

**NATURAL RESOURCES CONSERVATION SERVICE**  
**CONSERVATION PRACTICE STANDARD**  
**WASTE SEPARATION FACILITY**

(No.)  
**CODE 632**

**DEFINITION**

A filtration or screening device, settling tank, settling basin, or settling channel used to partition solids and/or nutrients from a waste stream.

**PURPOSE**

To partition solids, liquids and/or their associated nutrients to:

- improve or protect air quality
- improve or protect water quality
- improve manure handling methods or serve as a pre- or post-treatment for other processes

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies where the waste separation facility will:

- Remove solids from a liquid waste stream as a primary treatment process and facilitate further treatment processes.
- Reduce problems associated with solids accumulation in liquid waste storage facilities.
- Reduce solids content in waste stream so liquids can be recycled for other uses.
- Reduce solids content in a waste stream, to better facilitate land application of liquids using irrigation techniques.
- Assist with partitioning nutrients in the waste stream to improve handling and application of nutrient management.

**CRITERIA**

**General Criteria Applicable to All Purposes**

**Laws and Regulations.** Waste separation facilities shall be planned, designed and installed to meet all federal, state, local and tribal laws, rules and regulations.

**Location.** Position waste separation facilities so that the waste stream can be safely routed to and from the facility.

**Roofs.** If the facility is to have a roof, snow and wind loads shall be specified using the current Michigan Building Code.

**Waste Separator Selection.** Table 1 provides guidance on 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. Base the type of waste separator selected, whether mechanical or non-mechanical, on site specific data for the waste streams and management conditions where specific management objectives are to be met. A combination of separation unit processes may be necessary to achieve the desired or required results.

**Separation Efficiency.** Base the volume or percentage of solids separated on estimates of daily waste water (if applicable) and the total solids capture efficiency for the type of separation device selected. Manufacturer separation equipment performance is generally reported as concentration reduction or mass removal efficiency. Where manufacturer information or local data concerning total solids capture efficiencies are not available for the type of waste separation device selected, the efficiencies in Table 1 can be used to

estimate the amount of separated material generated.

**Chemical Amendments.** To enhance the separation process, chemical amendments, such as metal salts and polymers, can be used to flocculate manure solids to enhance the separation process. Addition of chemicals to the liquid waste stream for improving total solids capture efficiencies must be done according to the criteria in NRCS conservation practice Standard, Amendments for Treatment of Agricultural Waste (591).

**Table 1**

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%
Weeping Wall	50-85%
Dry Scrape	50-90%
Geotextile Container	50-98%
Membranes	60-99%
Sand Settling Lanes	50-70%
Mechanical Sand Separator	50-95%

**Storage of Separated Solids.** Provide adequate storage areas for separated solids unless they are transported directly from the separator to the final utilization location.

Design storage facilities for separated solids in accordance with requirements of NRCS conservation practice standards, Waste Storage Facility (313) and Roofs and Covers (367).

**Discharges.** Capture any seepage or discharge from solid or sand storage, waste separation

facility, or associated appurtenances in a waste storage or treatment structure unless it meets local, state and federal regulations regarding discharge to surface and ground water.

**Conveyance System.** Design waste transfer components for separated solids in accordance with requirements of NRCS conservation practice standard, Waste Transfer (634).

For conveyance systems, maintain sufficient velocities to keep solids in suspension until material reaches desired separation process or storage area.

**Outlets.** Provide adequate outlet capacity for a waste separation facility to safely convey the design load to a storage 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 for screening used to separate solids at the outlet of settling basins.

Use emergency overflow appurtenances such as notched weirs, or pipe bypasses to control flows exceeding design capacity. For separation facilities exposed to precipitation, 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 waste separation facility must be captured in a waste storage or treatment structure.

#### **Additional Criteria for Mechanical Separators**

**Performance.** The performance of mechanical separators is generally reported for a given throughput or flow rate. If different flow rates are required, obtain separator efficiencies from the manufacturer.

**Flow Rate and Velocity.** Follow manufacturer's recommendations for the design flow rate and liquid waste stream velocity for filtration and screening devices.

**Structural Design.** Design structural supports for filtration and screening devices in accordance with the requirements of NRCS

conservation practice standard, Waste Storage Facility (313).

For proper functioning of mechanical separation equipment, environmental conditions may require roofing and or building enclosure. Roofs and enclosures shall be designed in accordance with the requirements of NRCS conservation practices, Roofs and Covers (367) and Waste Storage Facility (313).

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

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

**Depth.** Provide sufficient depth for solids and liquids storage and for the depth of influent flow as needed. Include a minimum of one foot freeboard for earth embankment settling basins and 0.5 ft freeboard for fabricated structures.

Base the minimum liquid depth of settling basins on a minimum hydraulic retention time of 30 minutes.

**Bottom Width.** Establish the minimum bottom width for settling basins on the removal equipment used, but not less than 4 feet.

Construct settling basins of concrete and/or lined with a geosynthetic, compacted soil, or geomembrane liner meeting appropriate NRCS conservation practice liner standards. Design a settling basin utilizing a concrete slab for the basin floor to provide adequate support for clean out equipment. Ensure that settling basins constructed according to these criteria also meet appropriate criteria in NRCS conservation practice Standard, Waste Storage Facility (313).

**Access.** Establish the minimum top width of earthen embankments for settling basins at 15 feet when equipment access is needed for clean out.

Where no access is required to the settling basin for clean out; base the minimum top width on the equipment used to construct the embankment or berm, but not less than 4 feet.

Construct the side slopes of earthen embankments no steeper than 2 horizontal to 1

vertical (2:1). For earthen embankments greater than 3 feet in height, construct the 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 clean out by normal front end loading equipment at no steeper than 10:1. Allow steeper sloped access ramps where special surfacing of the ramp is done for traction purposes and the equipment used can accommodate the increased slope but in no case steeper than 4:1.

**Safety.** Include in the design appropriate safety features to minimize the hazards of the facility. Provide warning signs, fences, ladders, ropes, bars, rails, and other devices, as appropriate, to ensure the safety of humans and livestock. Ensure that proper ventilation and adequate warning signage is provided for waste separation equipment in an enclosed facility or confined area, as necessary, to prevent explosion, poisoning, or asphyxiation.

### **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.** Design the 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 feet per square foot of surface area per month for unpaved lots and 0.01 cubic feet per square foot of surface area per month for paved lots. Increase these values by 50% if

lots are steep or poorly maintained. The minimum accumulation storage period is one month.

#### **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 (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.** Design the 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. Use a minimum temporary liquid storage based on the volume of the liquid waste stream for one-day.

#### **General Criteria for Sand Separation and Reuse**

Separation processes that remove sand from water and organic material fall into this category.

**Dilution.** Provide adequate dilution water for sand laden manure to keep organic solids in suspension for proper sand separation. Use a minimum water to sand laden manure dilution ratio of 3:1 (volume basis).

**Capacity.** Provide adequate capacity for the system design to handle the required manure and sand loadings.

**Sand Storage.** Provide adequate storage of separated sand to allow for additional liquid drainage from the sand.

#### **Additional Criteria for Non-Mechanical Sand Separation and Reuse**

**Velocity.** Design the waste stream velocity between 1 and 2 feet per second. Adjust flow velocity according to sand size and distribution.

**Volume.** Provide a minimum settling area storage volume to correspond to the maximum cleanout period. Design the bottom width to be compatible with the removal equipment, but not be less than 8 feet.

**Hydraulic Retention Time.** Design the hydraulic retention time to be between a minimum of 3 minutes and a maximum of 5 minutes. Make adjustments according to sand size and distribution.

#### **CONSIDERATIONS**

Consider the potential effects of installation and operation of waste separation facilities on the cultural, archeological, historic and economic resources.

**Location.** When locating waste separation facilities, consider elevation and distance from the source of material to be separated and the location of long-term liquid and solid waste storage facilities. Take advantage of gravity flow wherever possible for locating waste separation facilities.

Other considerations for locating waste 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, install weeping walls around the entire perimeter of the waste to be treated and maintain drainage paths to and through the walls. Consider waste particle size, particle size distribution and length of flow paths when selecting screen opening size and spacing. Ensure drainage is transferred to a liquid storage facility.

**Sand Bedding.** When sand bedding is reused, select a uniformly sized sand to improve separation efficiency.

**Solid/Solid Separation.** When separating poultry litter into fine and coarse fractions, a higher percentage of the nutrients is partitioned with the fine fraction. The coarse material, consisting mostly of shavings and feathers, has a lower nutrient content and could be reused as bedding or as an energy source.

**Visual Screening.** Consider using vegetative screens or other methods to shield waste separation facilities from public view and for more aesthetic conditions.

**Rainfall.** Rainfall falling on the solids storage areas associated with waste separation facilities can result in increased waste water discharge into the long term storage facility. Consider covering of solids storage facilities in locations where high rainfall amounts occur.

**Sand System Abrasion Resistance.** Where sand is a major component of the liquid waste stream, encourage the use of abrasion resistant waste transfer piping and pumps to reduce frequency of repairs.

## PLANS AND SPECIFICATIONS

Plans and specifications shall be prepared in accordance with the criteria of this standard and shall describe the requirements for applying the practice to achieve its intended use and for construction and completion of the solids/liquid separation facilities.

Support data documentation requirements are as follows:

- Inventory and evaluation records
  - Assistance notes or special report
- Survey notes, where applicable
  - Design survey
  - Construction layout survey of waste products facilities, waste collection points, waste transfer pipelines, waste treatment and storage facilities.
  - Construction check survey
- Design records
  - Physical data, functional requirements and site constraints, where applicable
  - Soils/subsurface investigation report, where applicable
  - Design capacity for the facility
  - Document design factors related to operation and maintenance needs

- Design and quantity calculations
  - Location of all inflow and discharge pipelines, channels or lanes, a description of pipeline materials, diameter and slopes of all conveyances.
  - Details of support systems for solid/liquid separation devices.
- Construction drawings/specifications with:
  - Location map
  - “Designed by” and “Checked by” names or initials
  - Approval signature
  - Job class designation
  - Initials from preconstruction conference
  - As-built notes
  - Fencing and signage as appropriate for safety purposes
  - Operating characteristics
- Construction inspection records
  - Assistance notes or separate inspection records
  - Construction approval signature
- Well isolation distance documentation
- Record of any variances approved, where applicable
- Record of approvals of in-field changes affecting function and/or job class, where applicable.

**Warranties.** If a manufactured waste 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 (O&M) plan shall be developed for this practice. The O&M plan shall be consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for the design.

Ensure that the owner and operator understand the level of operation and maintenance (O&M)

required for the type of separator selected to operate as intended.

## REFERENCES

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