On-site Wastewater Training
For Tribal Environmental Programs

On-Site Pretreatment Systems

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What is an onsite wastewater treatment system?

1. Wastewater Source
2. Collection and Storage
3. Pretreatment components
4. Dispersal components and Final Treatment
Pretreatment Purposes

- Collection and conveyance of sewage
- Modification of sewage for final treatment
  - Settling undigestible solids
  - Fats, oils & grease separation
  - Anaerobic & aerobic digestion of solids
- Distribution of effluent to soil treatment area for final rennovation and return to the environment
Collection

• Piping from facility with cleanout
  – Blackwater
  – Graywater

• Holding tanks
Pipe materials

- Types
  - Ductile iron
  - ABS
  - High density polyethylene (HDP)
  - PVC
Pretreatment Components

- Septic tanks
- Aerobic treatment units
- Media filters
- Constructed wetlands
- Disinfection
Septic Tank

- Solids removal and storage
- Anaerobic digestion
- Watertightness is critical
Trash Tank

- Often used before ATUs
  - Integral with the ATU
  - Combined with a septic tank
- Removes the big stuff
Pump Tank or Surge/Flow Equalization Tank

Dosing Tank with Demand Controls

Flow Equalization Tank

Source

Septic tank

Pump tank or Surge/flow equalization tank

To remainder of treatment system

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Final Treatment and Dispersal Components

- Trench and bed distribution
- Evapotranspiration beds
- Low pressure distribution
- Drip field
- Spray field
Distribution trench options for gravity systems

- Washed rock
- Chambers
- Polystyrene aggregate
- Large diameter pipe

Trenches must be on contour and level
Parallel distribution: trench and bed configurations
Sequential distribution

- Used on sloping sites
- Trenches placed on contour and as level as possible
- Effluent fully ponds first trench before flowing to the next
- Trench length can vary
- Ability to rest individual trenches
- Can add more trenches downslope
Serial distribution

- Used on sloping sites
- Trenches placed on contour and as level as possible
- Effluent flows through first trench and fully ponds before flowing to the next in a serpentine pattern.
- Blockage stops the flow to downstream trenches!
- Difficult to rest individual trenches as in sequential
Parallel, sequential and serial distribution

- Trenches should be distributed
- This means trenches may not be straight
- Maintain proper separation between trenches
Trenches should be level

- If a trench ponds, effluent will re-distribute on the basis of gravity
  - Within the trench
  - Across the system
Parallel distribution on a level site

- Each trench should be level within 1”
- All trenches in a system should be level within 3” across the site
  - Or, according to local regulation
- Aim for a higher standard
Sloping sites: contour loading
Contour loading

Contour lines

5 x 90’ laterals

Soil treatment area

Direction of ground water flow

Drainage

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Contour loading

3 x 150’ laterals

Soil treatment area (drainfield)

Direction of ground water flow

Contour lines

Drainage

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System Choices

• Basic System (“Box & Rocks”)
  – Adequate lot size
    • Separation distances OK
    • Replacement STA available
  – Moderately permeable soils
  – Moderate slope
  – No restricting layers
  – Deep water table

• Advanced Systems
  – “Problem” sites
  – Increased $$ & maintenance
ET Bed Types
Aerobic Treatment Unit System

- Trash tank
- Air pump
- Aeration
- Clarifier
- Sludge return pump
- Final treatment and dispersal

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Aerobic Treatment Units

- Suspended Growth Unit
- Combination Suspended/Fixed Film Process
- Fixed Film Process
- Rotating Biological Contactor
- Adaptive Mechanical Aerator

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Types of Disinfection Systems
(for advanced treatment effluent)

- Chlorination (tablet or liquid)
  - Strong oxidizing agent
  - Highly corrosive
  - Contact time and concentration is important

- Ultraviolet (UV) light
  - A special lamp creates UV light
  - UV light destroys organism DNA / cells
  - Clarity of wastewater is an important factor
  - Contact time is important
    - Flow rate through unit
Basic components of a external tube tablet chlorination system

- Feed tubes
- Housing
- Water inlet
- Ca(OCl)_2 tablets
- Water outlet
Spray Distribution System

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Drip Field Layout
Anaerobic pretreatment
Drip Field Layout
Aerobic pretreatment

- From house
- Septic tank
- Advanced pretreatment
- Dosing tank
- Alternate return location
- Pressure regulator
- Filter
- Supply manifold
- Return manifold
- Emitters
- Flush / vacuum breaker valves

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Drip Tubing Specifications

- Drip tubing approved by the manufacturer for use with wastewater.
- The tubing is generally ½ inch diameter with an emitter equally spaced in the tubing.
- Bioslime and root intrusion control is achieved by bactericides, herbicides and flushing.
Lagoon Treatment System

Source

Septic tank

Fence

Lining

Earthen berm

Anti-siphon vent

Lagoon

Overflow outlet

Fence

Not in OK

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Lagoons

- Non-discharging/
  Total Retention
  - Preceded by a septic tank
  - Used as a pretreatment component
  - Polishing
  - Storage
  - Evaporation lagoon
  - Infiltration basin

- Discharging outfall

- These are high risk systems
  - Fencing to limit access
On-Site Treatment Systems

• Properly designed, installed & maintained pretreatment components do not eliminate the need for final treatment (soil treatment area)

• Improperly designed, installed & maintained pretreatment components will likely lead to failure of the soil treatment area
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