SOIL CONSERVATION SERVICE

WASTE STORAGE POND (NO.)

Definition

An impoundment made by excavation or earthfill for temporary storage of animal or other agricultural waste.

Scope

This standard establishes the minimum acceptable requirements for design, construction, and operation of waste storage ponds. Embankments are limited to an effective height of 35 feet or less and hazard class (a). This standard does not apply to waste treatment lagoons or to waste storage structures.

Purpose

To store liquid and solid waste, waste water, and polluted runoff to reduce pollution and protect the environment.

Conditions Where Practice Applies

This practice applies where: (1) An overall waste management system has been planned; (2) waste is generated by agricultural production or processing; (3) storage is necessary to properly manage the waste; and (4) soils and topography are suitable for construction.

This practice shall not be installed until the necessary components for a waste management system have been determined. This includes the following items: (1) control of surface runoff upstream and downstream from animal lots, (2) area required and the area available for spreading wastes, (3) need for filter strips, (4) period or interval between times pond is emptied, and (5) equipment needed to fill and empty the pond and apply wastes to the land.

Planning Considerations

Location. Waste storage ponds should be located as close to the source of waste and polluted runoff as practicable. Due consideration shall be given to economics, the overall waste management plan, and health and safety factors. The ponds should be located where prevailing winds, vegetative screening, and building arrangement minimize odor and visual resource problems. Nonpolluted runoff shall be excluded to the fullest extent possible.

Waste storage ponds should not be placed in floodways. Ponds located on the flood fringe must meet the requirements of Wisconsin Administrative Code NR116 and be protected from inundation by a 100-year regional flood. A freeboard of 3 feet above the 100-year frequency flood shall be provided.

Vertical separation distances to bedrock and/or ground water. All ponds shall have floors or bottom elevations located above either bedrock or the highest ground water elevation in accordance with table 1.

Distances to wells or reservoirs.
Criteria for location of storage ponds as related to wells are contained in table 1.

Criteria for reception pits, hoppers, and transfer pipes are contained in the interim standard for Waste Transfer (358).

Solids separation. To minimize frequency of solids removal from waste storage ponds, polluted runoff shall be directed settling low gradient channels, or settling basins to remove readily settleable solids. Settling facilities shall have adequate capacity to store settled solids for a reasonable period, based on climate, equipment, and method of disposal or storage. If animal manure, bedding, or manure containing a high content of fibrous material is to be flushed into a storage pond, a solids separator should be provided for removing this material to facilitate pumping and irrigation.

Sealing waste storage ponds. Waste storage ponds should have bottoms and sides sealed whenever soils containing less than 50% fines (amount passing the No. 200 sieve) are present within 3 feet of the floor or bottom of the pond. Waste storage ponds located in soil materials with 40 to 50 percent fines (amount passing the No. 200 sieve) do not require sealing if at least 15 percent of the soils material is small than .002 mm and the soil has a plastic index (P.I.) of 7 or more. Alternatives for sealing are contained in table 2. Waterstops or other similar sealants are required for construction joints in concrete when liquid-tight floors and/or walls are required.

Whenever waste storage ponds have linings using materials other than concrete, anti-scour devices or pads will be installed to prevent erosion of the materials. Normally these will consist of concrete pads or a floor which extend a minimum distance outward and up the side slopes 10 feet from each point where the agitator pump is operated. Flexible membranes will be protected on side slopes with concrete or similar material if equipment such as pumps will be allowed on the side slope. Consideration will be given to having more than one location for agitation. Gate openings, posts, or other methods will be used to locate the proper point where pumping and agitation equipment may be used.

Design Criteria

Soil and foundation.
Soil profiles obtained by borings or backhoe test pits shall be made to an elevation at least 3 feet below the constructed bottom of the pond or to bedrock. Ponds located within 250 feet of a well must be investigated to a depth of 5 feet or more (unless bedrock is encountered) below the anticipated bottom elevation. The elevation of water tables and the date of investigation will be noted.

Storage period. The storage period is the maximum anticipated length of time between emptying, based on climate, crops, equipment, and labor.

To reduce the necessity of spreading on frozen ground, a storage for a minimum of 180 days shall be provided. Storage for longer periods is desirable and recommended especially for northern areas of the state or where wet soils prevent spreading in early spring.

Design volume. Waste storage ponds shall store the design volume. Design volume is the minimum volume required to store waste for the storage period. It is the total of the following.

With Drainage Area	Without Drainage Area
1. Manure, waste water, and normal runoff. 1/	1. Manure and waste water. 1/
2. Normal precipitation less evaporation on pond surface. 1/	2. Normal precipitation less evaporation on pond surface. 1/
3. 25-year, 24-hour runoff.	3. 25-year, 24-hour precipitation on pond surface.
4. Solids accumulation. 2/	4. Solids accumulation. 2/

1/ Accumulated during the storage period.

Solid manure, associated liquids and bedding may be stored in a solid waste storage pond or structure. The facility shall have a capacity to store the waste for the storage period. Manure without adequate bedding will not stack and the capacity is calculated as a level pond.

2/ For the period between solids removal. This applies mainly to ponds used to store waste water and polluted runoff, and refers to the residual solids after the liquids have been removed.

Tables 3 and 4 are a guide to manure production from various animals.

If possible, the volume of wash water should be determined by actual measurement or estimated by a reliable method such as calibration of a faucet, hose, or spray nozzle and applying the rate of water used to the time of operation. Table 5 may be used for estimating the volume of milkhouse and milking parlor wastes.

After determining depth of pond required to contain manure, waste water, the normal 25-year frequency runoff, and solids accumulation, a minimum of 2.0 feet additional depth shall be provided to contain the normal and 25-year, 24-hour precipitation falling directly on the pond surface after allowing for evaporation and freeboard. This allows for 1.0' of freeboard for a 1-year design period.

Table 6 is a guide to determine the normal runoff for the storage pond.

Additional storage may be provided to meet management goals or regulations.

Separation of precipitation. Precipitation which collects on solid waste storage ponds must be drained or pumped away when conventional manure handling equipment is used for removal of the wastes. This polluted runoff must be collected and disposed of in a safe manner. Picket dams may be used to separate the water resulting from precipitation when the manure contains bedding. The pickets should be placed vertically and designed to withstand a horizontal loading at least equal to 45 pounds per cubic foot. The picket dam should extend up the ramp to a point where the wastes are first removed. The discharge through picket dams shall be collected and stored until disposal.

Settling Basin Capacity. The capacity of the settling basin or channel shall be sufficient to pass the peak runoff for a 25-year frequency, 24-hour storm to the holding pond in addition to providing capacity for solids removed from the runoff. Where solids are stored separately or the solids are removed regularly from the lot, a settling basin may be used. When the settling basin is cleaned after each significant storm a capacity equal to 0.5-inch runoff from the lot area should be provided. When the settling basin is not cleaned regularly, the capacity may be calculated using 0.2 to 0.5 cubic feet per day for each animal unit.

Channels or terraces used as settling basins should have side slopes 2:1 or flatter. The channel shall be designed to provide a design velocity of 1 foot per second or less for runoff for a 10-year frequency, 24-hour storm. Settling basins should have paved bottoms to facilitate cleanout.

Inlet and outlet. Inlets to storage ponds may be of any permanent type designed to resist erosion, plugging, and damage by ice. If slurry and solid waste is stored, the inlet must be designed so that waste will be deposited near the center of the pond.

There shall be no outlet that can automatically release storage from the design volume. An emergency spillway, combination of spillways, or additional storage shall be provided to protect the facility from overtopping during a 25-year, 24-hour storm occurring when the design volume is filled. Spillway requirements, however, do not apply to waste storage ponds without drainage areas.

Earth embankment. The design height of the embankment shall be increased by the amount needed to insure that the design top elevation will be maintained after settlement. This increase shall not be less than 5 percent. The minimum top width shall be 8 feet. The combined side slopes of the settled embankment shall not be less than 5 horizontal to 1 vertical.

All areas under embankments should be stripped to remove vegetation and unsuitable materials before placing fill. When fill heights will exceed 10 feet, cutoff trenches will be installed under the embankments.

For ponds with a drainage area, the minimum elevation of the top of the settled embankment shall be 1 foot above the elevation of the water surface during the 25-year, 24-hour emergency spillway storm occurring when the design volume is filled. For ponds without a drainage area, the minimum elevation of the settled top shall be 1 foot above the design volume.

Disposal facilities. Waste shall be removed from storage and used or disposed of at locations, times, rates, and volumes shown in the overall waste management plan without polluting the surface or ground water. Waste may be liquid, slurry, or solid, and proper equipment must be available to remove and apply it to the land.

If polluted runoff is stored, liquids shall be removed promptly to insure that sufficient capacity is available to store runoff from subsequent storms. The maximum allowable emptying time shall be based on the chance of overflow from subsequent storms and on the capacity of the disposal area.

Provisions shall be made for removing solids from storage ponds to preserve the storage capacity. The method of removal must be considered in planning, particularly in determining the size and shape of the pond. For ponds built to store runoff and waste water, an entrance ramp having a slope of 4:1 or flatter may be used. For those built to store slurry and solid waste, some type of emptying facility must be provided. It may be a dock, a pumping platform, a retaining wall, or a ramp having a slope of 7:1 or flatter.

Protection. If the waste storage pond creates a safety hazard, it shall be fenced and warning signs posted to prevent children and others from using it for other than the intended purpose. The embankment and surrounding areas shall be vegetated to control erosion. Vegetative screens or other methods should be used as necessary to shield the pond from public view and to improve visual conditions. Normally no vegetative screening is necessary if the surface of the pond when full cannot be observed from a public view.

Other Design Considerations - Waste Storage Ponds. Structural components including surfacing of bottoms and ramps shall be designed and constructed in accordance with applicable provisions of the SCS standard for Waste Storage Structure (313).

Waste Storage ponds should be designed as deep as practical to keep surface area to a minimum. The limitations of the landowner's pump must be considered in determining depth.

Agitation requirements should be considered in determining pond shape. Agitation is easily accomplished from the sides of ponds which are long and have widths of 70 feet or less. Ponds with greater widths may require pump docks or pump access on both sides of pond for proper agitation.

Materials such as sand, crushed rock, and straw should be kept out of the ponds as much as possible if emptying is to be accomplished by pumping.

Design Documentation Requirements

Location map, volume computations, depth, length, width, side slopes, bottom elevation, foundation investigation logs, soils data, thickness and other material data for linings.

Construction (As Built) and/or Certification Documentation Requirements

As built data on depth, length, width, side slopes, pertinent elevations, data on linings.

INTERIM SUPPLEMENT TO STANDARD 425

Storage Pond Abandonment

Waste storage pond abandonment will require a site-specific design and inspection during abandonment procedures. A local permit may be required for the abandonment operation. The minimum procedure for abandonment shall include:

1. Removal and proper disposal of all accumulated wastes in the pond in accordance with NRCS Standard 590, Nutrient Management.
2. Removal of any concrete or synthetic liner.
3. Removal of any soil saturated with waste or a minimum of 2 feet of soil from the bottom and sides for ponds without constructed liners.
4. Removal or permanent plugging of the waste transfer system serving the waste storage pond.
5. Disposal of excavated soil material in cropped fields or spreading and seeding the spoil.
6. Shaping the storage site or filling the excavated area to a level above grade to drain water away from the site.
7. Seeding and mulching of the entire disturbed area.

TABLE 1
HORIZONTAL AND VERTICAL SEPARATION DISTANCES FROM
WELLS FOR WASTE STORAGE PONDS 1/

		More than 50% of soil passes # 200 sieve 2/		Less than 50% of soil passes # 200 sieve 2/		
Storage Facility Description	Distance from well	Separation to bedrock & groundwater	Liner Class	Separation to bedrock & groundwater	Liner Class	
Storage Ponds (425) (Liquid or semi-solid system)	250 ft. or more	3 ft. or more	None required	3 ft. or more	A,B,C,D or E	
	250 ft. or more	1.5 ft. or more	A or B	1.5 ft. or more	A or B	
	250 ft. or more	2.0 ft. or more	C,D or E	2.0 ft. or more	C or E	
Storage Ponds (425) (Solid or semi-solid systems with drainage facilities consisting of slats or drainage openings (such as picket dams) along at least one side. Liquid runoff from the drainage facilities shall be conveyed in liquid-tight flumes or pipes to holding ponds or other acceptable facilities located over 250 feet from the well. The floor must be liquid-tight concrete).	150 ft. or more	5 ft. with soil of P.I. of 7 or higher	None required	5 ft. or more	A,B,C,D or E	
	200 ft. or more	5 ft. or more	None required	5 ft. or more	A,B,C,D or E	
Storage Ponds (425)	150 ft. or more	3 ft. or more	A,C,D or E	3 ft. or more	A,C or E	

1/ Distance is from top of bedrock or water table to bottom of liner.
2/ Refers to soil material surrounding the Waste Storage Pond. If more than 15% is smaller than the .002 mm size and the soil has a P.I. of 7 or more, 40% passing #200 sieve may be substituted for 50%.

Table 2 -- Description of Waste Storage Pond Liners
(See table 1 for conditions requiring a liner).

Class	Description
A	Compacted earth consisting of material of which 50% or more passes the #200 sieve, a plasticity index (P.I.) of 7 or more, and a resulting permeability of $1x10^{-7}$ cm/sec ($2.83x10^{-4}$ ft/day) or less. Minimum thickness is 24" on pond sides, 18 inches on bottom, and compacted to 90% of standard proctor density.
B	Compacted earth consisting of material of which 50% or more passes the #200 sieve, and which has a P.I. of 7 or more. Minimum thickness is 30" on pond sides; 24 inches on pond bottom, and compacted with maximum 6" lifts in a manner that every point on the surface of each lift is traversed by not less than one tread width of the loaded equipment (or equivalent compaction).
C	Reinforced concrete containing a minimum of 6"x6" x 10/10 gage welded wire fabric with 5" thickness of concrete. Concrete to be 3000 psi minimum. Water stops must be utilized at all construction joints.
D	Flexible membrane with minimum thickness of 20 mil. (This liner applicable only when in soils with 25% or more passing #200 sieve and no bedrock within 3 feet of the liner.)
E	Flexible membrane with minimum thickness of 30 mil.

Class D and E liners will require manufacturer's statement on life expectancy. Installation to be with company supervision.

Table 3 -- Daily Manure Production for Livestock 1/

Kind of Livestock	Weight/Animal	Cubic Feet Per Day		
		Solids	Liquids	Total
Dairy Cattle	1000	1.1	0.5	1.6
	1200	1.4	0.5	1.9
	1400	1.6	0.6	2.2
	1600	1.8	0.7	2.5
Beef Cows	1000	0.8	0.3	1.1
	1200	0.9	0.4	1.3
	1400	1.0	0.5	1.5
	1600	1.1	0.6	1.7
Feed Lot Cattle	400	0.5	0.2	0.7
	600	0.7	0.3	1.0
	800	0.9	0.4	1.3
	1000	1.0	0.4	1.4
	1200	1.2	0.5	1.7
Heifers, 10 months to freshening				1.1
Calves, 1-1/2 - 10 months				0.5
Calves, up to 1-1/2 months, excluding wash water for veal operations. Allow .5 to .7 cubic foot for wash water.				0.2
Swine	50			.07
	100			.13
	150			.20
	200			.25
	250			.33
Bred Sow (limit fed)				.13
Lactating Sows with Litter				.50

1/ Source - "Solid Manure Handling for Livestock Housing, Feeding, and Yard Facilities in Wisconsin" by E. C. Bruns and J. W. Crowley; Publication A2418, November 1972; University of Wisconsin Extension

and

"Livestock Waste Facilities Handbook", Midwest Plan Service - 18, 1975.

Table 3 (cont) Daily Manure Production For Poultry 1/

Kind of Poultry	Cubic Feet Per Day per 1000 Birds
Laying hens	4
Broilers	1.63
Turkeys	7.54

1/ Source - "Solid Manure Handling for Livestock Housing, Feeding, and Yard Facilities in Wisconsin" by E. C. Bruns and J. W. Crowley; Publication A2418, November 1972; University of Wisconsin-Extension

and

"Livestock Waste Facilities Handbook", Midwest Plan Service - 18, 1975.

Table 4 -- Volume Allowance For Straw Bedding 1/

Straw Used Per Day Per A.U. (lbs.)	Loose Straw Cu.Ft. Per Day Per A.U.	Chopped or Baled Straw Cu.Ft. Per Day Per A. U.
2	.25	.13
4	.50	.26
6	.75	.39
8	1.00	.52
10	1.25	.65
12	1.50	.78

1/ Source - "Solid Manure Handling for Livestock Housing, Feeding, and Yard Facilities in Wisconsin" by E. C. Bruns and J. W. Crowley; Publication A2418, November 1972; University of Wisconsin-Extension

and

"Livestock Waste Facilities Handbook", Midwest Plan Service - 18, 1975.

Table 5 -- Volume of Milkhouse and Parlor Wastes 1/

Washing Operation	Water Volume
Bulk tank	
Automatic	50-60 gal/wash
Manual	30-40 gal/wash
Pipeline	
In parlor (Volume increases for long lines in a large stanchion barn.)	75-125 gal/wash
Pail milkers	30-40 gal/wash
Misc equipment	30 gal/day
Cow prep	
Automatic	1-4 1/2 gal/wash per cow
Estimated average	2 gal/wash per cow
Manual	1/4-1/2 gal/wash per cow
Parlor floor	40-75 gal/day
Milkhouse floor	10-20 gal/day

1/ Source - "Livestock Waste Facilities Handbook", Midwest Plan Service - 18,

Table 6 -- Monthly Runoff From Barnyards and Feedlots in Wisconsin 1/

Month	Runoff Curve Number -- (AMC II)			
	RCN=85 2/	RCN=90 3/	RCN=95 4/	RCN=98
	(Inches)	(Inches)	(Inches)	(Inches)
January	0.6	0.7	1.1	1.5
February	0.6	0.7	1.1	1.5
March	1.9	2.2	3.5	4.7
April	2.2	2.7	4.1	5.5
May	1.4	1.7	2.6	3.5
June	1.1	1.3	2.0	2.6
July	0.7	0.8	1.3	1.7
August	0.6	0.7	1.1	1.5
September	0.7	0.8	1.3	1.7
October	0.7	0.8	1.3	1.7
November	0.7	0.8	1.3	1.7
December	0.6	0.7	1.1	1.5
TOTAL	11.8	13.9	21.8	29.1

1/ Due to the many variables involved, figures shown are for average conditions in Wisconsin. Figures were derived from procedures similar to example on page 12-68, Agricultural Waste Management Field Manual, with modifications for snow accumulation, snow melt and dormant seasons of the year.

2/ Recommended for unpaved barnyards and feedlots having slopes of 4 percent or flatter.

3/ Recommended for unpaved barnyards and feedlots having slopes greater than 4 percent.

4/ Recommended for paved barnyards and feedlots.

Table 7 -- Monthly Values For Precipitation and Evaporation in Wisconsin 1/

Month	Ave. Precip. (Inches)	Ave. Evap. (Inches)	Net (Inches)
January	1.1	0.3	0.8
February	0.9	0.3	0.6
March	1.8	0.7	1.1
April	2.7	1.5	1.2
May	3.8	2.3	1.5
June	4.4	3.6	0.8
July	3.8	5.0	-1.2
August	3.5	5.1	-1.6
September	3.7	4.0	-0.3
October	2.2	2.6	-0.4
November	1.9	1.5	0.4
December	1.3	0.5	0.8
Annual	31.1	27.4	3.7

1/ Source - Precipitation - "Climatological Data Annual Summary, 1976, NOAA". Average values from several stations.
Evaporation - "Mean Monthly Evaporation From Shallow Lakes and Reservoirs"; Standard Drawing ES-1016 (13 sheets). Material from deleted section of SCS National Engineering Handbook, section 4.

SOIL CONSERVATION SERVICE

SPECIFICATIONS GUIDE

Excavation

To the extent that it is needed, all suitable materials removed from the excavations shall be used in the construction of the earthfills. All surplus or unsuitable excavated material shall be disposed of at a suitable location or as specified.

When the quantity of suitable material obtained from the excavation is not sufficient to construct the fill, additional material shall be obtained from the borrow area(s). The top six (6) inches of borrow areas and areas where fill is to be placed shall be stripped and stockpiled. Stripping shall be performed just prior to excavation in order to reduce potential erosion.

Fill

All fill material shall be obtained from the required excavation and borrow area(s). Fill material shall contain no sod, brush, roots, or other perishable materials. Rock particles larger than six (6) inches, where fill is not adjacent to structures, shall be removed. If fill is adjacent to a structure, the maximum rock particle size shall be three (3) inches.

The fill shall be placed in approximately horizontal layers extending the entire length and width of the embankment. No fill shall be placed on a frozen surface. No ice, snow, or frozen material shall be incorporated in the fill. The material shall contain sufficient moisture to permit satisfactory compaction.

Compaction requirements for the fill are as follows:

a. For fills less than 20 feet high at the low point on the centerline of the embankment, each layer of fill shall be compacted by routing the hauling and spreading equipment over the fill in such a manner that every point on the surface will be traversed by not less than one tread track of the loaded equipment traveling in a direction parallel to the main axis of the fill. Maximum thickness of each layer of fill is 12 inches.

b. Adjacent to structures, compaction of fill shall be accomplished by means of manually directed power tampers or plate vibrators unless otherwise specified. Heavy equipment shall not be operated within two (2) feet of any structure. Compaction by means of drop weights operating from a crane or hoist of any type will not be permitted.

Other Wisconsin Construction Specifications which may be applicable are:

1. Clearing; 2. Excavation; 3. Earthfill; 4. Concrete; 4A. Concrete;
7. Conduits: Concrete Pipe, Clay Pipe, and Asbestos - Cement Pipe;
10. Fencing; 11. Fertilizing, Seeding, and Mulching.