth;
- b) By a licensed septage hauler.

### **Places to try before you buy**

Manufacturers should be able to give you a list of facilities you can visit. In addition, there are a number of public facilities in Massachusetts that use composting toilets:

- Halibut Point State Park, Rockport, MA
- Johnny Appleseed Tourist Information Center, Route 2, Lancaster, MA
- Mass. Audubon, Visitor's Center, Wellfleet, MA
- Nickerson State Park, Brewster, MA
- Salisbury Beach, Salisbury, MA
- Walden Pond State Reservation, Concord, MA
- Wallum Lake, Douglas, MA
- Waquoit Bay National Estuarine Research Reserve, Waquoit, MA.

## **GREYWATER SYSTEMS**

If a facility using a composting toilet generates greywater (i.e. wastewater from sinks, showers, washing machines, etc.), a soil absorption system still is needed for its safe treatment and disposal. A 2002 study by University of Massachusetts in Amherst ([Greywater Characterization And Treatment Efficiency](#)) indicates that greywater, while containing less of many pollutants than combined domestic wastewater, is still contaminated. It may contain toxic chemicals, nutrients such as phosphorus and nitrogen, and pathogens, including bacteria and viruses.

There are three approval options for greywater systems: Remedial Use, General Use for New Construction, and Piloting Approvals. In addition to the information below, see DEP's [Technology Approval Process for I/A Systems](#).

**Remedial Use**

Remedial Use Approvals ([310 CMR 15.284](#)) may be used for greywater systems in all types of existing facilities (residential, commercial, or public) that meet three criteria:

- a) Design flow of less than 10,000 gallons per day;
- b) Served by an existing system which has failed, is failing or does not conform to Title 5 standards;
- c) There is no proposed increase in the design flow from the facility.

Under remedial use, an existing cesspool may be used as a leaching pit under the following conditions:

- The cesspool is pumped and cleaned when the other system components are installed;
- The bottom of the cesspool is located at least two feet above the high groundwater elevation;
- The cesspool meets the design criteria of Title 5 ([310 CMR 15.253](#)) for depth, separation between units, and inspection access, or the cesspool is replaced by a precast concrete leaching pit meeting these requirements;
- The requirements of [310 CMR 15.242](#) on effluent loading rates are satisfied.

When greywater is to be discharged to a facility's existing soil absorption system and that system has failed, a new soil absorption system is required. The soil absorption system may be reduced by 40% from the size required by its Title 5 design flow ([310 CMR 15.242](#)). A new septic tank also is required if a filter system approved by the DEP is not installed; note that to date DEP has not approved any greywater filter systems. Since filters are plumbing fixtures installed in a building, they would need to be on the [list](#) approved by the Board of Registration of Plumbers and Gas Fitters, and an inspection by the local plumbing inspector is required.

*Approval Process for Remedial Use:* A Disposal System Construction Permit and Certificate of Compliance must be obtained from the local Board of Health; no application to DEP is required unless variances from Title 5 are being requested. If DEP variances are needed, the applicant must apply for the variances first to the Board of Health and then to the appropriate Regional Office of DEP using form BRP WP 59b (DEP Approval of Variance). See <http://www.mass.gov/dep/brp/wwm/t5forms.htm#ia> for DEP Forms and Applications.

**General Use for New Construction**

Under Title 5, New Construction includes facilities built on an undeveloped lot and any situation in which a facility increases its design flow, e.g., adding a bedroom to a home or adding seats to a restaurant. In a facility with a composting toilet, if there is a greywater discharge or a discharge from a drain equipped with a garbage grinder, a septic tank and soil absorption system are required. A filter system specifically approved by DEP for this type of application can be used instead of the septic tank; note that to date DEP has not approved any such filters. Since filters are plumbing fixtures installed in a building, they would need to be on the [list](#) approved by the Board of Registration of Plumbers and Gas Fitters, and an inspection by the local plumbing inspector is required.

For greywater systems in New Construction, the size of the soil absorption system may be reduced by 40%. However, in residential construction the site must be capable of providing 100% leaching capacity. This ensures that there will be available land for waste disposal in case

the current or subsequent property owners remove the composting toilets. Installations at commercial and public facilities do not have to meet this requirement for a site with 100% leaching capacity (2002 MGL, chapter 176, §3).

There is currently no nitrogen removal credit established for the use of composting toilets; therefore, the loading on the lot cannot exceed 440 gallons per day per acre in a nitrogen sensitive area ([310 CMR 15.214](#)).

*Approval Process for New Construction:* A Disposal System Construction Permit and Certificate of Compliance must be obtained from the local Board of Health or approving authority. No application to DEP is required, unless DEP variances to Title 5 are needed, in which case the application also must be submitted to the appropriate Regional Office of DEP using application form BRP WP 59b (DEP Approval of Variance). See <http://www.mass.gov/dep/brp/wwm/t5forms.htm#ia> for DEP Forms and Applications.

### **Greywater Piloting Approvals**

DEP issues Piloting Approvals for innovative greywater systems such as greywater gardens. Piloting Approvals for New Construction must meet the conditions in [310 CMR 15.285](#). The applicant must also show that a fully complying Title 5 system could be constructed on the site, should the piloting project fail and require replacement. In addition, greywater systems with Piloting Approval may be installed as Remedial Use systems to replace a failed, failing, or nonconforming system.

DEP has approved alternative greywater systems to serve homes and public facilities such as state parks and rest areas. Based on performance data from the Greywater Piloting Program and information from the University of Massachusetts study, DEP has proposed regulatory changes to Title 5 for greywater systems. In the meantime, DEP will continue to accept applications for Piloting Approvals of greywater disposal or reuse projects.

*Approval Process for Piloting:* Applicants for a Piloting Approval must show through available laboratory data, field-testing, previous use and other information that the system is likely to be capable of providing a level of protection at least equivalent to a conventional Title 5 system. For installations in homes, commercial facilities, and local public facilities, the applicant must first obtain Board of Health approval and then submit DEP application BRP WP64b (Installation of Alternative Systems) to the Boston DEP. For state and federal public facilities, applicants should submit BRP WP63 (Disposal System Construction Permit for State and Federal Facilities) to the Boston DEP. See <http://www.mass.gov/dep/brp/wwm/t5forms.htm#ia> For DEP Forms and Applications.