NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

SOLID/LIQUID WASTE SEPARATION FACILITY

(No.)
Code 632

DEFINITION

A filtration or screening device, settling tank, settling basin, or settling channel used to separate a portion of solids from a liquid waste stream.

PURPOSES

To partition solids, liquids and their associated nutrients as part or a conservation management system to:

- improve or protect air quality.
- improve or protect water quality.
- improve or protect animal health.
- meet management objectives.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where solid/liquid separation will:

- remove solids from the liquid waste stream is a primary treatment process and allowing further treatment processes to be applied such as composting and anaerobic digestion.
- allow partly digested feed to be separated from the liquid waste stream so that it can be used as a feed supplement or for bedding.
- reduce problems associated with solids accumulation in liquid storage facilities.
- reduce solids in stored liquids so liquids can be recycled for other uses (i.e. flush water).
- reduce solids in stored liquids to better facilitate land application of liquids using irrigation techniques.
- assist with partitioning nutrients in the waste stream to improve nutrient management.
- remove sand for the liquid waste stream to protect or prolong the life of equipment, to use as bedding, and/or other uses.

CRITERIA

General Criteria Applicable to All Purposes

Laws and regulations. Waste treatment facilities must be planned, designed, and constructed to meet all Federal, state, and local laws and regulations. Waste management systems may need to be approved or permitted by the Florida Department of Environmental Protection. Refer to Chapter 62-522 Florida Administrative Code (F.A.C.) and Chapter 62-670 F.A.C. for permitting requirements.

Location. Solid/liquid separation facility should be located outside of floodplains. However, if site restrictions require location within a floodplain, solid/liquid separation facility shall be protected from inundation or damage from a 25year, 24-hour storm event, or a larger storm event if required by laws, rules, and regulations.

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

Solid/Liquid separation facilities shall be located so that the waste stream can be safely routed to and from the facility.

Solid/Liquid Separator Selection. Table 1 provides guidance on the different types of solid/liquid separators available. Capture efficiency varies widely for each type of separator depending on the type and consistency of the waste to be treated. The type of solid/liquid separator selected shall be based on site specific data for the liquid waste stream and management conditions where specific management objectives are to be met.

Solid/Liquid Separation Efficiency. The volume of solids separated shall be based on estimates of daily waste water volume and the total solids capture efficiency for the type of solid/liquid separation device selected. Where manufacturer information or local data concerning total solids capture efficiencies are not available for the type of solid/liquid separation device selected, the efficiencies in Table 1 can be used to estimate the volume of separated solids generated.

Table 1 – Solids Separation Device Efficiency

Solid/Liquid Separators	Total Solids Capture Efficiency
Static Inclined Screen	10-20%
Inclined Screen with Drag Chain	10-30%
Vibratory Screen	15-30%
Rotating Screen	20-40%
Centrifuge	20-45%
Screw or Roller Press	30-50%
Settling Basin	40-65%
Dry Scrape	50-90%
Geotextile Filtration Material	50-98%

Chemical Amendments. Guidance for the addition of chemicals to the liquid waste stream for improving total solids capture efficiencies is given in Florida NRCS conservation practice standard Amendments for Treatment of Agricultural Waste, Code 591shall be in accordance with manufacturer's recommendations.

Storage of Separated Solids. Adequate storage areas shall be provided for separated solids so they can be properly managed. Temporary storage areas shall be provided for separated solids unless they are transported directly from the separator to the final utilization location (i.e. offsite composter).

Storage facilities for storage of separated solids shall be designed in accordance with requirements of Florida NRCS conservation practice standard Waste Storage Facility, Code 313.

All seepage from separated solid storage facilities shall be directed to short or long term liquid storage facilities.

Waste Transfer Piping. It is standard practice to route flow to and from a solid/liquid separation facility using underground and above ground pipe. Refer to Florida NRCS conservation practice standard Manure Transfer, Code 634 for guidance in designing pipelines for waste water transfer.

Outlets. The outlet capacity for a solid/liquid separation facility shall be capable of safely conveying the design capacity to a storage or utilization location.

Outlets may include pipelines, perforated or slotted pipe risers, porous plank walls or dams, or screened walls. Screening used to separate solids at the outlet of settling basins should provide at least 10% open area.

Emergency overflow appurtenances such as notched weirs, or pipe bypasses can be used to control flows exceeding design capacity. Emergency overflow appurtenances shall be designed to pass the peak runoff from the drainage area of the facility for a 25-year 24-hour storm frequency plus the normal waste stream discharge. Any discharge from the solid/liquid separation facility must be captured in a waste storage or treatment structure unless it meets local, state and Federal regulations regarding discharge to surface and ground waters.

Utilization. Utilization of the separated solids and liquid shall meet the Florida NRCS conservation practice standards Nutrient Management, Code 590 and Waste Utilization, Code 633.

Erosion protection. To control erosion, the embankments and disturbed areas surrounding

the facility shall be vegetated according to Florida NRCS conservation practice standard Critical Area Planting, Code 342.

Additional Criteria for Filtration or Screening Devices

Flow rate. The design flow rate (combined flow of solid and liquid waste) for filtration and screening devices shall be in accordance with the manufacturer's recommendations.

Velocity. The liquid waste stream velocity through filtration and screening devices shall be in accordance with the manufacturer's recommendations.

Structural Design. Structural supports for mechanical separators shall be designed in accordance with the requirements of Florida NRCS conservation practice standard Waste Storage Facility, Code 313.

General Criteria Applicable to Settling Basins

Velocity. The liquid waste stream velocity through the settling basin shall not exceed 1.5 feet per second.

Depth. The total depth for settling basins that are to be cleaned out using conventional front end loading equipment shall be 5 feet or less. Safety concerns during cleanout shall be addressed where the total depth for settling basins will exceed 5 feet.

The total depth of earthen settling basins shall be based on the sum of the depth needed for liquids and solids storage plus 1 foot of freeboard.

The total depth of concrete settling basins shall be based on the sum of the depth needed for liquids and solids storage plus 0.3 foot of freeboard.

The minimum liquid depth of settling basins shall be based on a minimum hydraulic retention time and the solids settling rate. A minimum hydraulic retention time of 30 minutes shall be used except where sand is a major component of the liquid waste stream. Where sand is a major component in the liquid waste stream the hydraulic retention time shall be a minimum of 3 minutes and a maximum of 5 minutes.

Bottom Width. The minimum bottom width for settling basins shall be 10 feet.

Settling basins used for dewatering shall be constructed of concrete and/or lined with a geosynthetic, clay, or geomembrane liner meeting applicable Federal, state, and local rules and regulations. A settling basin not utilizing a concrete slab for the basin floor shall be designed to provide adequate support for clean out equipment. A settling basin constructed according to thses criteria shall also meet appropriate criteria in Florida NRCS conservation practice standard Waste Storage Facility, Code 313.

Liners. Self-sealing settling basins are not an acceptable means of preventing the nutrients from causing an environmental problem. Settling basin shall be lined with an appropriate liner in conformance with Florida NRCS conservation practice standard Waste Storage Facility, Code 313.

Access. The minimum top width of earthen embankments for settling basins shall be 15 feet where equipment access is needed for clean out. Where no access is needed for clean out, the minimum top width shall be governed by equipment used to construct the embankment or berm but shall not be less than 4 feet.

The side slopes of earthen embankments shall be 2 horizontal to 1 vertical (2:1) or greater. For earthen embankments greater than 3 feet in height, the side slopes shall be no steeper than 3:1 on the outside and 2:1 on the inside of the embankment.

Access ramps to allow entry into the settling basin for cleanout by normal front end loading equipment shall be no steeper than 10:1. Steeper slopes shall be allowed where special surfacing of the ramp is done for traction purposes and the equipment used can accommodate the steeper slope but in no case shall the access ramp be steeper than 4:1.

Additional Criteria for Settling Basins Receiving Lot Runoff

Settling basins used in conjunction with or without screening to remove waste solids from process generated liquid waste streams (i.e. flush water from covered freestall barns, or milking parlor waste water) that include significant external drainage fall into this category.

Flow rate. The design flow rate for a settling basin that receives lot runoff shall be based on the normal liquid waste stream discharge from the operation plus the peak runoff from the

drainage area of the basin computed using a 25 year-24 hour storm frequency.

Volume. The design volume for settling basins receiving lot runoff shall be based on the total depth needed for liquid and solids storage and the minimum surface area required for the basin. Where no specific information is available for sludge accumulation, use 0.05 cubic feet per cubic foot-Month for unpaved lots and 0.01 cubic feet per cubic foot-Month for paved lots. These values should be increased by 50% if lots are steep or poorly maintained.

Additional Criteria for Settling Basins that Exclude Lot Runoff

Settling basins used in conjunction with or without screening to remove waste solids form process generated liquid waste streams (i.e. flush water from covered freestall barns, or milking parlor waste water) and do not receive significant external drainage fall into this category.

Flow rate. The design capacity for a settling basin that excludes lot runoff shall be based on the normal liquid waste stream discharge from the operation.

Volume. The design volume for settling basins that exclude lot runoff shall be based on the volume needed to provide solids storage for a specified treatment period plus temporary liquid storage necessary during dewatering. Dewatering type settling basins should be designed with two cells of equal volume to allow for continuous operation with one cell while the other is drying and being emptied. Minimum temporary liquid storage shall be based on the volume of the liquid waste stream for seven day.

CONSIDERATIONS

Location. Locating solid/liquid separation facilities should consider elevation and distance from the source of material to be separated and the location of the long-term liquid and solid waste storage facility. Location of solid/liquid separation facilities should take advantage of gravity flow wherever possible.

Other considerations for locating solid/liquid separation facilities include vehicle access, wind direction, neighboring dwellings, proximity of streams and floodplains, and visibility.

Weeping Walls. To maximize drainage and solid/liquid separation, weeping walls should be used on the entire perimeter of the waste to be treated and drainage paths maintained to and through the walls. Ensure drainage is transferred to a liquid storage facility.

Visual Screening. Vegetative screens or other methods should be considered solids separation facilities from public view and for more aesthetic conditions.

Rainfall. Rainfall falling on the solids storage areas associated with solid/liquid separation facilities can result in increased wastewater discharge into the long term storage facility. Covering of solids storage facilities should be considered in locations where high rainfall amounts occur.

Consider using additional air quality conservation practices such as Windbreak/Shelterbelt Establishment, Code 380 or Herbaceous Wind Barriers, Code 603 to impede transport of particulate matter between the source (i.e., heavy use area) and nearby sensitive areas.

Sand Separation. Consider using sand separation prior to mechanical separators to improve the mechanical life of the system.

Operation and Maintenance. Where sand is a major component of the liquid waste stream, special emphasis should be given to abrasion resistant waste transfer piping and pumps to reduce frequency of repairs.

The owner and operator should understand the level of operation and maintenance (O&M) required ensuring the type of separator selected will be operated as intended.

PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared in accordance with the criteria of this standard and good engineering practice. The plans and specifications shall include all details necessary for construction and completion of the solid/liquid separation facilities.

As a minimum, the plans and specifications shall provide the following:

1. Layout of waste production facilities, waste collection points, waste transfer pipelines, waste treatment and storage facilities.
2. Location of all inflow and discharge pipelines, pipeline materials, diameter and slope.

3. Details of support systems for solid/liquid separation devices.
4. Fencing and signage as appropriate for safety purposes.
5. Operating characteristics.

Warranties. The contractor shall provide a one-year warranty on all construction. If a manufactured solid/liquid separation device is installed, the manufacturer shall provide a warranty that describes the design life of the device and what the warranty covers.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be developed and reviewed with the owner prior to construction of the solid/liquid separation facility. The O&M plan shall be consistent with the purposes of the solid/liquid separation device chosen, its intended life, safety requirements, and the criteria for its design. The plan shall contain operation and maintenance requirements including but not limited to:

1. Documentation of design assumptions.
2. Design capacity for the facility.
3. A description of normal operation of the facility, safely issues, and normal maintenance items.
4. Alternative opeation procedures in the event of equipment failure.
5. Daily inspection of the following:
   - Separation device and support structure.
   - Screens and outlets
   - Remaining capacity in storage facilities.

The O&M plan for solid/liquid waste separation may be included as a part of the overall waste management plan. Periodic removal and management of solids will be addressed in the O&M plan.

REFERENCES

Chapter 62-522 and 62-670 F.A.C.
Florida NRCS Conservation Practice Standards
Amendments for Treatment of Agricultural Waste, Code 59
Critical Area Planting, Code 342
Herbaceous Wind Barriers, Code 603
Manure Transfer, Code 634
Nutrient Management, Code 590
Waste Storage Facility, Code 313
Waste Treatment Lagoon, Code 359
Waste Utilization, Code 633
Windbreak/Shelterbelt Establishment, Code 380
USDA/NRCS, National Engineering Handbook, Part 651, Agricultural Waste Management Field Handbook, 1992, Last revised, June 1999