

REFERENCE MANUAL 83B1 WASTEWATER SYSTEMS

A. General

- A.1 NPS Unit Managers will ensure operators are adequately trained and certified in accordance with operator requirements of the Primacy Agency. Unit managers will designate, in writing, primary operators, and backup operators who have adequate training and skills to operate the system(s). Parks that operate only individual, on-site wastewater systems will have appropriately trained operators.
- A.2 NPS Unit Managers will develop training plans and assure that operators receive any required and/or appropriate training.
- A.3 NPS Unit Managers will assure that required records are maintained in permanent files for periodic review by the regional Public Health Consultant (PHC) or Primacy Agency representatives, and that reports are submitted on a timely basis as requested by the PHC and/or required by the Primacy Agency.
- A.4 When wastewater system modifications or new construction are proposed, parks will submit plans and specifications to the Primacy Agency for approval. A copy of the plans and specifications will be provided to the PHC.
- A.5 All wastewater facilities will be installed, operated and monitored in accordance with Primacy Agency requirements.
- A.6 Suitable front country waste systems include: flush toilets; vault toilets; and chemical toilets. Chemical toilets are for temporary use only since they require frequent service and pumping to prevent objectionable odors.
- A.7 Suitable backcountry waste systems include flush toilets; composting toilets; barrel toilets; evaporator toilets; incinerator toilets and pit privies. Pit privies should only be used as a last resort where other types of facilities are not possible. The Park Sanitarian or the PHC should conduct the siting of pit privies.
- A.8 All new vault toilets will incorporate the U.S. Forest Service Sweet Smelling Toilet (SST) design features. Vault toilets will be pumped as necessary. The U.S. Forest Service *In-Depth Design and Maintenance Manual for Vault Toilets* is provided in RM83(B2).
- A.9 All toilet facilities will be cleaned and re-supplied as often as necessary to maintain a high degree of sanitation. The U.S. Forest Service guidance manual *Cleaning Recreation Sites* is provided in RM83(B3).
- A.10 Adequate sanitation facilities will be required for remote areas such as river rafting, horseback riding, back country biking, backpacking and similar activities in accordance with RM83(F).

- A.11 Septic tanks shall be inspected annually to determine the amount of accumulated scum and sludge. Records of septic tank measurements, inspections, and pumping will be available for review by the PHC. Septic tank risers will be provided for inspection holes to facilitate inspection and pumping. Septic tanks will be pumped when the scum and or sludge levels in the tank dictate (generally every 3-5 years). The bottom of the scum should never be closer than 3 inches to the bottom of the outlet device, and the top to the sludge layer should never be less than 8 inches from the bottom of the outlet device.
- A.12 Septic tank drain fields shall be surveyed annually during a high use period to identify system failures such as odors and surfacing wastewater. The drain field should be kept clear of trees and bushes, which may send roots into the drain field piping system resulting in clogging and causing premature failure.
- A.13 Personnel who routinely come into contact with sewage or who work in or inspect wastewater treatment facilities, lagoons, etc. will have a current immunization for tetanus.
- A.14 Wastewater treatment plant personnel will not eat, drink or smoke when performing maintenance or inspecting equipment, which may be contaminated with human sewage.
- A.15 In the event of a major wastewater leak or spill, the PHC will be notified within one business day. Facilities and equipment contaminated with sewage as a result of leaks, spills, and sewage system backflow will be thoroughly washed down with water and detergent. Further guidance is provided in RM83(B4) Raw Sewage Spill Notification and Cleanup.

B. DEFINITIONS

Aerobic Waste Treatment: The stabilization of wastes through the action of microorganisms in the presence of oxygen.

Anaerobic Waste Treatment: Waste stabilization brought about through the action of microorganisms, which exist in the absence of oxygen.

Back Country Systems: Systems not readily serviceable by motorized vehicles or boat. They are found in remote areas frequented by backpackers, hikers and other park users.

Barrel Toilet: A toilet which collects waste in a barrel or drum which can be sealed when full and transported by truck or helicopter to a treatment plant for proper disposal.

Biochemical Oxygen Demand (BOD): The amount of oxygen required to stabilize decomposable organic matter.

Cesspool: Covered open joint walled pits that receive raw sewage.

Chemical Oxygen Demand (COD): The amount of oxygen required to stabilize decomposable organic and oxidizable inorganic material.

Chemical Toilet: A toilet that collects wastes in a small storage container filled with a chemical disinfectant, which destroys microorganisms and controls odor. Usually covered with an enclosed insect proof structure.

Coliform: A group of bacteria commonly found in soil and intestines of man and other warm-blooded animals. The presence of coliforms in surface and/or ground waters is a general indicator of recent human and/or animal fecal contamination.

Composting Toilet: A toilet that promotes aerobic decomposition and stabilization of human waste through the addition of a carbon source (e.g., wood shavings). Requires regular operations to function properly.

Confined Space: Any space that by design has limited openings for entry and exit; unfavorable natural ventilation which could contain or produce dangerous air contaminants, and which are not intended for continuous employee occupancy. Confined spaces include but are not limited to storage tanks, ship compartments, process vessels, pits, vats, silos, degreasers, reaction vessels, boilers, ventilation and exhaust ducting, sewers, manholes, tunnels, trenches, underground utilities, septic tanks, wet wells, and pipelines.

Dissolved Solids: The material contained in a liquid, which shall pass through a glass fiber filter. Examples include iron, calcium, magnesium, potassium and sodium in combination with chloride, sulfate, bicarbonate, carbonate and nitrate.

Effluent: Wastewater flowing out of a reservoir, basin, sewage treatment plant, industrial treatment plant or marine sanitation device.

Evaporator Toilet: A toilet that evaporates liquid from human waste to decrease the weight prior to removal from the site.

Fecal Coliform: A group of bacteria in the coliform group, which inhabits the intestines of all warm-blooded animals. The presence of fecal coliforms in surface and/or ground waters is a good indicator of recent human and/or animal fecal contamination.

Front Country Systems: Those systems accessible by motorized vehicle or boat.

Intrinsically Safe: Equipment designed so that there is no possibility of creating an ignition source.

Lagoon: A pond containing raw or partially treated wastewater in which aerobic, facultative and/or anaerobic stabilization occurs.

NPDES: The National Pollutant Discharge Elimination System is a program developed by the EPA to control discharge pollution of natural waters and is found in EPA 40 CFR 122.

Permit: An authorization, license or equivalent control document issued by EPA or an "approved State" to implement the requirements of NPDES (National Pollutant Discharge Elimination System).

Primacy Agency: A State agency authorized by the Environmental Protection Agency (EPA) to administer the program. If a state has not requested this authorization, EPA is the Primacy Agency.

Primary Treatment: The physical removal of solids from wastewater involving settling or flotation.

Privy: A dug hole in the ground for the disposal of human waste. Usually covered with an insect proof enclosure.

Sanitary Survey: A detailed investigation of the features of a wastewater system and conditions, which may impact the ability of the system to adequately treat wastewater.

Secondary Treatment: Biological treatment of wastewater which produces an effluent with a monthly average of 30 mg/l of BOD and suspended solids, 200 fecal coliform/100 ml and a pH between 6 and 9.

Septage: The liquid and solid material removed from a septic tank, cesspool, vault toilet or similar domestic wastewater treatment system or holding tank when the system is cleaned or maintained.

Septic Tank: A watertight, covered tank designed and constructed to receive sewage from a building sewer. It separates solids from the liquid, digests organic matter; stores digested solids through a period of detention, and allows clarified liquids to discharge.

Sludge Digestion: The further decomposition and stabilization of solids removed from primary and secondary treatment processes. This process uses microorganisms, which can be either aerobic or anaerobic.

Suspended Solids: Those solids that are visible and in suspension in water. May be settleable or non-settleable.

Tertiary Treatment: Additional treatment following secondary treatment designed to achieve a specific effluent quality.

Total Organic Carbon (TOC): A measure of the total carbon as carbon dioxide in a liquid after all inorganic carbon has been removed or accounted for.

Total Solids: The combined sum of the suspended and the dissolved solid material in wastewater.

Vault Toilet: A toilet with a watertight underground tank, which totally contains all wastewater, which enters. The tank shall be emptied periodically and the wastes properly disposed. It requires adequate ventilation to control odor and should be easily pumped out. Usually covered with an enclosed, insect proof structure.

Wastewater: Liquids and waterborne solids from domestic, industrial or commercial uses that have been used in man's activities. If improperly controlled or inadequately treated can cause human illness and/or pollution of the environment.

Waters of the United States: All natural ground and surface waters that meet the criteria of 40 CFR 122.2.

C. PLAN REVIEW AND APPROVAL

C.1 When wastewater system modifications or new construction is proposed, parks should contact the PHC to determine if approval of plans and specifications should be submitted to the primary Agency for approval.

D. PAYMENT OF FEES FOR SERVICE

D.1 Many Primacy Agencies charge fees for services. Fees are charged for plan review, construction permits, operating permits, and for sanitary surveys. Parks may be required to pay these fees.

E. OPERATOR REQUIREMENTS

E.1 All systems requiring a NPDES discharge permit or all onsite treatment systems, as required by the state, shall have certified operators. All other treatment systems shall have staff who have adequate training and skills to operate the system. The park should consult with the Primacy Agency to determine operator certification requirements.

E.2 The Park should designate, in writing, primary operators, and backup operators who have adequate training and skills to operate the system when the primary operator is not available.

F. FRONT COUNTRY WASTEWATER SYSTEMS

F.1 Suitable front country waste systems include (1) Flush toilets, (2) Vault toilets, and (3) Chemical toilets (temporary use only).

G. BACKCOUNTRY WASTEWATER SYSTEMS

G.1 Suitable backcountry waste systems include (1) Flush toilets, (2) Composting toilets, (3) Barrel toilets, (4) evaporator toilets and (5) Pit privies.

G.2 Adequate sanitation facilities should be provided by Park or Concessioner for group trips to

remote areas such as river rafting trips, horseback riding trips, backcountry biking, or backpacking groups. Requirements for the number of facilities required for campgrounds, picnic areas, etc. are included in "Environmental Health Practices in Recreational Areas" by the U.S. Public Health Service, Centers for Disease Control and Prevention. The facilities should be in compliance with RM83(F), Backcountry.

H. MONITORING REQUIREMENTS

H.1 NPDES Permitted Facilities

- a. The National Pollution Discharge Elimination System (NPDES) regulations (EPA 40 CFR 122) dictate basic monitoring requirements for systems, which discharge into "waters of the United States". Systems, which do not discharge any effluent, are not effected by the NPDES regulations. NPDES discharge permits are issued by the Primacy Agency (usually the State) and the permit describes the specific monitoring requirements of a given system.

In addition to wastewater discharges, the requirements include sludge disposal, water treatment facility discharges, non-point discharges, and storm water drainage **systems** constructed after October 1, 1992.

The permit program is operated by a Primacy Agency (EPA or the State) and applies to owners or operators of any facility, which discharges effluent. The Primacy Agency issues permits for a fixed term not to exceed five years. At the end of that time period, the application is reviewed and the permit is reissued, as is, with new monitoring criteria or canceled.

- b. The permit application forms are available from the Primacy Agency. It may request information on estimated daily maximum flows, daily average flows and source of information for each outfall for the pollutants mentioned in NPDES. The permit may require influent and effluent monitoring of BOD, COD, TOC, total solids, suspended solids, coliforms, flow, phosphorus, ammonia as nitrogen, and temperature (winter and/or summer). Permits may also require monitoring of groundwater (monitoring wells) and/or adjacent surface waters. The Primacy Agency may only grant waivers.
- c. The permits are generally effective for a fixed term not to exceed 5 years.

H.2 Non-Permitted Treatment Facilities - These facilities do not require regular monitoring unless specifically requested by the Regional PHS Consultant to determine operational performance.

I. OPERATIONAL REQUIREMENTS

These guidelines are provided to give NPS operators' basic guidance on common systems. However, these guidelines are not all inclusive and do not address proper operating procedures for operation of activated sludge plants, trickling filters, tertiary treatment, sludge

digestion, physical chemical treatment, etc. For these types of facilities, the following references should be consulted. If these references are not available, contact the PHS Consultant.

Manual of Septic Tank Practice, USPHS Publication No. 526, Reprinted 1969, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20201.

Wastewater Treatment/Disposal for Small Communities, EPA/625/R-92/005, September 1992.

Activated Sludge Process Control, Compiled by Ronald G. Schuyler, P.E.

I.1 Wastewater Treatment Ponds (Lagoons)

- a. Lagoons should be monitored at least every two weeks for liquid coloration, presence of septic odors, properly operating aerators, materials floating on the surface, insect breeding, and vegetation growth. The dikes should be free of rodent burrows. Vegetation on the dikes and at the waterline should be controlled.
- b. All lagoons should be signed and fenced in such a manner to exclude unauthorized entry.
- c. An all weather road should be constructed to each lagoon facility. These roads should be periodically graded and maintained to facilitate access for operation and maintenance purposes.

I.2 Septic Tank Drain Field Systems

- a. Septic tanks should be inspected annually to determine the amount of accumulated scum and sludge.
- b. Risers with appropriate covers should be provided for septic tank inspection holes to facilitate location, inspection and pumping.
- c. Septic tanks should be pumped when the scum and/or sludge levels in the tank dictate (generally every 3-5 years). The bottom of the scum mat should never be any closer than 3 inches to the bottom of the outlet device, and the top of the sludge layer should never be less than 8 inches from the bottom of the outlet device.
- d. Records of septic tank measurements, inspections and pumping should be maintained and be available for review by the Public Health Consultant. Please see Attachment B for a recommended septic tank log sheet and diagram.
- e. Drain fields should be surveyed annually during a high use period to identify system failures such as odors and surfacing wastewater.

- f. Additives to enhance bacterial growth in septic tank systems generally are not recommended.
- g. Copper sulfate can be used to control root intrusion.
- g. The drain field area should be kept free of trees and large bushes that may cause plugging by sending roots into the drain field piping.

I.3 Vault Toilets

- a. They should be pumped as needed.
- b. All new installations should incorporate the U.S. Forest Service Sweet Smelling Toilet (SST) design features (see RM83(B2)).

I.4 Composting/Evaporator/Incinerator Toilets

- a. Composting/Evaporator/Incinerator Toilets should be operated in accordance with manufacturers' recommendations.
- b. The final product should be removed as needed and disposed of properly.

I.5 Chemical Toilets

- a. Chemical toilets should only be used temporarily. In situations where there are permanent facilities, every effort should be made to replace permanent chemical toilet facilities with vault or flush toilets. In no case should chemical toilets be installed as permanent facilities.
- b. They should be pumped as needed to prevent objectionable odors.

I.6 Sewage Spills (see attachment B)

- a. In the event of a sewage spill, the PHC and Primacy Agency will be notified within one business day.
- b. Workers cleaning up wastewater spills will wear coveralls, rubber boots, and rubber gloves. On completion of the cleanup, personnel will complete the following:
 - 1. Take a hot shower using sufficient soap and water.
 - 2. Remove contaminated clothing and place it in a plastic bag for laundering. This clothing will not be re-worn until it has been laundered.
 - 3. Rubber boots, gloves and any other protective equipment will be cleaned with hot water and detergent and rinsed with a 100 ppm disinfectant solution

of hypochlorite. The hypochlorite solution consists of two tablespoons of sodium hypochlorite (Purex, Chlorox or other household bleach) per gallon of water.

J. SANITARY SURVEYS

Sanitary surveys should be conducted annually or at a frequency determined necessary by PHC's or park sanitarians to ensure that wastewater treatment systems in Parks are operated properly in accordance with all applicable Federal and state regulations.

Attachment A
Sample Restroom Cleaning Protocol

A. Safety Considerations:

1. Know your chemicals. Read the product labels and material data safety sheets prior to use.
2. Always wear rubber gloves.
3. Always wear goggles or safety glasses.
4. Wear a dust respirator when sweeping dusty areas.
5. Keep hands and feet outside of waste receptacles to prevent puncture wounds from unseen sharp objects.
6. Do not touch face with contaminated hands/gloves.

B. Cleaning Frequency:

1. Pick up all paper and litter. Dispose in the trash container not the toilet.
2. Restock toilet paper and paper towels as needed.
3. Use general-purpose cleaners for sinks, walls, partitions, door handles and so on. Ensure all stains and marks such as graffiti and are removed.
4. NEVER mix products containing chlorine bleach and products containing ammonia.
5. Spray disinfectant on sink, faucets, hand dryer surfaces, paper towel dispensers, flushometers, stool seats, toilet back and base, grab bars, partitions and doors. Wipe down all surfaces. Ensure all stains and marks such as graffiti and are removed.
6. Apply toilet bowl cleaner solution according to the label instructions. Use a long handle brush to scrub toilets and urinals. Ensure that all surfaces of the urinal and stool are clean. If preferred, a sponge may be used to wash the outer surfaces of these fixtures but do not use the same sponge for other fixtures such as sinks, door handles etc.
7. Periodically flush the floor drain to keep water in the trap and ensure stagnant water doesn't collect.
8. Clean light lenses.
9. Rinse all mops, sponges and brushes. After use, cleaning supplies should be placed in a position that allows them to air-dry without soiling walls, equipment or supplies.

**Attachment B
Record of Septic Tank Sewage Disposal Maintenance and Inspection**

Name of System: _____

Location of System: _____

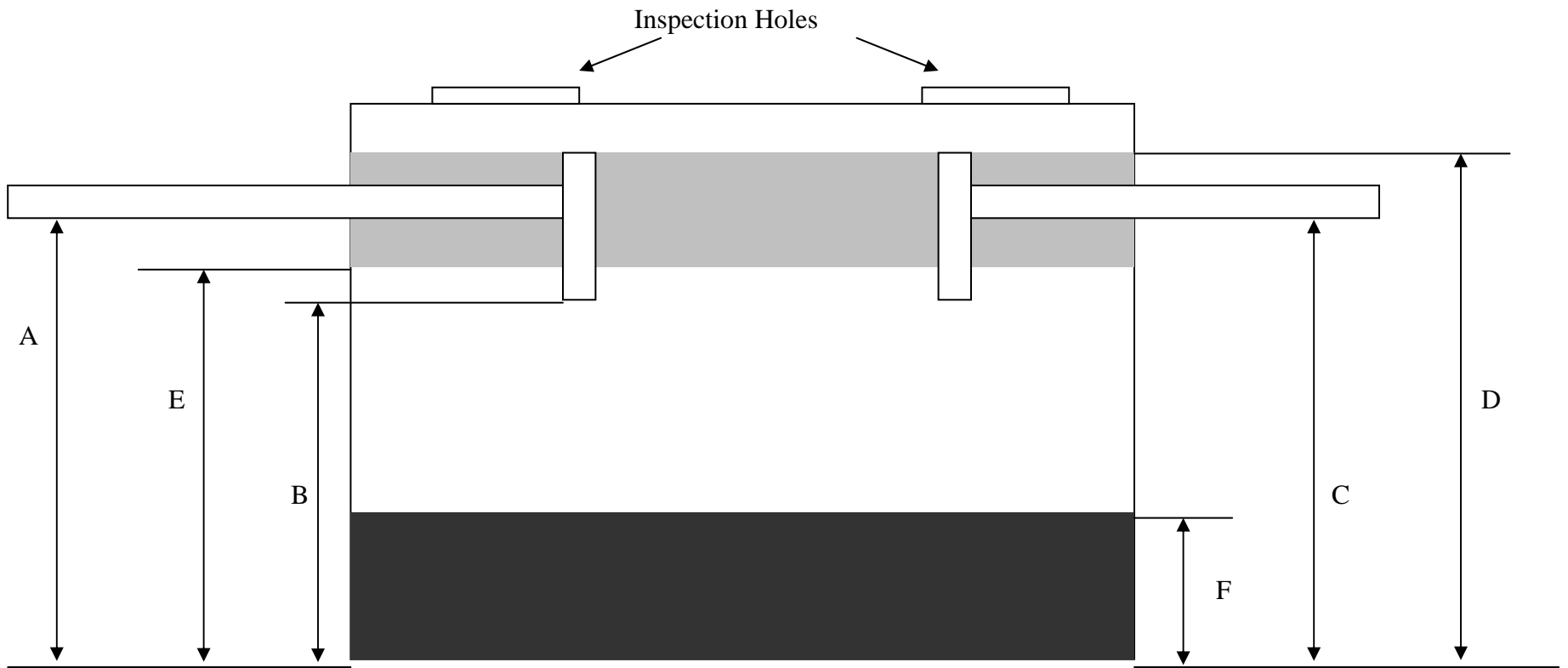
Inside Tank Dimensions				**See Back of Sheet for Illustration**				ID	Clay	CI	PVC	Wood	Concrete
Width:	Length:	Depth:	Gallons:				Tank						
Distance from inlet to Tank Bottom:			(A)	Baffle									
Distance from Tee (or Baffle) to Tank Bottom:			(B)	D Box									
Distance from Outlet Pipe Invert to Tank Bottom:			(C)	Inlet									
				Outlet									

Septic Tank Measurements						Remarks	Distribution Box	Absorption Field	Remarks
Date	D	E	F	G	H				

D = Distance from Scum Top to Tank Bottom
G = E-B (If less than 3" Tank is to be pumped)

E = Distance from Scum Bottom to Tank Bottom
H = B-F (If less than 6-8" Tank is to be pumped)

F = Sludge Depth



Typical Tank Diagram