

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) Waste is generated by agricultural production or processing; (2) storage is necessary to properly manage the waste; and (3) soils and topography are suitable for construction.

This practice shall not be installed until an overall waste management system has been planned and the essential components determined.

All federal, state, and local laws, rules and regulations governing waste management, pollution abatement, health, and safety shall be strictly adhered to. The owner or operator shall be responsible for securing all required permits and approvals and for performing in accordance with such laws and regulations. Regulations published by the Environmental Protection Agency are listed on page WI-1-1 of the Agricultural Waste Management Field Manual. Responsibility for enforcement of the EPA regulations in Wisconsin is under the authority of the Department of Natural Resources.

DESIGN CRITERIA

Location. Waste storage ponds shall be 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 shall 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 shall not be located on flood plains unless they are protected from inundation or damage from a 25-year flood event.

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 three feet should also be provided.

Distances to wells or reservoirs. Reception pits and hoppers must be: (1) located at least 75 feet from the nearest well or reservoir; (2) be liquid-tight; and (3) have floors which are at least 3 feet above bedrock and/or highest ground water level.

Minimum allowable distances between storage ponds and wells or reservoirs are as follows:

- (1) One hundred and fifty feet if: (a) The pond has at least 5 feet of clay between the pond floor and the bedrock and/or highest ground water level; and (b) has a liquid-tight concrete floor (or liquid-tight concrete floor and partial concrete walls); and (c) has drainage facilities consisting of slats or mesh openings on at least one side or wall. 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.
- (2) Two hundred feet if: (a) The pond floor is located at least 5 feet above bedrock and/or highest ground water level; and (b) has a liquid-tight concrete floor (or liquid-tight concrete floor and partial concrete walls); and (c) has drainage facilities consisting of slats or mesh openings on at least one side or wall. Liquid runoff from the drainage facility shall be conveyed in liquid-tight flumes or pipes to holding ponds or other acceptable facilities located over 250 feet from the well.
- (3) Two hundred and fifty feet for ponds other than (1) and (2) above. The pond floor must be at least 3 feet above bedrock and/or highest ground water level.

For the purpose of this standard, clay is defined as a mineral soil of low permeability and a plastic index (PI) of more than 7.

Liquid-tight concrete floors shall have a thickness of at least 5 inches, contain as a minimum reinforcement steel equal to 6" x 6" x 10-gauge welded wire fabric, and meet the requirements of Wisconsin Construction Specification 4A for class 3000 concrete.

Subsurface drains may be considered as a means to lower the ground water in the vicinity of storage ponds provided:

- (1) The drains have a gravity outlet which can be monitored for water quality, and
- (2) The vertical distance of 3 feet between the floor of the pond and the ground water can be maintained, and
- (3) The drains are not located beneath the pond, and
- (4) The drain does not discharge to a field tile drain or directly to surface water.

If the vertical distances required under "Distances to wells or reservoirs" cannot be met, variances in these standards will be considered if other design alternatives are included which compensates for the reduced vertical separation between the storage facility and the bedrock and/or ground water. Requests for such variances will be submitted to the state conservation engineer (when the design is prepared by SCS offices).

Sealing Waste Storage Ponds

Waste storage ponds should have both bottoms and sides sealed whenever the required minimum vertical distances from bedrock or ground water cannot be obtained and a variance is requested or when soils containing less than 12% fines (amount passing the No. 200 sieve) are present within 3 feet of the floor or bottom of the pond. Alternatives for sealing include the following methods:

- (1) Constructing a reinforced concrete structure using water-stops at construction joints.
- (2) Constructing a clay blanket, using a soil material having a plastic index of 7 or more. The blanket shall have a minimum thickness of 1.5 feet and be compacted to a density of 90% or more standard proctor test. Clay blankets having densities less than 90% shall have thicknesses greater than 1.5 feet.
- (3) Constructing a lining by treating with bentonite in accordance with standard 521-C except the minimum thickness of the mixed layer shall be 12 inches. It shall be constructed by using two 6-inch lifts.
- (4) Installing a flexible membrane in accordance with standard 521-A. The minimum thickness of plastic sheeting shall be 12 mils. The membrane shall be covered with at least 12 inches of fine-grained soil.
- (5) Installing a system of drains with a collection system which allows monitoring the quantity and quality of seepage. This alternative may be used in addition to any of alternatives 1 through 4 above.

Manure Pump Discharge Pipes - Pipe used to transfer manure from a pump to a reception pit or waste storage facility must be installed at least 25 feet from a well or reservoir and meet one of the following:

- (a) AWWA Standard Specification C-900, pressure class 150; or
- (b) ASTM Standard Specification D2241, pressure class 250.

Pipe may be installed as close as 50 feet from a well or reservoir providing it meets one of the following standard specifications:

AWWA, C-100, C-200, C-300, or C-400.

Pipe of lesser quality must be installed at least 100 feet from a well or reservoir.

Soil and foundation. Locate on soils of slow to moderate permeability or on soils that can be sealed. If possible, avoid gravelly soils and shallow soils over fractured or cavernous rock.

Soil profiles obtained by borings or backhoe test pits shall be made to an elevation 3 to 6 feet below the maximum depth of excavation. Ponds located within 250 feet of a well must be investigated to a depth of 5 feet or more 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.

Waste storage ponds may be designed to contain (1) only liquid runoff or wastes; (2) only manure including associated bedding and liquid; or (3) a combination of manure and liquid runoff from the barnyard. When ponds contain surface runoff, design volumes must provide for the wastes for the design period in addition to the storage required for precipitation and runoff.

To reduce the necessity of spreading on frozen ground, a storage for a minimum of 180 days should 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. Restrict application to areas with a minimum pollution hazard.

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

1. Manure, waste water, and normal runoff. 1/
2. Normal precipitation less evaporation on pond surface. 1/
3. 25-year, 24-hour runoff
4. Solids accumulation 2/

Without Drainage
Area

1. Manure and waste water. 1/
2. Normal precipitation less evaporation on pond surface. 1/
3. 25-year, 24-hour precipitation on pond surface.
4. Solids accumulation 2/

1/ Accumulated during the storage period.

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.

When possible, design volumes should consider anticipated future herd expansions.

Tables on pages WI-4-1 and WI-4-2 of the Agricultural Waste Management Field Manual 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 WI-4-4 on page WI-4-3 of the Agricultural Waste Management Field Manual may be used for estimating the volume of milkhouse and milking parlor wastes.

After determining depth of pond required to contain manure, waste water, 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 and 1.0' of excess precipitation in addition to evaporation. Use of this 2.0-foot additional depth eliminates the need for determining normal precipitation, 25-year precipitation, and evaporation in Wisconsin.

Table WI-4-5 on page WI-4-4 of the Agricultural Waste Management Manual is a guide to determine the normal runoff for the storage pond.

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

Solids separation. To minimize frequency of solids removal from runoff storage ponds, polluted runoff shall be directed through vegetative filter strips, low gradient channels or debris 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. If animal manure, such as from forage fed animals, is flushed into a storage pond, a solids separator should be provided for removing fibrous solids to facilitate pumping and irrigation.

The capacity of the debris basin or channel shall be sufficient to pass the peak runoff for a 10-year frequency, 24-hour storm to the holding pond in addition to providing capacity for solids removed from the runoff. An allowance for 0.2 to 0.5 cubic feet of solids per day for each 1000-1200-pound animal should be provided. The number of days to be used in computing storage depends on anticipated time between cleanings of the settling basin. The 0.2 cubic foot per day applies to lots on steeper slopes that are not cleaned regularly. (A settling basin for a paved lot cleaned irregularly would require a capacity for solids as follows: $0.3 \text{ cu. ft./day} \times 365 = 100 \text{ cu. ft. per } 1000 \text{ lb. animal}$. Assumed once a year cleaning for settling basin.)

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.

Separation of Precipitation. Precipitation which collects on 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 equal to 45 pounds per cubic foot. The picket dam should extend up the ramp to a point where the wastes are first removed.

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.

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.

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.

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.

Protection. If the location creates a safety hazard, the waste storage pond 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 must be used to shield the pond from public view and to improve visual conditions.

Design Considerations - Manure 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).

Manure 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.

Pipes conveying wastes from manure pumps should extend as near to the center of pond as practicable.

Drains used to lower the water table around manure ponds must have gravity outlets.

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.
- 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.