USDA
NATURAL RESOURCES
CONSERVATION SERVICE

MARYLAND CONSERVATION
PRACTICE STANDARD

WASTEWATER TREATMENT STRIP

CODE 635
(Reported by Acre)

DEFINITION

An area of vegetation designed to remove sediment, organic matter, and other pollutants from wastewater.

PURPOSE

This standard establishes the minimum requirements for design, operation and maintenance of the wastewater treatment strip for removing sediment, organic matter, pollutants and for utilizing nutrients from wastewater through plant uptake.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies in locations requiring wastewater treatment strips as part of an agricultural waste management system to treat wastewater. This practice does not apply to treatment of human or industrial wastes.

CONSIDERATIONS

Water Quantity

1. Effects on components of the water budget;
2. Effects on downstream flows or aquifers that affect other water uses or users.

Water Quality

1. Effects on erosion and movement of sediment, pathogens, and soluble and sediment-attached substances carried by runoff;
2. Effects on the visual quality of onsite and downstream water resources;
3. Effects on wetlands, streams and water-related wildlife habitats;
4. Effects on groundwater.

CRITERIA

General Criteria

There shall be a minimum of 20 inches of soil depth between finished grade and bedrock and the seasonal high water table. When soils are classified as excessively drained or soils do not meet the above criteria the wastewater treatment strip shall be modified in accordance with recommendations from the appropriate specialists.

Wastewater treatment strip slopes shall be between 1 percent and 15 percent.

Clean water runoff from the 25-year, 24-hour storm shall be diverted around the wastewater treatment strip.

The wastewater treatment strip shall not be located within 100 feet of streams, sinkholes, springs, wetlands, wells or other water bodies.

The Maryland conservation practice standard, Critical Area Planting, code 342 shall be used to determine the appropriate grass species to be established, based on site conditions and the amount of water, sediment, nutrients, and pollutants to be applied to the wastewater treatment strip. Plants listed on the Maryland noxious weed list shall not be planted or allowed to become established in the wastewater treatment strip.

The wastewater treatment strip shall be fenced to exclude livestock in accordance with Maryland conservation practice standard, Fence, code 382. Controlled grazing of grass filter areas shall be in accordance with the Maryland conservation

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

practice standard, Prescribed Grazing, code 528A. Controlled grazing of grass filter channels is not permitted.

The Maryland conservation practice standard, Waste Storage Structure, code 313 shall be used for design of structural elements such as settling facilities, curbs, slabs etc constructed as a component of this practice.

The wastewater treatment strip may be a uniformly sloping grass filter area or a grass filter channel. Minimum dimensions shall be based on the design flow. Regardless of the filter type or shape, provide an area adequate for a maximum application rate of 1 inch per week

Grass filter areas – They shall be generally on the contour and sufficiently sized to pass the designed application flow at a depth of 0.5-inch or less. Flow length shall be sufficient to provide at least 15 minutes of flow-through time, calculated using a Manning's n = 0.24. Sheet flow across the full width of the grass filter area shall be maintained for the full length of the grass filter area.

Grass filter channels – They shall be designed to carry the designed peak flow at a depth of 0.3-foot or less. Flow length shall be sufficient to provide at least 15 minutes of flow-through time using D-retardance. Grass species and shape of channel shall be such that grass stems will remain upright during design flow.

Criteria for Controlled Overland Flow Treatment of Liquid Wastes

These additional criteria apply to wastewater treatment strips for wastewater from milking parlors, milking centers, waste treatment lagoons, on-farm food processing plants, silos, and waste storage facilities.

If suspended solids are expected in the wastewater, provide a settling facility with a minimum of two-day detention volume for floatable and settleable solids. The outlet from this settling facility shall be gravity flow. A pump or siphon for distribution of wastewater shall be located in a dosing tank separate from the settling facility.

The wastewater treatment strip shall be dosed with the volume of flow from the wastewater source or from the settling facility if required. The peak flow used to size the filter shall be based on the capacity of the pump, siphon, or gravity discharge pipe.

Gravity discharge (without a pump or siphon) may be used to dose a wastewater treatment strip only if the duration of flow is less than three hours per day, it provides uniform distribution of the flow across the head of the wastewater treatment strip, it does not produce a sustained trickle flow to the wastewater treatment strip, the wastewater treatment strip is rested as required below, the wastewater treatment strip soil has a permeability less than 2.0 inches per hour, and the filter slope is greater than 2%.

Waste water shall be applied to a wastewater treatment strip on no more than one of any three consecutive days to provide a rest period for the vegetation, maintain an aerobic soil condition, and prevent deep percolation of waste water.

Criteria for Runoff from Concentrated Livestock Areas

These additional criteria apply to wastewater treatment strips for runoff from feedlots, barnyards, manure stacking facilities, and composting facilities.

Grass Filter Areas without Settling Facilities – For grass filter areas without a settling facility, the following minimum criteria shall be followed:

1. Minimal solids transport is anticipated onto the grass filter area. This may be due to infrequent use, type of system, design of system size or frequent cleaning.
2. The discharge outlet onto the grass filter area shall be generally on the contour. It shall be constructed so the discharge is uniform over the entire width of the grass filter area and concentrated flow does not occur.
3. The maximum flow length across the contributing drainage area is less than 100 feet unless provisions to redistribute the discharge as sheet flow across the entire width of the grass filter are provided. This may be accomplished by curbing, level distribution pad or by similar means.

4. Them maximum slope of the contributing drainage area onto the grass filter area shall not exceed 1.5% unless provisions to reduce the velocity of the discharge before entering the grass filter area are made. This may be accomplished by curbing, level distribution pad or by similar means.
5. The flow length of the grass filter area shall be equal to the maximum flow path of its drainage area but in no case less than 20 feet or greater than 100 feet.
6. The minimum size of the grass filter area shall be equal to the size of its drainage area.

Grass Filter Areas and Channels with Settling Facilities **–** A settling facility shall be provided between the waste source and wastewater treatment strip if one or both of the following conditions occur:

1. When it is anticipated that a high volume of manure solids will run off the concentrated livestock area, due to infrequent cleaning or less than optimum site management;
2. When the criteria shown in the previous section cannot be met.

The settling facility shall have sufficient capacity below the overflow to store 0.5-inch of manure solids from the concentrated waste area and an additional 1-inch of runoff to the top of the settling facility. Any basin outflow shall be disregarded in computing minimum storage.

Additional storage capacity, based on frequency of cleaning, shall be provided for manure and other solids settled within the basin. If the basin is to be cleaned after every 2-inch rainfall or when the solids storage is full, no additional storage is required. If infrequent cleaning of the basin is planned, additional storage equivalent to at least 0.5 inches runoff from the concentrated waste area shall be provided for each month between planned cleanings.

The settling facility shall be designed to completely discharge a 1-inch volume of runoff from the drainage area in no longer than 2 hours, and not produce a trickle flow to the wastewater treatment strip. Minimum dimensions of the wastewater treatment strip shall be based on the design flow from the 1-inch runoff discharge from the settling facility.

In addition, the criteria in the Maryland conservation practice standard, Sediment Basin, code 350 shall be met if the contributing drainage area exceeds one acre or the settling facility includes an embankment greater than three feet high.

Materials

Concrete – Concrete shall meet the requirements of Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials, Section 414, Mix No. 3.

Precast Concrete **–** Precast units shall comply with ACI-523 and 533.

Gravel - Crushed rock or gravel shall be compliant with gradations and quality found in the Maryland Department of Transportation, State Highway Administration Standard Specifications for Construction and Materials, Section 901.

Joint Sealers – Joint sealers shall conform to the requirements for ASTM-C920 as set forth in Section 7, or Federal Specification SS-S-210A; except that sealers for vertical or overhead application must meet the requirements of Federal Specification TT-S-227, Type II.

Waterstops - Vinyl-chloride polymer types shall be tested in accordance with Federal Test Method Standard No. 601, and shall show no sign of web failure due to brittleness at a temperature of -35 degrees Fahrenheit. Colloidal waterstops shall be at least 75 percent bentonite in accordance with Federal Specification SS-S-210A.

Plastic Pipe and Appurtenance - Plastic pipe shall be suitable for underground use. The pipe shall conform to the requirements of the following ASTM specifications:

1. D1527 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Schedules 40 & 80;
2. D1785 Poly(Vinyl Chloride) (PVC) Plastic Pipe Schedules 40, 80, 120;
3. D2104 Polyethylene (PE) Plastic Pipe Schedule 40;

4. D2239 Polyethylene (PE) Plastic Pipe, (SIDR-Pressure Rated) Based on Controlled Inside Diameter;
5. D2241 Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series);
6. D2282 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, (SDR-Pressure Rated).
7. D2447 Polyethylene (PE) Plastic Pipe, Schedules 40 & 80, Based on Outside Diameter;
8. D3035 Polyethylene (PE) Plastic Pipe, (SDR-Pressure Rated) Based on Controlled Outside Diameter;
9. F714 Polyethylene (PE) Plastic Pipe, (SDR-Pressure Rated) Based on Outside Diameter;

Fittings shall conform to the requirements of the following ASTM specifications:

1. D 2464 Threaded Polyvinyl Chloride (PVC) Plastic Pipe Fittings Schedule 80;
2. D 2465 Threaded Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Threaded, Schedule 80;
3. D 2466 Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40;
4. D 2467 Socket-Type Polyvinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80;
5. D 2468 Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 40;
6. D 2469 Socket-Type Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 80;
7. D 2609 Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe;
8. D 2610 Butt Fusion Polyethylene (PE) Plastic Pipe Fittings, Schedule 40 (for IPS Pipe);
9. D 2611 Butt Fusion Polyethylene (PE) Plastic Pipe Fittings, Schedule 80 (for IPS Pipe);
10. D 2683 Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing;
11. D 3036 Socket-Type Polyvinyl Chloride (PVC) Plastic Line Couplings;
12. D 3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
13. D 3261 Butt Heat Fusion Polyethylene (PE) Plastic Fittings, for Polyethylene (PE) Plastic;

Solvents for solvent-welded plastic pipe joints shall conform to the following ASTM specifications, as applicable:

1. D 2235 Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings;
2. D 2564 Solvent Cements for Poly(vinyl Chloride) (PVC) Plastic Pipe and Fittings;
3. D 2855 Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

Rubber gaskets for pipe joints shall conform to the requirements of the following ASTM specification:

1. F 477, Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

SPECIFICATIONS

Plans and specifications for wastewater treatment strips shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

OPERATION AND MAINTENANCE

An O & M plan specific to the type of practice shall be provided to the landowner. The plan shall include, but not be limited to, the following provisions:

1. Maintenance and operation instructions for pumps, settling basin, and other components of the system;
2. Inspect collection and storage devices, valves, outlets and pipelines at least biannually. Make repairs as needed;
3. Check for debris or sludge or other materials in the system, which may restrict the inflow or outflow system and remove;
4. Protect from damage due to livestock and farm equipment. Maintain fences and other devices used for this purpose;
5. Check for leaks and repair immediately;
6. Check valves, automatic water level devices, and overflow pipes for proper operation;
7. Maintain vegetative cover in a vigorous condition. For optimum water quality benefits, mow at least two to three times annually to a height of 3 to 5 inches. Reseed the area as needed. Apply soil amendments (lime and fertilizer) only if needed based on soil test results;
8. Control undesirable plants by pulling, mowing, or spraying with a selective herbicide. Control noxious weeds as required by state law.

SUPPORTING DATA AND DOCUMENTATION

Field Data and Survey Notes

The following is a list of the minimum data needed to be recorded on survey note paper, SCS-ENG-28:

1. System plan sketch;
2. Profile along centerline of proposed pipe from source to outlet;
3. Topography of wastewater treatment strip;
4. Special control or field feature that must be considered in design, including a soil investigation of the wastewater treatment strip area.

Design Data

Record on appropriate engineering paper. For guidance on the preparation of engineering plans see chapter 5 of the EFH, Part 650. The following is a list of the minimum required design data:

1. Plan view including all system components and site specific specifications;
2. Delivery system design. Show profile of system on plans. Show type and size of pipeline system on profile;
3. Collection system and settling facility design as appropriate. Show construction details on plans;
4. Wastewater treatment strip design shall be in accordance with Design Guide MD-#4, Wastewater Treatment Strip. Show dimensions, cross section and profile as needed on plans.
5. Job Class on plan;
6. Quantities estimate;
7. Planting plan. This must meet the criteria, specifications, and documentation requirements of the Maryland conservation practice standard, Critical Area Planting, code 342;
8. Written Operation and Maintenance Plan.

Construction Check Data

Record on survey note paper, SCS-ENG-28, or other appropriate engineering paper. Survey data will be plotted on plans in red. The following is a list of minimum data needed for as-builts:

1. Documentation of site visits on CPA-6. The documentation shall include the date, who performed the inspection, specifics as to what was inspected, all alternatives discussed, and decisions made and by whom;
2. Elevations of control features;
3. Dimensions of pipelines, collection system, wastewater treatment strip and other components;
4. Statement on seeding and fencing;
5. Final quantities and documentation for quantity changes. Materials certification, when requested.
6. Sign and date checknotes and plans by someone with appropriate approval authority. Include statement that practice meets or exceeds plans and NRCS practice Standards.

REFERENCES

1. American Concrete Institute, *Guide for Precast Concrete Wall Panels, ACI 533,* Farmington Hills, Michigan.
2. American Concrete Institute, *Guide for Precast Cellular Concrete Floor, Roof and Wall Units, ACI 523*, Farmington Hills, Michigan.
3. American Society for Testing and Materials, *ASTM Standards*, Philadelphia, Pennsylvania.
4. Maryland Department of Transportation, *Standard Specifications for Construction and Materials*, State Highway Administration, Baltimore, Maryland, October 1993.
5. USDA, Natural Resources Conservation Service, *Maryland Field Office Technical Guide, Section IV, Standards and Specifications*.
6. USDA, Natural Resources Conservation Service, *National Engineering Handbook*, Part 650.
7. USDA, Natural Resources Conservation Service, *National Engineering Handbook, Part 651*, Animal Waste Management Field Handbook.
8. USDA, Natural Resources Conservation Service, *Maryland Design Guide Field Handbook*, MD#4, Wastewater Treatment Strip,