Pump Systems

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CT Public Health Code
Regulations and Technical Standards for Subsurface Sewage Disposal Systems

Design Manual for Subsurface Sewage Disposal Systems

www.ct.gov/dph/subsurfacesewage

Pump Systems

Pump systems are utilized:

- when a gravity system cannot be installed
- to provide even distribution
- when there is limited storage capacity in the leaching system
- when required by leaching system manufacturer

Pump Systems

- Methods of effluent distribution:
  - Gravity
  - Pump (mechanical)
  - Siphon/Dipper Box/Flout (passive)
- Distribution method must:
  - Promote uniform distribution
  - Fully utilize leaching system
  - Allows for air transfer

Pump Systems: Mandatory Dosing

- Dosing required for large leaching systems (2,000 GPD or greater) with 600 linear feet of leaching system by means of pumps, siphon or other approved method
- All large leaching systems utilizing pump systems shall have dual alternating pumps
- Designed to dose at frequency of 3-6 cycles per day or 50% minimum of distribution piping volume

Pump Systems

Pump systems can utilize timed-dosing or volume-dosing.

- Timed-dosed systems usually dose small amounts of effluent at programmed timed intervals (once per hour)
- Volume-dosed systems dose a specific volume regardless of time.

Pump Systems

- Pump systems shall avoid dosing large volumes of effluent into leaching systems with limited internal storage capacities.
- Dosing volumes should not exceed 20% of the leaching system internal storage capacity.

Pump Chambers

- Pump chambers must be concrete or other durable material.
- Non-concrete tanks must be approved by DPH and installed per manufacturers specifications
- Concrete chambers shall meet the structural requirements for concrete septic tanks.

Pump Chambers

- Subject to other septic tank provisions
  - Performance testing
  - Tank abandonment
  - H-20 loading
- Concrete pump chambers shall be marked with tank manufacturer, size, date, load limits, and entrance warning
- Effluent pumps used must be approved by manufacturer for use in sewage disposal

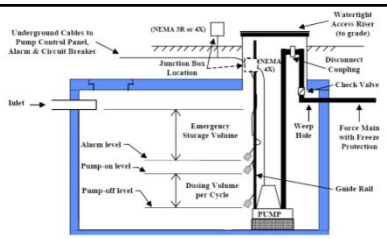


Figure 11 - Pump Chamber

- Watertight risers/manholes to grade
- Top of tank deeper than 24" requires large 24" diameter riser
- High-level alarm (audio and visual)

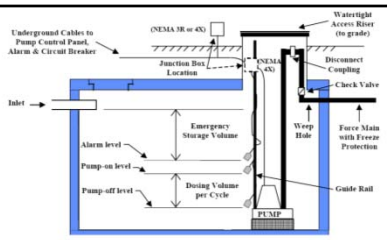


Figure 11 - Pump Chamber

- Freeze protection for force main (weep hole, below frost line, insulation)
- When using weep hole for frost protection, avoid back siphonage and excessive cycling

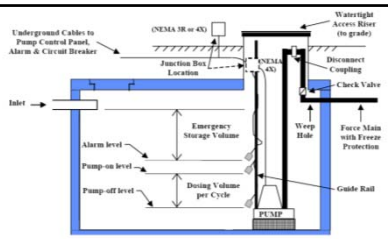


Figure 11 - Pump Chamber

Septic system with design flows <2000 GPD

- Require 24 hour emergency storage above the high-level alarm and below inlet pipe OR
- Provide duplicate alternating pumps

Dual Alternating Pumps

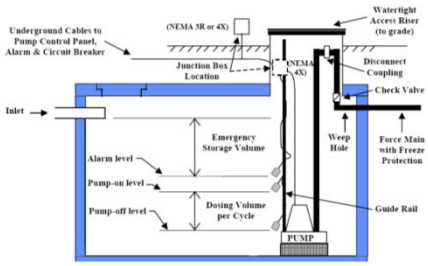


Figure 11 - Pump Chamber

- Pump on/off elevations
- Alarm on elevation
- Emergency storage
- Dosing per cycle
- Check valve
- Pump lift chain type

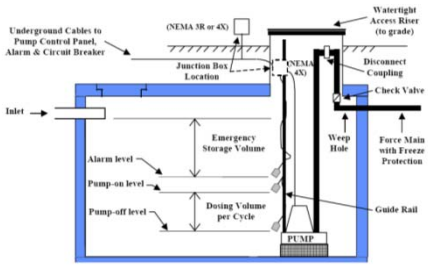


Figure 11 - Pump Chamber

- Force main (Table 2D)
- Disconnect couplings
- Pump submerged
- Guide rail
- Inlet pipe
- Junction boxes

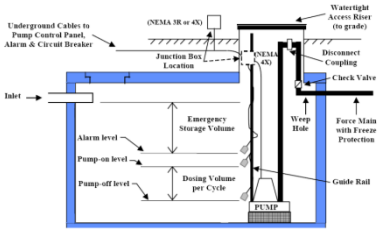


Figure 11 - Pump Chamber

- Tanks, manholes and access risers shall be H-20 rated in vehicular traffic areas
- Mechanical floats, pressure transducers (mercury float switches banned in CT)

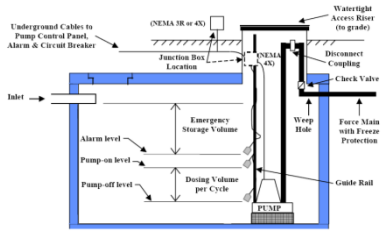


Figure 11 - Pump Chamber

- Specifications of all internal components to be provided on plan
- Internal components must be non-corrosive and suitable for corrosive environment

Pump Chambers

Important:

- Piping unions, manhole location and lift chains must allow for convenient pump removal
- Pump specified be rated to handle the design flow at the total dynamic head (avoid short cycling)

Pump Chambers

Important:

- All electric work on the pump chamber requires a separate permit from the local building official.
- Separate circuits for pump and alarm
- Electrical connections readily accessible from ground surface

What about areas with high groundwater levels?

Pump Chamber

- Infiltration in major concern through pump chamber mid-seam and pipe openings
- Pump chambers in shallow groundwater areas shall utilize watertight tank seals
- Recommend that tank is tested for leakage

Water tight

Pump Chamber

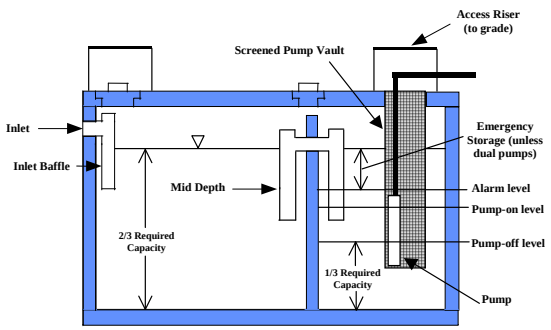
- Monolithic tanks can also be used (a.k.a. seamless, top slab)
- Pump chambers can be coated on the exterior with a sealant to reduce risk of leakage

Pump Systems: Combo Tank

- A combination septic tank/pump chamber can be utilized for both new construction and repairs. (space or site limitations)
- Combo systems must utilize an approved screened pump vault installed in the second compartment of an oversized septic tank.
- The combo tank must use tee baffle piping so that drawdown occurs in second compartment only.

Pump Systems: Combo Tank

- Septic tank sizing still applicable
  - 2/3 capacity in the first compartment
  - 1/3 capacity below the pump off in the second compartment.
- Pump chamber sizing still applicable
  - 24 hour storage or dual pumps required



Baffled D-box

Baffled D-box used to slow effluent down prior to entering the leaching system.

Splash Box

Pump Systems: Low Pressure Distribution

- Requires a PE design
- Design must include:
  - Access and flushing provisions
  - Provisions for flow adjustment
  - Pressure filters
  - Orifice shields
  - Manifold access
  - Pipe information
  - Operation and maintenance requirements

Pump Systems: Raw Sewage Pumps

- Pump used before the septic tank
- Not recommended for use with SSDS
- If necessary:
  - Solids handling pumps recommended over grinder pumps
  - If for lower level fixtures, upper level flows should be directed to the septic tank by gravity.
  - More than 25% of design flow pumped directly to tank requires septic tank size increased by 50%

Pump Systems: Raw Sewage Pumps

- If located outside the foundation, including below the basement slab the pump is considered part of the SSDS
- In the basement: If sealed liner or other containment method used the pump will not be considered part of the SSDS (building code applies)

Pump Systems: Raw Sewage Pumps

- Exterior raw sewage pumps must have access to grade and an alarm
- DPH shall maintain a list of approved exterior raw sewage pump systems

How do I determine pump chamber volumetric storage and dosing?

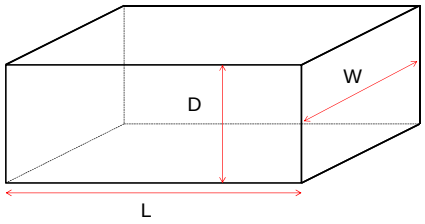
- Responsibility of the plan designer
- Information should be provided on plan cross-section
- Review information, and if questions defer to plan designer

Formulas to know:

- Surface area = Length x Width = L x W
- Volume = L x W x Depth (D) = L x W x D
- 1 cubic foot = 7.48 gallons
- 1 foot = 12 inches

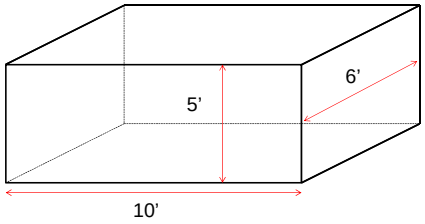
Volume = Length x Width x Depth

1 cubic foot (cf) = 7.5 gallons

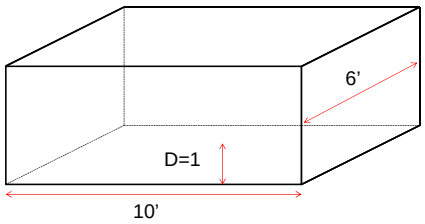


Volume = 10’ x 6’ x 5’ = 300 cf

Volume = 300 cf x 7.5 g/cf = 2250 gals

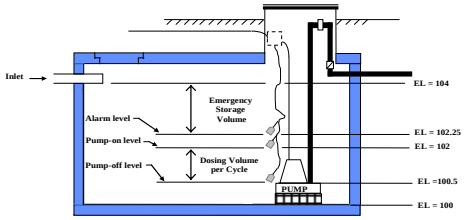


If we assume Depth = 1 foot
Volume = 10’ x 6’ x 1’ = 60 x 7.5 = 450 gals/ft
OR
Volume = 450/12 = 37.5 gals per inch



Example: Inside tank dimensions are 8 feet long and 4 feet wide. Given the elevations, find:

1) tank storage capacity
2) dosing volume
3) emergency storage volume (ESV)

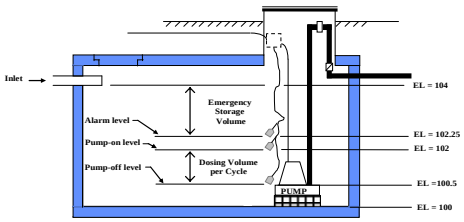


Find Storage capacity: 8' long and 4' wide.

Depth (D) = 104 – 100 = 4 feet

Storage = L x W x D = 8' x 4' x 4' = 128 cubic feet

Storage = 128 cf x 7.5 gals/cf = 960 gallons

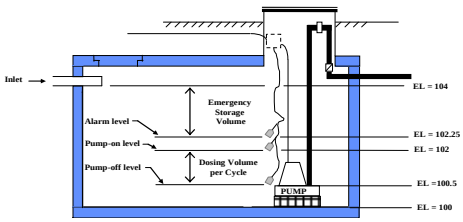


Find Dosing Volume: 8' long and 4' wide.

Depth (D) = 102 – 100.5 = 1.5 feet

Dosing Volume = L x W x D = 8' x 4' x 1.5' = 48 cubic feet

Dosing Volume = 48 cf x 7.5 gals/cf = 360 gallons

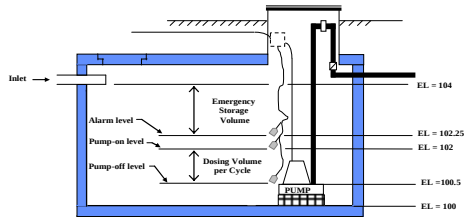


Find Emergency Storage Volume: 8' long and 4' wide.

Depth (D) = 104 – 102.25 = 1.75 feet

ESV = L x W x D = 8' x 4' x 1.75' = 56 cubic feet

ESV = 56 cf x 7.5 gals/cf = 420 gallons

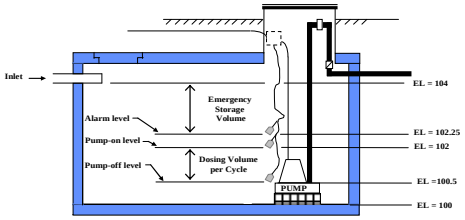


Storage Capacity = 960 gallons

Dosing volume = 360 gallons

Emergency Storage Volume = 420 gallons

Is this OK for a 4-bedroom house?



Questions?

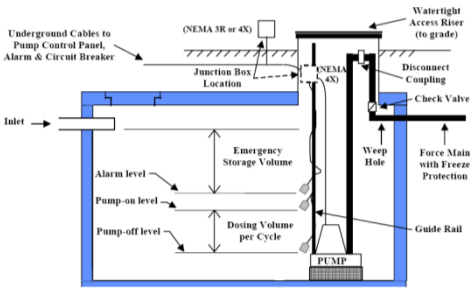


Figure 11 - Pump Chamber