

WASTE TRANSFER

Definition

Installation of components such as conduits, pumps, valves, and other structures to transfer animal waste from buildings and yards to a storage and/or loading area for final disposal.

Scope

This standard establishes the minimum acceptable requirements for design, construction, and operation of waste transfer components. It includes mechanical pumping or elevation differential (gravity head) systems.

Purpose

To convey animal waste through a hopper or reception pit, a pump (if applicable), and a conduit to a waste storage facility or a loading area for final disposal.

Conditions Where Practice Applies

This practice applies where waste is generated by agricultural production or processing, a conveyance system is necessary to transfer waste from the source location to a storage facility and/or a loading area for final disposal and the soils and topography are suitable for construction.

This practice shall not be installed until the 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. Dairy farms supplying grade "A" milk must have transfer and storage component construction plans approved by the Wisconsin Department of Agriculture prior to construction. Regulations published by the Environmental Protection Agency (EPA) 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

Reception pits, hoppers, and gravity drop structures must be: (1) located at least 75 feet (22.8 m) from the nearest well or reservoir; (2) be liquid-tight; and (3) have floors which are at least 3 feet (.91 m) above bedrock and/or the highest ground water level. The reception pit or hopper shall be located to provide acceptable access for the scraping and cleaning equipment. The design shall consider the safety of humans and animals during construction and operation. Excavation depths near or under building foundations should be the minimum required. Support for the foundation may be necessary to protect the building and workers during construction.

Gravity drop structure for dairy operations

The drop structure is a vertical chute or hopper which guides the manure and liquid waste, if applicable, into a large diameter transfer pipe. The structure shall be constructed of durable, corrosion-resistant material, and be liquid-tight.

Suggested materials are monolithic (formed) reinforced concrete, reinforced concrete pipe or other prefabricated noncorrosive material. The structure must withstand the earth and hydrostatic pressures.

The inlet or loading opening to the drop structure shall be compatible with the cleaning equipment. When manure is scraped with a front-end loader or an alley scraper system a grate to provide the necessary opening for manure flow into the structure shall be provided. The suggested maximum slot width between the grate cross-bars shall be 6 inches (15 cm). The minimum suggested area of the grate is 9 square feet (7.5 m²) with one minimum dimension of 4 feet (1.2 m). The grate shall support the anticipated loads.

A cover that will support the anticipated live and dead loads and provide safety for animals and/or humans shall be provided for the drop structure. Permanent barriers such as gates, fences, etc., may be installed in lieu of a cover if such barriers insure adequate safety for human and animal traffic.

A concrete curb which is a minimum of 12 inches (0.3 m) high and 5 inches (12.7 cm) wide or a plank which is 12 inches high is suggested across from the loading side of the grate to insure total manure flow into the drop structure when applicable. These curbs must be adequately anchored to the barn floor or the drop structure.

The drop structure inlet shall be a minimum of 4 feet (1.2 m) above the top elevation of the storage when the pipe length is 100 feet (30.5 m) or less. Six feet (1.8 m) or more of elevation difference is suggested. The structure inlet shall be a minimum of 4 feet (1.2 m) above the top of the transfer pipe.

The volume of the drop structure above the maximum design storage elevation shall be at least one-half the anticipated daily volume of manure.

The outlet of the drop structure shall be constructed to minimize the head loss at the inlet of the transfer pipe. The floor of the structure shall slope in the direction of the outlet. A minimum slope of 30 percent (approximately 1 vertical to 3 horizontal) is suggested. Fillets to reduce sharp corners and significant head losses at the pipe inlet are recommended.

Gravity system transfer pipe

The transfer pipe is a conduit used to transfer manure and liquid waste by gravity from the source to a waste storage facility. Pipe installed more than 25 feet (7.6m) but less than 250 feet (76.2m) from a well or reservoir and must meet or exceed the requirements of one of the following standard specifications:

- (a) AWWA C-200, C-300 or C-400.
- (b) ASTM D3033, D3034, or F679.

All pipe must have watertight couplings. Rubber or neoprene O-ring gaskets are required for PVC, steel (with bell and spigot ends) and concrete pipe. Steel pipe may be welded. Gaskets for asbestos cement pipe shall be the gaskets provided by the manufacturer of the pipe.

Pipe installed more than 250 feet (76.2m) from a well or reservoir and more than 3 feet (0.9m) above bedrock and the highest ground water level may be of lesser quality than stated above. Watertight couplings are suggested.

All pipe must withstand the earth, live-load, and dead-load pressures. The minimum earth cover over the pipe shall be 4 feet (1.2 m). The minimum internal pressure rating of the pipe shall be five times the maximum anticipated head.

The maximum length of pipe shall be 150 feet (45.7m) for bedded manure and 200 feet (61.0m) for manure with no bedding.

The pipe shall not have curves or bends except minor deflections in the pipe joints. The pipe outlet invert elevation shall be at or above the storage bottom elevation. The outlet end shall have a sufficient cover of manure to prevent freezing during cold weather. The end section of pipe shall be sufficiently anchored to prevent movement of the section into the pond. Special design of deadman anchors may be required.

Scraping of frozen or dried manure into gravity systems is not recommended.

The minimum pipe diameters for dairy operation wastes shall be:

| Minimum head 1/ (ft) (m) | Amount of bedding 2/ (lb/day/hd) (Kg/day/hd) | Pipe diameter 3/ | | | |
|-----------------------------|---|---------------------------------|--------|-----------|--------|
| | | Concrete Steel (smooth wall) | | PVC AC | |
| | | (in) | (cm) | (in) | (cm) |
| 4 (1.2) | none | 24 | (61.0) | 18 | (45.7) |
| | 2-3 (0.9-1.4) | 30 | (76.2) | 24 | (61.0) |
| 6 (1.8) | none | 21 | (53.3) | 15 | (38.1) |
| | 2-3 (0.9-1.4) | 27 | (68.6) | 21 | (53.3) |

1/ Head equals the elevation difference from the hopper inlet to the top elevation of the storage.

2/ Two to three pounds (0.9-1.4 kg per day per head) of chopped or short hay or straw is the maximum amount of bedding recommended. Long hay or straw bedding does not flow well. Heavy material such as sand is not permissible.

3/ These minimum diameters are for pipe lengths of 100 feet (30.5m) or less. For lengths greater than 100 feet (30.5m) increase the head by 3 feet (0.9m) or the diameter by 6 inches (15.2cm) for each additional 50 feet (15.2m) of length.

The minimum transfer pipe diameter for swine wastes shall be 6 inches (15.2 cm) for pipe slopes of 1.0 percent or more and 10 inches (25.4 cm) for pipe slopes from 0.5 percent to 1.0 percent.

Gravity system outlet pipe

The outlet pipe is a conduit used to convey manure from the storage facility to a spreader or unit for final disposal.

The outlet pipe must be welded steel pipe. The minimum diameter shall be 16 inches (40.6cm). The minimum head difference (bottom of storage to invert of outlet end) shall be 4 feet (1.2m).

The bottom of the pond should be sloped a minimum of 2 percent toward the inlet of the pipe. An additional depression of 1 foot at the inlet is also suggested.

The outlet pipe shall have a minimum slope of 4 percent. Two shut-off valves shall be installed on the pipe; one at the outlet end and one which is located below the frost line and between the outlet end and the storage facility. The valves shall be operated by different power sources (i.e. one manual and one hydraulic; one hydraulic operated by electric motor and one hydraulic operated by tractor). The valves must be dual acting (capable of applying pressure in both directions).

The end section of the outlet pipe shall be designed to support the anticipated horizontal and vertical loadings. The outlet end of the pipe shall be at least 8 feet (2.4m) above the loading platform. The loading platform must support the anticipated spreading equipment.

Manure pumps

The pump provides mechanical energy to move manure through a transfer pipe to a storage facility. The hopper or pit size and dimensions for the pump installation shall be as recommended by the pump manufacturer. The outlet from the pump shall provide a smooth transition to the transfer pipe.

Manure pump transfer pipe

Pipe used to transfer manure from a pump to a reception pit or waste storage facility must be installed at least 25 feet (7.6 m) from a well or reservoir. All pipe must have water tight couplings.

For installations which are 25 to 50 feet (7.6-15.2 m) from a well or reservoir, the pipe must meet or exceed both of the following:

- (a) Requirements of the Department of Natural Resources Administrative Code, Chapter NR 112.07(2)(e).
- (b) Pump manufacturer's recommendations.

Pipe installed more than 50 feet (15.2 m) from a well or reservoir shall meet or exceed both of the following:

- (a) ASTM D 3033 or ASTM D 3034.
- (b) Pump manufacturer's recommendation.

Establishing Vegetation

Seedbed preparation, seeding, fertilizing, and mulching shall be as stated in the standard for Critical Area Planting (342) in the Wisconsin Technical Guide.

Operation and Maintenance

The protective cover or barrier for the hopper or drop structure inlet shall be maintained to provide safety for animal and human traffic. The cover or barrier shall be replaced immediately after each cleaning.

Shields and other safety features installed on manure pumps shall be maintained.

Care shall be exercised by equipment operators when loading the transfer system and unloading the storage structure to prevent damage to the system. Any damage to the system should be repaired as soon as practicable.

Construction Drawings and Specifications

Plans and specifications for waste transfer systems shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Design Documentation Requirements

Location map, volumes of manure and bedding, structural loadings (live and dead loads), drop structure dimensions, pipe diameter and length, seeding requirements.

Construction (As-Built) and/or Certification Documentation Requirements

Drop structure dimensions, conduit parameters (manufacturer, applicable specification, diameter, length and slope), brand and model of pump when applicable.

SPECIFICATIONS GUIDE

Construction of the waste transfer system shall be according to the following Wisconsin Construction Specifications as applicable:

| <u>Number</u> | <u>Title</u> |
|---------------|--|
| 1. | Clearing |
| 2. | Excavation |
| 3. | Earth Fill |
| 4 or 4A | Concrete |
| 5. | Reinforced Concrete Pressure Pipe Spillway Conduits (Section 7 - Placing Concrete; Section 8 - Laying the Pipe) |
| 7. | Concrete, Clay and Asbestos Cement Pipe Conduits (Section 4 - Laying and Bedding; Section 5 - Joining Bell and Spigot Pipe; a. & b. Rubber gasket sealed joint; Section 7 - Joining Asbestos Cement Pipe) |
| 11. | Fertilizing, Seeding & Mulching, & Sodding |