

COMMERCIAL & INDUSTRIAL GREYWATER SYSTEMS

Practical Applications, Inc.



MIT Brain &
Cognitive Center
Greywater System,
Cambridge MA

Synopsis:

Follow these basic steps on the reverse of this page to complete your next successful Greywater System Installation

 PRACTICAL
APPLICATIONS

Successful Greywater projects include the following elements:

1. The project has a favorable Return on Investment (ROI),
2. A wastewater stream characterization was completed,
3. Based on item two, suitable recover and storage equipment was chosen,
4. Based on item two, suitable treatment equipment and piping was chosen, and
5. The system design integrated Plumbing Code & Environmental Regulations including protection, monitoring and regulatory reporting.

Return On Investment

All Greywater projects should have a Return on investment that has a payback of less than two years. Currently the MWRA Water and Sewer Rates Average \$9.8/HCF (updated Nov 2008, Boston MA Commercial). A typical Greywater system costs between \$50,000.00 and \$100,000.00. Based on Boston commercial water and sewer rates, owners need to recycle at least 5,228 gallons of water per day for the system to have a favorable ROI.

Wastewater Stream Characterization

Typical Greywater systems recover water from sources that contain a variety of contaminants that need to be measured to ensure that downstream systems and equipment are not damaged and to prevent exposure of harmful pollutants to the end users. At a minimum the following measurements are made from a representative stream:

- a. Suspended Solids
- b. Dissolved Solids
- c. Organics (synthetic)
- d. pH (Acidity & Alkalinity)
- e. Bacteria

Once a baseline analysis is performed further sampling and analysis may be necessary to address site specific contaminants.

Recovery and Storage

Cisterns and Day Tanks need to be configured to minimize contaminant loading and to prevent code violations. For example, cisterns can be configured to bypass the first portion of rainwater during a rain event to reduce the organic loading on the system caused by bird waste and other debris which may accumulate on the roof. Second, mixed recovered wastewater streams cannot be discharged to the storm drain and vice versa. It is illegal to discharge rain water to the sewer system and it is illegal to discharge industrial wastewater to the storm system.

The cistern and day tanks need to be sized appropriately to recover the maximum water amount yet minimize the tank's footprint. Cisterns should be sized large enough to capture typical rain events and oversized to maximize a rain events' capture.

Sample Calculation

Cistern volumes can be determined by calculating the roof top water yield for any given rainfall, shown in Equation 1 below.

Day tanks are sized based on the process feeding the Greywater System. A day tank used to recover Reverse Osmosis Reject (RO Reject) is sized to capture the entire reject cycle.

Treatment Equipment & Piping

Based on the wastewater stream characterization study, the Greywater may require some treatment prior to use. Most systems employ mechanical filtration to remove the suspended dirt to protect downstream equipment such as flush valves. The type of mechanical filtration equipment will depend on the flow rate.

Typical equipment according for flow rates is:

**Multimedia Filtration Systems
(flows 50gpm and higher)
Bag Filtration (flows 10gpm to 100gpm)
Cartridge Filtration (flows less than 15gpm)**

If needed, treatment to remove or protect the Greywater may include; Bleach, Ozone, or UV Light. The choice is site/wastestream dependent.

Piping planned and installed in new construction projects is critical to meeting the ROI budget as it is almost impossible to retrofit an existing building with separate Greywater Systems.

Regulations require that mixed wastewater is discharged to the appropriate drain system (i.e., storm drains, sanitary drains). Therefore, attention is needed to determine if the cistern overflow piping is directed to storm drainage and if the day tank overflow is directed to sanitary drainage. A regulatory review is needed to ensure that the piping is correct.

Plumbing Code and Environmental Regulations

Currently the Massachusetts Plumbing code requires a State issued special permit for Greywater Systems. All permits are issued by the Board of State Examiners of Plumbers and Gasfitters via the "Special Permission Plumbing Request Application Form." The Massachusetts Department of Environmental Protection (MADEP) regulates Greywater systems under state regulations 314CMR20.00. The MADEP requires that the water not harm the public who come in contact with the Greywater. Therefore, some Greywater systems may need to add chemicals to kill harmful microorganisms or may need special treatment to remove harmful toxins.

The local Board of Health may also require permitting and monitoring.

EQUATION 1 : $V = A2 \times R \times 0.90 \times 7.5 \text{ GALS./ FT.3}$

where:

- V= volume of cistern (gallons)
A2= surface area roof (square feet)
R= rainfall (feet)
0.90= losses to system (no units)
7.5= conversion factor (gallons per cubic foot)

Example: one 600-gallon Cistern would provide runoff storage from a rooftop area of approximately 2150 square feet for a 0.5 inch (0.042 ft.) of rainfall.

600 gallons = 2150 ft.2 x 0.042 ft. x 0.90 x 7.5 gallons/ft.3

Download a PDF of this article at:

www.paih2o.com/documents

Contact Practical Applications today to discuss your Greywater System options.

Find out more at www.paih2o.com.

Contact us at info@pai-online.com and by telephone at 617-423-5639.



12 Channel St. Boston, MA 02210