

**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.

**PURPOSE**

To partition solids, liquids, and their associated nutrients as part of 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 as a primary treatment process and allow 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 (e.g., 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

**CRITERIA**

**General Criteria Applicable to All Purposes**

**Laws and regulations.** The installation and operation of the separation facility shall comply with all federal, state, and local laws, rules, and regulations. The Alabama Department of Environmental Management (ADEM) Rules require owners/operators of animal feeding operations (AFO's) and associated waste management systems to fully implement and regularly maintain effective best management practices (BMP's) that meet or exceed NRCS technical standards and guidelines to prevent discharges and to ensure ground water and surface water quality.

All construction activities must implement adequate construction stormwater management BMP's. In addition, to comply with the National Pollutant Discharge Elimination System (NPDES) Phase II Rule, all construction activities involving one acre or more of land disturbance shall obtain NPDES permit coverage and have and follow a construction best management practices plan (CBMPP) until construction is complete and all disturbed areas are stabilized.

ADEM AFO/CAFO rules require that operators retain records documenting that (1) all designs and plans for any structures were prepared and certified by a professional engineer registered in the State of Alabama (PE); (2) construction was supervised by a PE; (3) once construction was completed, a PE certified that the completed facility was constructed in accordance with the approved plans and met or exceeded good engineering practices and NRCS technical standards and guidelines; and (4) any modifications or repairs made to the structures were supervised and certified by a PE.

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service [State Office](#) or visit the [electronic Field Office Technical Guide](#).

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**Cultural Resources.** Ground disturbing activities such as excavation and site preparation for animal waste facilities and pipelines have the potential to affect significant cultural resources. Complete a cultural resources review prior to ground disturbing activities to assure that existing cultural resources will not be adversely impacted.

**Location.** Locate solid/liquid separation facility so that the waste stream can be safely routed to and from the facility.

Locate separation facility to meet the minimum buffer distance requirements from water(s), wells, property lines, and public or private facilities as defined in the ADEM Administrative Code, Chapter 335-6-7, as amended.

**Structural Design.** Design all structures associated with the solid/liquid separator facility to meet the requirements of Alabama NRCS conservation practice standard Waste Storage Facility, Code 313. Design structures so that all liquid waste from the separation facility will be directed to liquid storage or treatment facilities.

**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. Select the type of solid/liquid separator 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.** Base the volume of solids separated 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.

**Chemical Amendments.** Guidance for the addition of chemicals to the liquid waste stream for improving total solids capture efficiencies is given in Alabama NRCS conservation practice standard Amendments for Treatment of Agricultural Waste, Code 591.

<b>Solid/Liquid Separators</b>	<b>Total Solids Capture Efficiency</b>
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%
Weeping Wall	50-85%
Dry Scrape	50-90%
Geotextile Container	50-98%

**Storage of Separated Solids.** Provide adequate storage areas for separated solids so they can be properly managed. Base length of storage on the geographical location in the state and the type of vegetation on the land application area according to Alabama NRCS conservation practice standard Nutrient Management, Code 590. Storage may be temporary or long-term unless the separated solids are transported directly from the separator to the final utilization location (e.g., offsite composter).

Design storage facilities for separated solids in accordance with requirements of Alabama NRCS conservation practice standard Waste Storage Facility, Code 313.

Direct all seepage from solid storage facilities to liquid storage or treatment facilities.

**Outlets.** Provide outlet capacity for a solid/liquid separation facility to safely convey the design capacity to a storage, treatment, or utilization location.

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

Emergency overflow appurtenances such as notched weirs or pipe bypasses can be used to control flows exceeding design capacity. Design emergency overflow appurtenances 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, be land applied, or be otherwise contained to prevent discharge to surface and ground water.

### **Additional Criteria for Filtration or Screening Devices**

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

**Velocity.** Design liquid waste stream velocity through filtration and screening devices in accordance with the manufacturer's recommendations.

**Structural Design.** Design structural supports for filtration and screening devices in accordance with the requirements of Alabama NRCS conservation practice standard Waste Storage Facility, Code 313.

### **General Criteria Applicable to Settling Basins**

**Velocity.** Design liquid waste stream velocity through settling basins to not exceed 1.5 feet per second.

**Depth.** Provide a total depth of 5 feet or less for settling basins that are to be cleaned using conventional front end loading equipment. Address safety concerns during cleaning where the total depth for settling basins will exceed 5 feet.

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

Base the total depth of concrete settling basins on the sum of the depth needed for liquids and solids storage.

Base the minimum liquid depth of settling basins on a minimum hydraulic retention time and the solids settling rate. Use a minimum hydraulic retention time of 30 minutes except where sand is a major component of the liquid waste stream. Where sand is a major component in the liquid waste stream, provide hydraulic retention time of a minimum of 3 minutes and a maximum of 5 minutes.

Design the maximum solids settling rate to be 4 feet per hour for settling basins with a total storage depth greater than 2 feet and 2 feet per hour for settling basins with a total storage depth equal to or less than 2 feet.

**Bottom Width.** Provide a minimum bottom width for settling basins of 10 feet.

Where settling basins are not used for dewatering, an earthen bottom can be used (e.g., level diversion).

Design settling basins used for dewatering to be concrete and/or lined with a geosynthetic, compacted soil, or geomembrane liner meeting applicable local laws and regulations. Design the floor of a settling basin not utilizing a concrete floor slab to provide adequate support for cleaning equipment. A settling basin constructed according to these criteria shall also meet appropriate criteria in Alabama NRCS conservation practice standard Waste Storage Facility, Code 313.

**Access.** Provide a minimum top width for earthen embankments for settling basins of 15 feet where equipment access is needed for cleaning. Where no access is needed for cleaning, design the minimum top width according to the equipment used to construct the embankment or berm, but not less than 4 feet.

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

Design access ramps to allow entry into the basin for cleaning by normal front end loading equipment to be no steeper than 10:1. Allow steeper slopes where special surfacing of the ramp is done for traction purposes and the equipment used can accommodate the steeper slope, but in no case 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 (e.g., flush water from covered freestall barns or milking parlor wastewater) that include significant external drainage fall into this category.

**Flow rate.** Base the design flow rate for a settling basin that receives lot runoff on the normal liquid waste stream discharge from the operation plus the peak runoff from the drainage area of the basin computed using a 10-year 1-hour storm frequency.

**Volume.** Base the design volume for settling basins receiving lot runoff 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 on sludge accumulation rates from lot surfaces, use 0.05 cubic foot per square foot per month for unpaved lots and 0.01 cubic foot per square foot per month for paved lots. Increase these values 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 from process generated liquid waste streams (e.g., flush water from covered freestall barns or milking parlor wastewater) and do not receive significant external drainage fall into this category.

**Flow rate.** Base the design capacity for a settling basin that excludes lot runoff on the normal liquid waste stream discharge from the operation.

**Volume.** Base the design volume for settling basins that exclude lot runoff on the volume needed to provide solids storage for a specified treatment period plus temporary liquid storage necessary during dewatering. Base minimum temporary liquid storage on the volume of the liquid waste stream for one-day.

#### **CONSIDERATIONS**

Solid/liquid separation facilities should take advantage of gravity flow wherever possible. Consider locating separation facilities based on elevation and distance from the source of material to be separated and the location of long-term liquid and solid waste storage and treatment facilities.

Other considerations for locating separation facilities include vehicle access, wind direction, and visibility. Consider vegetative screens or other methods to shield separation facilities from public view and for more aesthetic conditions.

To maximize drainage and solid/liquid separation, use weeping walls on the entire perimeter of the waste to be treated and maintain drainage paths to

and through the walls. Ensure drainage is transferred to a liquid storage or treatment facility.

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

Precipitation falling on the solids storage areas associated with solid/liquid separation facilities can result in increased wastewater discharge into the long-term storage or treatment facility. Consider covering solids storage facilities in locations where high precipitation amounts occur.

Where sand is a major component of the liquid waste stream, give special emphasis 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 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:

- layout of waste production facilities, waste collection points, waste transfer pipelines, solid/liquid separation facilities, and waste treatment and storage facilities
- location of all inflow and discharge pipelines and a description of pipeline materials, diameter, and slope
- details of support systems and facilities for solid/liquid separation devices
- fencing and signage as appropriate for safety purposes
- 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.

- remaining capacity in storage or treatment facilities

### **OPERATION AND MAINTENANCE**

Develop and review an operation and maintenance (O&M) plan with the owner and operator prior to constructing the solid/liquid separation facility. Prepare the O&M plan to 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 O&M requirements including but not limited to:

- documentation of design assumptions
- design capacity for the facility
- a description of normal operation of the facility, safety issues, and normal maintenance items
- alternative operating procedures in the event of equipment failure
- daily inspection of the following:
  - separation device and support facilities
  - screens and outlets

### **REFERENCES**

- ADEM Administrative Code  
AFO/CAFO Rule, Chapter 335-6-7, as amended  
Construction Stormwater Rule, Chapter 335-6-12, as amended
- ADEM/NRCS Buffer Distance Summary for Animal Feeding Operations
- Mid West Plan Services Handbook 18, Livestock Waste Facilities Handbook, Third Edition, 1993
- Burns, R.T. and Moody, L.B.. 2003. Development of a Standard Method for Testing Mechanical Manure Solids Separators. ASAE-CIGR Meeting Paper No. 034131. St. Joseph, MI.: ASAE
- NRCS Cultural Resources Handbook
- NRCS, National Engineering Handbook, Part 651, Agricultural Waste Management Field Handbook. 1992, last revised June 1999