

## CONSERVATION PRACTICE STANDARD

### MANURE TRANSFER

(Each)

CODE 634

#### DEFINITION

A manure conveyance system using structures, conduits, or equipment.

#### PURPOSE

To transfer animal manure (bedding material, spilled feed, process and wash water, and other residues associated with animal production may be included) through a hopper or reception pit, a pump or other dosing device(if applicable), or conduit to:

- A manure storage/treatment facility,
- A loading area, and
- Agricultural land for final utilization.

#### CONDITIONS WHERE PRACTICE APPLIES

The manure transfer component is a part of a planned manure management or comprehensive nutrient management system.

Where manure is generated by livestock production or processing, and a conveyance system is necessary to transfer manure from the source to a storage/treatment facility and/or a loading area, and/or from storage/treatment to an area for utilization. This includes manure from one geographical area with excess manure to a geographical area that can utilize the manure in an acceptable manner.

This practice does not include land application or other use of manure. Criteria for land application of manure are included in standard Nutrient Management, PA590 or Waste Utilization, PA633.

#### CRITERIA

##### General Criteria Applicable to All Purposes

**Regulations.** Manure transfer components shall comply with all federal, state, and local laws, rules and regulations.

**Location.** Reception pits, hoppers, manure pumps, gravity drop structures, and gravity flow conduits shall be located away from a potable water well, spring or reservoir wherever possible. New livestock facilities shall be set back a minimum of 100 feet from wells or springs. All transfer components shall be installed a minimum of one foot above bedrock and the seasonal high water table unless the water table is lowered or the transfer component is designed to withstand the external hydrostatic pressures. The design shall consider the safety of humans and animals during construction and operation. Excavation depths near or under building foundations shall be the minimum required.

**Structures.** All structures, including those that provide a work area around pumps, shall be designed to withstand the anticipated static and dynamic loading. Structures shall be designed to withstand static and dynamic loading in accordance with standard Waste Storage Facility, PA313. All structures and components that contain or convey manure or wastewater shall be liquid tight.

Openings to structures to receive manure from alley scrape collection shall be a minimum of 9 square feet with one dimension no smaller than 4 feet. The opening shall be equipped with a grate designed to support the anticipated loads. Grate openings where safety is a concern shall not be more than 6 inches in one direction.

When curbs are needed in conjunction with structures, they shall be constructed of either

concrete or wood. Curbs shall be of sufficient height to ensure manure flows into the structure and be adequately reinforced and anchored.

**Reception Pits.** A reception pit is a temporary storage facility that will store manure for 1 to 28 days. The manure in a reception pit is generally transferred to the storage facility by means pumps or dosing valves to gravity systems.

For reception pits collecting runoff, the reception pit shall be sized to also contain at least the volume of runoff from the 25-year, 24-hour storm. Additional capacity shall be added as needed for freeboard and emergency storage.

Openings in the top or side of a reception pit shall be sized and designed to accommodate both manure loading and unloading pumps and other systems. Covers, grates and other protective devices shall be installed over reception pit openings. Warning signs shall be posted at the reception pit to indicate the potential dangers of toxic gases.

**Gravity Drop Structures.** A gravity drop structure is a vertical chute or hopper, which conveys waste into a large diameter transfer pipe. The structure shall be constructed of durable, corrosion-resistant material, and be liquid tight.

Hoppers shall be sized to contain a minimum of one half of a full day's manure or wastewater production. This volume is to be above the maximum effective storage elevation in the waste storage facility. The inlet or loading opening to the drop structure shall be compatible with the scraping and cleaning equipment width and capacity.

A cover 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 animals. Warning signs shall be posted at the drop structure to indicate the potential dangers of toxic gases.

Where slurry or semi-solid manure is transferred in a gravity system a minimum operating head of 2 feet shall be maintained. For heavily bedded dairy manure 4 feet of head is required on the pipe system. When the manure is liquid the minimum head can be 1 foot.

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 drop structure shall slope in the direction of the outlet to provide a smooth

transition from the drop structure into the conduit. Fillets to reduce sharp corners and significant losses at the pipe inlet are required.

Gravity outlets from main waste storage facilities shall not be used.

**Pipelines.** Design of pipelines shall be in accordance with sound engineering principles considering settling, vibration, load on the pipe, exposure, etc. The minimum pipeline capacity from collection facilities to storage/treatment facilities shall be the maximum peak flow anticipated on a daily basis.

The minimum pipeline capacity from storage/treatment facilities to utilization areas shall ensure the storage/treatment facilities can be emptied within the time limits stated in the management plan for manure utilization.

Pipelines used for transferring waste to an irrigation system shall meet the requirements of standard, Irrigation Water Conveyance, Pipeline, PA430. Elbows or bends in the pipe alignment greater than 5 degrees shall be supported by thrust blocks.

All pipes shall be designed based on the type of material and total solids content, and shall convey the required flow without plugging. Flow velocities shall be sufficient to minimize settling of solids in the pipeline. Pipelines shall be installed with appropriate water tight joints and connection devices to prevent contamination of private or public water supply distribution systems and ground water.

The size, type, strength and pressure rating of pipe and fittings shall meet or exceed the pump manufacturer's recommendations. All pressure pipes and fittings shall have a minimum internal pressure rating two times the maximum operating pressure.

Pipelines shall have a minimum cover of 3 feet or be otherwise protected from freezing and surcharges where anticipated over the pipe.

**Valves.** In all systems where the top of the reception pit or top of the hopper is below the top of the waste storage facility, manually operated valves shall be installed to prevent the reverse flow of manure through the pipe and pump. At a minimum, a valve shall be located immediately outside the waste storage facility. Also, a second valve shall be required near the pump. This shall be in addition to the check valve normally installed as an integral part

of the loading pump and the check valve inside the storage. Valves should be exercised on a regular basis.

**Gravity Transfer Pipes.** The transfer pipe is a conduit used to transfer manure and liquid waste by gravity from the source to a waste storage facility. The pipe must meet or exceed the requirements of the applicable standard specifications listed in the following table:

<u>Pipe Material</u>	<u>Specification</u>
Polyvinyl Chloride (PVC)	ASTM D 3754 ASTM F 679 ASTM D1785 ASTM D3034 ASTM F794
Polyethylene	ASTM F894 ASTM D3035 ASSHTO M252, M294
Steel	ASTM A53, ASTM A134, ASTM A135, ASTM A139

All gravity pipelines must have watertight couplings for the maximum anticipated head in the pipe.

Where needed, vents shall be installed in gravity lines and the top of vented openings shall be above maximum storage elevations.

All pipes must withstand the static and dynamic loads. Pipes shall have a minimum cover of 3 feet or be otherwise protected where surcharges are anticipated over the pipe. Where the soil cover must be less than 3 feet over the pipe, it shall be insulated or otherwise protected from freezing.

The maximum pipe length for manure with chopped hay or saw dust bedding shall be 150 feet. The length of the pipe can be increased to 200 feet between manholes if water is added to the manure at the inlet of the pipe. Chopped hay or sawdust bedding must be kept to a minimum to avoid plugging of the pipe. Gravity flow pipe systems are not recommended for manure with long hay. Gravity flow systems using sand bedding require extreme

design considerations such as elimination of water, extra cleanouts, more drop in pipe outlets and/or pull plug flow systems. Where possible, the gravity pipe shall be installed on five percent slope or flatter. The minimum slope shall be 1 percent. The maximum slope for a gravity pipeline shall be 15 percent. The maximum grade can be exceeded for liquid manure or short distances not exceeding 25 feet. Abrupt changes in grade or alignment with steep gradient pipes may warrant the use of thrust blocks.

Gravity pipelines shall not have horizontal curves or bends, except minor deflections within the limits of the pipe manufacturer's recommendations, or unless special design considerations are used. Other changes in horizontal directions shall be made in drop structures or manholes.

Clean-out access shall be provided for gravity pipelines at a maximum interval of 200 feet for lines carrying non-bedded manure. For pipelines carrying bedded manure the maximum interval shall be 150 feet.

The pipe outlet invert elevation shall be within 2 feet of the bottom of a waste storage facility whenever possible. When this is not possible, the design and/or operation and maintenance plan shall address freezing, drying, and odor issues related to prolonged exposure of the pipe outlet. When using sand or there are other settling concerns the elevation shall be higher. Changes in the pipe grade shall be kept to a minimum. In locations where the pipe grade changes, the pipe shall be vented to prevent an air lock. The end section of the pipe shall be sufficiently anchored to prevent movement of the section into the clay or other such lined storage facility. A headwall or deadman anchors may be required.

For dairy manure, the minimum pipe diameter shall be 24 inches for slurry or semi-solid manure. The smallest diameter for liquid manure shall be 18 inches.

For swine and veal manure with no bedding, a system to prevent the build up of solids shall be used. This can be a flush type system or other system that maintains a minimum velocity of 2 fps in the pipeline. The minimum diameter pipe shall be 6 inches for pipe slopes greater than 1.0 percent, and 10 inches for pipe slopes between 0.5 to 1.0 percent. The minimum pipe diameter for scraper type systems shall be 12 inches

For wastewater including milk house and parlors, the minimum pipe diameter shall be 4 inches for pipe slopes greater than 1.0 percent and 6 inches for pipe slopes between 0.5 and 1.0 percent. A minimum velocity of 2 fps shall be maintained in the pipeline.

**Gravity Outlet Pipes.** The outlet pipe is a conduit used to convey manure from the storage facility to a spreader or other hauling unit for application of manure to the field. Due to the potential hazard and management requirements, gravity outlet pipes shall not be used.

**Pump Outlet Pipelines.** The outlet pipe shall be pressure rated to be compatible with the pump. The outlet pipe shall have a minimum of two gates or valves when there is storage above the valve. The valves must be dual acting and capable of handling pressure in both directions.

The end section of the outlet pipe shall be designed to support the anticipated horizontal and vertical loads. The outlet end of the pipe shall be high enough to load hauling equipment. A loading platform shall be constructed below the outlet and designed to support the anticipated spreading equipment.

**Other Conduits.** Concrete lined ditches shall be designed in accordance with standard PA468 Lined Waterway or Outlet. A minimum design velocity of 1.5 feet per second shall be used.

**Pumps.** Pumps installed for manure transfer shall meet the requirements of Standard PA533 Pumping Plant. Pumps shall be sized to transfer manure at the required system head and volume. Type of pump shall be based on the consistency of the manure, the type of bedding used, and the harsh operating environment. Requirements for pump installations shall be based on manufacturer's recommendations.

**Pump Station.** A pump station is a tank, pump and other appurtenance used to collect milk house, and parlor wastewater, or other wastewater, and transfer it to a storage or treatment facility.

The minimum size tank for dairy operations with milking parlors shall be 1000 gallons. The minimum tank size for pipeline/milkhouse systems shall be 500 gallons. Tanks shall be installed in ground below frost elevation. If a tank cannot be installed in ground, other provisions, such as insulation and

supplementary heat, shall be provided to prevent freezing in the tank. Provisions shall be made to install tanks above the seasonal high water table or designed to withstand buoyant forces. Existing in-place, septic tanks may be used provided they are sound, intact and meet the size requirements of the operation.

A settling tank shall be used ahead of a pump station where solids will be a concern. The capacity of the settling tank shall be a minimum of 500 gallon and be accessible for cleaning.

Pumps and appurtenances shall be designed or selected in accordance to manufacturer's recommendation. Sump pumps shall not be used. Pumps shall be selected based on solids handling capacity and working head. Pumps shall be installed to allow for easy access for maintenance and repair. Transfer pipes shall be installed in ground be below frost elevation. If transfer pipe is installed above ground, the pipe shall be installed so the wastewater left in the pipe after the pump shuts off is allowed to drain freely out of the pipe, unless insulated to prevent freezing. Where possible, above ground transfer pipes shall be installed through barns or other buildings. Above ground pipes should not be directly exposed to cold weather. Backflow from pipelines when pumps shut down shall be included in the storage volume of the pump station tank. Pipelines shall drain sufficiently to prevent back siphoning and freezing.

**Manure Stacker.** The manure stacker is an elevator that transports solid and semi-solid manure and bedding from the barn (e.g. gutter cleaner) to the storage facility. Manure stackers are not designed to handle liquid manure. The stacker shall be installed as recommended by the manufacturer. The discharge end of the manure stacker shall be suspended over the storage facility approximately one-third to one-half the total length of the facility. The support structure for the manure stacker shall be designed and installed in accordance to standard PA313 - Waste Storage Facility and manufacturer's recommendations.

**Push-Off Ramp.** A push-off ramp allows manure to be loaded directly into the manure storage facility or spreader or hauler by means of front end loader or other scraping equipment.

Push off ramps shall be constructed of concrete, masonry, wood, or other durable materials. Push off

ramps shall be design to withstand all anticipated static and dynamic loads in accordance to standard PA313 - Waste Storage Facility. Gates, fences, barriers, and other devices shall be installed to provide safety to humans and animals. Warning signs shall be posted at the pushoff ramp.

**Safety.** The system design shall address the safety of humans and animals during construction and operation.

Open structures shall be provided with covers or barriers such as gates, fences, etc. Ventilation and warning signs shall be provided for manure transfer systems as necessary to warn of the danger of entry and to reduce the risk of explosion, poisoning, or asphyxiation.

Pipelines from enclosed buildings shall be provided with a water-sealed trap and vent or similar devices where necessary to control gas entry into buildings.

Barriers shall be placed on push-off ramps to prevent tractors or other equipment from slipping into waste collection, storage, or treatment facilities.

**Biosecurity.** Manure from diseased animals shall be handled in accordance with the state veterinarians' recommendations.

Equipment leaving the farm shall be sanitized or other measures taken as appropriate to prevent the spread of disease.

#### **Additional Criteria in Support of Agricultural Land for Final Utilization**

**Waste utilization.** Manure shall be applied to the utilization area in amounts, uniformity, rates, and at a time consistent with the requirements of standard PA590 Nutrient Management or standard PA633 Waste Utilization, as appropriate.

Liquid or slurry manure shall be adequately agitated prior to transfer for the purpose of land application both on and off the farm.

**Transfer to Fields.** The transfer of manure or wastewater to fields consists of the pumping from the storage facility or reception pit to the field or wastewater treatment strip or constructed wetland.

Irrigation pumps, conduits, sprinklers, and other appurtenances shall be designed, installed, maintained and operated in accordance with standards PA430 Irrigation Water conveyance, PA442 Irrigation System, Sprinkler, and PA552

Irrigation Regulating Reservoir as applicable to the planned system. PA430 and PA552 shall be followed in designing a system to convey manure or wastewater to a drag hose field application system. Other components not covered by the PA standards shall be designed, installed, maintained and operated according to manufacturer's recommendation.

Transfer of wastewater to a treatment strip or constructed wetland shall be designed in accordance with this standard and PA635 or PA656, as applicable.

#### **CONSIDERATIONS**

Consider economics (including design life), overall manure management system plans, and health and safety factors.

In locating structures, utilize existing topography to the greatest extent possible to generate head on structures and reduce pumping requirements.

Consider the operating space requirements of loading and unloading of equipment in the vicinity of the manure transfer components.

A two-foot earthen berm may be installed around the loading platform to contain any manure spilled during normal unloading operations. A pipe with a shut off valve shall be installed through the berm as an outlet.

Consider the subsurface conditions, i.e., depth to bedrock, water table, etc., when locating and designing structures.

When applicable and compatible, consider the joint use of manure transfer pipelines with irrigation system design requirements.

The pipe pressure rating required may need adjustment based on manure temperature.

Consider corrosion resistance and water tightness in the selection of pipe material and joints.

Consider the potential for deposits of solids to accumulate in pipes or their outlets.

Consider the need for appropriate check valves, anti-siphon protection and open air breaks in all pipelines.

Provisions should be made for removing solids from conveyance conduits such as concrete lined ditches, etc

### **PLANS AND SPECIFICATIONS**

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

### **OPERATION AND MAINTENANCE**

A site specific Operation and Maintenance (O&M) Plan must be prepared and reviewed with the landowner or operator responsible for the application of this practice. The O&M Plan shall provide specific instructions for proper operation and maintenance of each component of this practice and shall detail the level of repairs needed to maintain the effectiveness and useful life of the practice.

The plan shall include contingency or emergency procedures to be followed in the event of accidental spill, seepage, or unforeseen circumstances. A copy of the O&M Plan shall be immediately available at all times.

The O&M Plan shall describe what actions will be taken to minimize flies and other insects during the transfer of manure.

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.

Heavily bedded, frozen or dried manure can cause plugging of the transfer system. Frozen manure should be piled or stacked until thawed before loading into transfer system.

Irrigation pipelines used for transferring manure should be flushed with clean water after use.

Consider flushing pipelines once per year drawing the storage down completely at least every two years.

Shields and other safety devices on gutter cleaners, manure pumps, and other equipment shall be maintained.

Equipment operators should exercise care 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. The landowner should train all persons involved in the operation of the gravity outlet system. All control valves shall be closed at the end of each day.

Consider alarms when over flows could cause water quality impairment.

Valves should be operated regularly.

Operation and maintenance manuals for pumps and other such equipment should be provided to the operator and be included in the O&M Plan.