

Section 13 – Design Criteria: Alternative Systems

1. Evapotranspiration and Evapotranspiration/Absorption Systems

- a. Non-Pressurized Drip Dispersal System (NDDS):
 - i. An NDDS is considered a type of evapotranspiration/absorption system. However as specific design criteria is provided for an NDDS, they are exempt from the additional requirements of sections 13.1.b, c and d.
 - ii. *The Colorado Professionals in Onsite Wastewater Guidelines for the Design and Installation of Non-Pressurized Drip Dispersal Systems (NDDS)*, September, 2016 is the procedural guideline in the design of a NDDS and must be followed when an NDDS is proposed.
 - iii. The width of an NDDS system may be wider than 12 feet.
- b. The following section provides general criteria which must be followed when an evapotranspiration or evapotranspiration/absorption bed is proposed.
 - i. The design may only be permitted in arid climates where the annual evaporation rate exceeds the annual precipitation rate by more than 20 percent, and where site characteristics dictate that conventional methods of effluent dispersal are not appropriate.
 - ii. The design may only be permitted in soil types 4, 4A and 5.
 - iii. If data for the Pan Evaporation Rate is provided, it must be multiplied by 0.70, or less, to obtain the equivalent Lake Evaporation Rate.
 - iv. The width of the bed may be wider than 12 feet.
 - v. The required capillary or wicking sand must meet the gradation requirements in Table 13-1 and be approved by the design engineer. This sand is to be covered by a crowned, thin layer of loamy-sand mix and appropriate vegetation that will assist in drawing the water to the surface.
 - i. Adjustment factors as provided in Table 11-2 and 11-3 must not be used.

Table 13-1 Gradation of Wicking Sand for Evapotranspiration Beds (Fine Sand)

Sieve Size	Percent Passing
4	100
40	50-70
200	<15

c. For systems designed strictly as an evapotranspiration bed, the following criteria must be met:

- i. Design data to be furnished must include, but shall not be limited to: system dimensions, distribution system design, specifications of distribution media and wicking sand, liner material if used, bedding, properties of the soil under the system, vegetation cover, and a water balance calculation including annual precipitation and storage requirements for periods of the year when evapotranspiration does not occur.
- ii. The following formula must be used for determining the minimum area necessary for total evapotranspiration of septic tank effluent:

$$\text{Area (in sqft)} = \frac{\text{Design Flow (in GPD)} \times 586}{\text{Lake Evaporation Rate at the Site (in per year)}}$$

** Additional area may be required based on the annual water balance calculations.

- iii. Designs will include a rock and pipe, or other Division approved proprietary distribution product, with the centerline of the distribution system 6 to 8 feet on center. A thin non-woven fabric may be placed above the distribution system. Capillary wicking of the effluent is accomplished by a uniform depth layer of the specified sand media (capillary wicks), no more than 24 inches deep, placed between and above the distribution media. The base of the evapotranspiration bed may be no more than 30 inches below finished grade.
- iv. Capillary wicks which penetrate between the distribution system to the bottom of the bed, must be at least 15 percent of the bed surface area. The wicks must be uniformly spaced throughout the system.
- v. Except for dwellings, if the system is designed for summer use only, as determined by the Department, the surface area may be multiplied by 0.6 to obtain the required area.

d. For systems designed as an evapotranspiration/absorption bed, the following criteria must be met.

- i. Data to be furnished must include, but is not limited to: system dimensions, distribution system design, specifications of wicking sand, properties of the soil under the evapotranspiration/absorption bed, provision for vegetation cover, and a water balance calculation including annual precipitation and storage requirements for periods of the year when evapotranspiration does not occur.
- ii. Design will include a rock and pipe, or other Division approved proprietary distribution product, with the centerline of the distribution system 6 to 8 feet on center. A thin non-woven fabric may be placed above the distribution media. Capillary wicking of the effluent is accomplished by a uniform depth layer of the specified sand media (capillary wicks) no more than 24 inches deep placed between and above the distribution media. The infiltrative surface may be no more than 30 inches below finished grade.

- iii. Capillary wicks which penetrate between the distribution system to the bottom of the bed, must be at least 15 percent of the bed surface area. The wicks must be uniformly spaced throughout the bed.
- iv. Amount of storage and evapotranspiration capacities may be reduced by the volume of effluent absorbed by the underlying soil based on the long-term acceptance rate for that soil type and the formulas provided below.
- v. The following formula must be used for determining the minimum area necessary for evapotranspiration/absorption of septic tank effluent:

$$Area (sqft) = \frac{Flow (GPD)}{(LTAR + ETR)}$$

- vi. LTAR refers to the long-term acceptance rate of the underlying soil as provided in Table 11-1 for TL1 effluent.
- ii. ETR refers to the evapotranspiration rate derived from the following formula:

$$ETR \left(\frac{gal}{day} sqft \right) = \frac{Lake\ Evaporation\ Rate\ at\ the\ Site\ (inch\ per\ year)}{586}$$

- iii. Additional area may be required based on the annual water balance calculations.

2. Seepage Pits

- a. The construction of new seepage pits for the treatment and dispersal of on-site wastewater on new sites is prohibited.
- b. For repairs involving seepage pits, see Section 11.8.f.

3. Vault (other than vault privy)

- a. Vaults for full time use in new construction are prohibited where a property can accommodate an OWTS with a soil treatment area.
- b. Vaults for full time use may be permitted when a failing OWTS cannot be replaced.
- c. A variance for residential use may be granted if the dwelling is on land where the installation of an OWTS with a soil treatment area cannot be permitted and has been approved by the Department.
- d. A vault for residential use, if permitted, must have a minimum 1,000 gallon effective volume or capable of holding a minimum of the 48-hour design wastewater flow, whichever is larger.
- e. A vault for non-residential use, if permitted, must have a minimum 500 gallon effective volume or be capable of holding a minimum of the 48-hour design wastewater flow, whichever is larger.
- f. A visual or an audible signal device or both, indicating filling to a maximum of 75 percent capacity, must be installed to indicate when pumping is necessary.

- g. Concrete vaults must meet the strength and watertightness requirements for septic tanks. Prefabricated fiberglass, fiberglass-reinforced polyester, and plastic tanks may be used as vaults, if the tank manufacturer provides testing criteria certifying them for this use.

4. Vault Privy

- a. Vault privies are prohibited for residential use.
- b. Existing vault privies for residential uses must be abandoned and a conforming OWTS must be installed.
- c. For nonresidential uses, the effective volume of the vault must be no less than 400 gallons and it must be constructed of concrete or plastic. The vaults for privies must meet the structural and watertightness standards of vaults.
 - i. A vault privy must be built to include: fly- and rodent-tight construction, a superstructure affording complete privacy, an earth mound around the top of the vault and below floor level that slopes downward away from the superstructure base, a floor, and a riser of concrete or other impervious material with hinged seats and covers of easily cleanable, impervious material. All venting must be fly-proofed with No. 16 or tighter mesh screening.

5. Pit Privy

- a. The new construction of pit privies is prohibited.
- b. Existing pit privies must be abandoned and a conforming OWTS must be installed.

6. Incinerating, Composting and Portable Chemical Toilets

- a. The Department may permit incinerating, composting and chemical toilets. The use of an incinerating, composting or chemical toilet will not reduce the required size of the OWTS as noted in Section 9.1.
- b. Permitting of an incinerating or composting toilet may also be subject to the jurisdiction of a local agency regulating plumbing or the Colorado Plumbing Board, whichever has jurisdiction over plumbing in the location.
- c. An incinerating or composting toilet may be used for toilet waste where an OWTS is installed for treating wastewater remaining after removal of toilet waste. Subject to Clear Creek County Board of Health or other applicable regulations or codes (e.g., Colorado Plumbing Code if a local code does not exist), the compartment may be located within a dwelling or building provided the unit complies with the applicable requirements of this regulation, and provided the installation will not result in conditions considered to be a health hazard as determined by the local public health agency. Compartment and appurtenances related to the unit must include fly-tight and vector-proof construction and exterior ventilation.

d. Composting Toilets

- i. Composting toilets must meet the requirements of NSF/ANSI Standard 41 (2016 version) and bear the seal of approval of the NSF or an equivalent testing and certification program.
- ii. An approved composting toilet must treat deposits of feces, urine, and readily decomposable household garbage that are not diluted with water or other fluids and are retained in a compartment in which aerobic composting will occur.
- iii. The effective volume of the receptacle must be sufficient to accommodate the number of persons served in the design of the unit installed. The effective volume of the unit must include sufficient area for the use of composting materials which must not be toxic to the process or hazardous to persons and which must be used in sufficient quantity to assure proper decomposition.
- iv. Residue from the composting toilet must be removed when it is filled to 75 percent of capacity. Residue from the unit must be properly disposed of by methods recommended by the manufacturer and acceptable to the local public health agency. Disposal methods must prevent contamination of water and not cause a public health nuisance. Disposal using solid waste practices is recommended.
- v. If a system will be installed where low temperature may be a factor, design and installation must address the effects of the low temperature.
- vi. Composting toilets must be operated according to manufacturer's specifications.
- vii. A permit is required for the use of a composting toilet

e. Incinerating Toilets

- i. An approved incinerating toilet must be designed and installed in accordance with all applicable federal, state, and local air-pollution requirements and manufacturer's instructions.
- ii. Incinerating toilets must meet the requirements of the NSF Protocol P157 (2014 version) and bear the seal of approval of the NSF or an equivalent testing and certification program.
- iii. Incinerating toilets must be operated according to manufacturer's specifications.

f. Portable Chemical Toilets

- i. Portable chemical toilets are prohibited for residential use, or in permanently occupied structures, except:
 1. During construction, or
 2. Under emergency circumstances where a temporary permit allowing conditional use has been issued by the Clear Creek Environmental Health Department.

7. Slit Trench Latrine

- a. The new construction of slit latrines is prohibited.
- b. Existing slit latrines must be abandoned and a conforming OWTS must be installed.

8. Treatment Systems Other Than Those Discharging Through a Soil Treatment Area or Sand Filter System

- a. Effluent Discharged to Surface Waters
 - i. Any system that will discharge into surface waters must be designed by a professional engineer. The discharge permit application must be submitted for preliminary approval to the Clear Creek County Board of Health. Once approved by the Board, the application must be submitted to the Water Quality Control Division for review in accordance with the Water Quality Control Act, 25-8-101, et seq .C.R.S, and all applicable regulations of the Water Quality Control Commission. Compliance with such a permit will be deemed full compliance with this regulation.
- b. Systems that discharge other than through a soil treatment area or a sand filter system must:
 - i. Be designed by a professional engineer;
 - ii. Be reviewed by the Clear Creek County Board of Health; and
 - iii. Not pose a potential health hazard or private or public nuisance or undue risk of contamination.
 - iv. Not allow drainage of effluent off of the property of origin.
 - v. The Clear Creek County Board of Health may choose to permit only systems that do not allow drainage of effluent off the property of origin.
 - vi. The following minimum performance criteria must be required for all permitted systems pursuant to this section:
 1. If effluent discharge is made into areas in which the possibility exists for occasional direct human contact with the effluent discharge, the effluent at the point of discharge must meet the minimum treatment criteria of TL3 effluent and specifically adhere to each of the following standards:
 - a. The geometric mean of the *E. coli* density must not exceed 15 per 100 milliliters when averaged over any five consecutive samples, and no single sample result for *E. coli* can exceed 126 per 100 milliliters.
 - b. The arithmetic mean of the standard five-day carbonaceous biochemical oxygen demand (CBOD₅) must not exceed ten

milligrams per liter when averaged over any three consecutive samples.

- c. The arithmetic mean of the total suspended solids must not exceed ten milligrams per liter when averaged over any three consecutive samples.
 2. If the effluent discharge is made into an area so restricted as to protect against the likelihood of direct human contact with the discharged effluent, the effluent at the point of discharge must meet the treatment criteria of TL2 effluent and specifically adhere to each of the following standards:
 - a. The geometric mean of the *E. coli* density must not exceed 126 per 100 milliliters when averaged over any five consecutive samples, and no single sample can exceed 325 *E. coli* per 100 milliliters.
 - b. The arithmetic mean of the standard five-day carbonaceous biochemical oxygen demand (CBOD₅) must not exceed 25 milligrams per liter when averaged over any three consecutive samples.
 - c. The arithmetic mean of the total suspended solids must not exceed 30 milligrams per liter when averaged over any three consecutive samples.
- vii. To determine compliance with the standards contained in this section, the required sampling frequency for *E. coli*, CBOD₅, and total suspended solid levels must be performed at least once per month when the system is in operation and the results submitted to the Clear Creek Environmental Health Department for compliance with the permit requirements.
- viii. Methods of Analysis - Sampling Points:
 1. All effluent samples must be analyzed according to the methods prescribed in the American Public Health Association, American Water Works Association, and Water Environment Federation: Standards Methods for the Examination of Water and Wastewater, 21st edition.
 2. The sampling point must be a location that is representative of final discharge from the system.