

SOIL CONSERVATION SERVICE

WASTE TRANSFER (NO.)

Definition

Installation of components such as conduits, pumps, valves, and other structures or devices 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 system 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 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 loading area for final disposal and the soils and topography are suitable for construction of the system or facility.

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

Design CriteriaLocation

Reception pits, hoppers, manure pumps, and gravity drop structures located within 75-100 feet (22.8-30.5 m) from a potable water well or reservoir shall have floors which are at least 3 feet (.91 m) above bedrock and/or the highest ground water level. The structures must be liquid tight.

For the purpose of this standard, "floors" shall be defined as the lowest point at which manure is stored, agitated, or pumped in the named structures, including manure pumps.

All concrete structures, including those which provide a work area around piston pumps, shall be designed to withstand the anticipated static and dynamic loadings. They shall be liquid-tight. Liquid-tight concrete can be obtained by

using a minimum of 5-1/2 bags of Portland cement per cubic yard, a maximum of 6 gallons of water (includes moisture in the aggregate) per sack of cement and a minimum steel reinforcement of 6" x 6", 10-gage welded wire fabric unless design loadings require heavier gage fabric or reinforcing bars. The minimum thickness shall be 5 inches. Openings in the concrete for appurtenances, pipe, etc. shall be sealed by packing a neat cement-mortar mix between the appurtenance and the concrete wall.

Reception pits, hoppers, manure pumps, and gravity drop structures more than 100 feet from a potable water well or reservoir shall have floors at least 0.5 foot above bedrock and/or the highest ground water level and shall be liquid tight.

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

The drop structure is a vertical chute or hopper which conveys 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 anticipated earth and hydrostatic loadings.

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 at least one dimension no smaller than 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 wooden curb which is 12 inches (nominal or actual) 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 highest elevation of the storage unit when the pipe length is 100 feet (30.5 m) or less. Six feet (1.8 m) or more of elevation difference is preferred. 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 must be installed more than 25 feet (7.6m) from a well or reservoir and more than 1 foot (.3 m) above bedrock and/or ground water. It must meet or exceed the requirements of the applicable standard specifications as follows:

<u>Pipe material</u>	<u>Specification</u>
Polyvinyl Chloride (PVC)	ASTM D 3033, ASTM D 3034, or ASTM F 679
Concrete	ASTM C 76
Steel	ASTM A 53, ASTM A 134, ASTM A 135, or ASTM A 139
Asbestos Cement (AC)	ASTM C 428

All pipe must have watertight couplings. Elastomeric seals or gaskets are required for PVC, steel (with bell and spigot ends) and concrete pipe. Gaskets shall be the type recommended by the manufacturer of the pipe. Steel pipe may be welded.

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. Deadman anchors of special design may be required.

The minimum pipe diameters for dairy operation wastes shall be:

Minimum head 1/ (ft) (m)	Weight of bedding (per hd/per day)2/ (lb) (Kg)		Pipe diameter 3/ Concrete or Steel (smooth wall)				PVC or AC	
	(in)	(cm)	(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 highest elevation of the storage unit.

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.

Swine waste gravity transfer pipe

The minimum diameter pipe for "flush-type" systems shall be 6 inches (15.2 cm) for pipe slopes of 1.0 percent or greater, or 10 inches in diameter for pipe slopes from 0.5 percent to 1.0 percent. The minimum diameter pipe for "scraper-type" systems and pipe to transfer scrapings from outdoor pens shall be 12 inches.

Gravity system outlet pipe

The outlet pipe is a conduit used to convey manure from the storage facility to a spreader or hauling 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 independent power sources (i.e. one manual and one hydraulic; or one hydraulic operated by electric motor and one hydraulic operated by tractor). The system used to operate the valves shall be capable of applying pressure for both opening and closing the valve.

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 high enough to load the hauling equipment but in no case shall it be less than 8 feet (2.4m) above the loading platform. The loading platform must support the anticipated hauling 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 watertight couplings.

The pipe must meet or exceed the applicable specification and pressure rating listed in table 1 for distances from a well or reservoir and bedrock and/or highest ground water level.

TABLE 1 - MINIMUM PIPE QUALITY FOR VARIOUS SEPARATION DISTANCES TO WELLS, BEDROCK, AND GROUNDWATER

Distance from		Pipe Material	Minimum Pressure Rating (psi)	Specification
Well (ft)	Bedrock or Ground Water (ft)			
25-50'	Greater than 0.5	PVC	200	ASTM D 2241
		All Other	200	<u>1/</u>
50-100'	0.5'-3'	PVC	125	ASTM D 2241
	Greater than 3'	All Other	80	<u>1/</u>
Greater than 100'	0.5'-3'	PVC	80	Soil Conservation Service Std. 430-DD ^{2/}
	Greater than 3'	All Other	-	<u>1/</u>
		PVC		SCS Std. 430-DD ^{2/}
		All other		<u>1/</u>
		PVC		ASTM D 3033 or D 3034 (Max. SDR=35)
		All other		Sewer Pipe <u>1/</u>

1/ Applicable ASTM or AWWA standard for specific material

2/ National Handbook of Conservation Practices

All pipe installations must meet or exceed the pump manufacturer's recommendations. All joints in the pipe must be made watertight by using solvent-cement or elastomeric methods. The manufacturer's recommendations for sealing the joints must be followed. Elbows or bends in the pipe alignment greater than 5 degrees shall be supported by thrust blocks.

Establishing Vegetation

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

Frozen, or dried manure can cause plugging of the transfer system. Frozen manure should be piled or stacked until thawed before loading into the transfer system. Dried manure should have water added or be mixed with sloppy manure before loading into the system.

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 practical.

Construction Drawings and Specifications

Plans and specifications for waste transfer systems shall be in accordance 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, soil investigation logs, 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