CONSERVATION PRACTICE STANDARD

WASTE TRANSFER

(Each)

CODE 634

DEFINITION

A system using structures, pipes or conduits installed to convey wastes or waste byproducts from the agricultural production site to storage/treatment or application.

PURPOSE

To transfer agricultural waste material associated with production, processing, and harvesting to:

- a storage facility,
- a treatment facility,
- a handling or loading area,
- agricultural land for agronomic application.

CONDITIONS WHERE PRACTICE APPLIES

The waste transfer system is included as an element of the agricultural production area, storage/treatment facility and/or land application areas of the agricultural operation.

The practice applies where it is necessary to transfer waste material generated by livestock production or agricultural product processing from:

- the generation site to the application area,
- the generation site to a storage/treatment facility,
- the storage/treatment facility to land for agronomic application.

This practice does not apply to hauling waste material with equipment or vehicles.

CRITERIA

General Criteria Applicable to All Purposes

Permits. Notify landowner and/or contractor of responsibility to locate all buried utilities in the project area, including drainage tile and other structural measures. The landowner is also required to obtain all necessary permits for project installation prior to construction.

Structures. Structures including concrete pits, tanks, hoppers, manholes, and channels used for waste transfer, prefabricated or cast in place, must meet the criteria in NRCS Conservation Practice Standard *Waste Storage Facility (PA313)* for liquid tightness and structural strength, regardless of materials used for construction. Covers, when needed, shall be designed to support the anticipated dead and live loads.

Design all structures, including those that provide a work area around pumps to withstand the design static and dynamic loading. Design structures to withstand earth and hydrostatic loading as specified for comparable structural criteria in *Waste Storage Facility (PA313)*.

Investigate the subsurface conditions (i.e., depth to bedrock, soil classification, water table, etc.) when locating and designing structures.

Design floor openings with structures that receive manure from alley scrape collection, with a minimum of 9 square feet, having one dimension of that opening 4 feet or larger. Equip floor grate with openings wide enough to pass the waste and engineered to support the anticipated live loads. Provide safety features to prevent accidental entry to the waste reception pit. Grate openings where safety is a concern shall not be more than 6 inches in one direction.

Construct curbs in conjunction with structures that

meet the purpose of this standard and design criteria in *Waste Storage Facility (PA313)*. Design curbs to be anchored to withstand working loads. Construct curbs of either concrete or wood and shall be adequately reinforced and anchored.

Use the *Roofs and Covers (PA367)* to design covers where needed for structures.

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

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 of pumps or dosing valves to gravity systems.

Size reception pits (areas established to temporarily accumulate effluent flow) to contain a minimum volume of one full day's waste production where appropriate. 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 and designed to support the anticipated loads. 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 unless an alternative design is approved by the design engineer. Additional storage shall be added for heavily bedded manure that may encounter delay in traveling through the pipe. 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/Conduits-General. Design transfer pipeline/conduits in accordance with sound engineering principles, taking into account the waste material properties, management operations, pipe exposure, static and dynamic loads on the pipe, working pressure, transfer system pressure rating, required capacity and all applicable design factors. Pipe pressure rating required may need adjustment based on effluent temperatures and consistency.

Use water tight or sewer grade pipelines and connection devices for waste transfer pipelines. The type of liquid waste material and total solids content will determine the transfer pipe designs to convey the required flow without plugging.

The minimum pipeline/conduit design capacity from collection facilities to a storage/treatment facility is the maximum anticipated peak flow.

Design the pipeline capacity from the storage/treatment facility to the land application area, to empty the facility within the time as outlined in *Nutrient Management (PA590)* or a Comprehensive Nutrient Management Plan (CNMP).

Protect pipes exposed to sunlight from ultraviolet radiation by selecting UV resistant pipe materials or

by painting the pipe exterior to withstand UV damage throughout the intended life of the pipe.

Install pipe properly at all locations to accommodate any traffic crossing, farming operations, frost depth, subsurface saturation, or bedrock elevations. Protect pipe from uplift if subjected to hydrostatic forces. Separate pipe installed near bedrock with at least 6 inches of bedding. Excavation of bedrock is acceptable to provide bedding depth.

Maintain the integrity of a wall or liner at pipe penetrations of waste storage structures, reception tanks, and channels. The section of pipe that penetrates the liner of a waste storage facility surface will have a minimum length of 10 feet and will be supported with a cast-in-place concrete restraint or equal support system as per the design engineer. Provide joint restraints within 25' of the manure storage, where appropriate, considering change in alignments, changes in elevations, waste velocity, and earth fill conditions. Other appropriate means of support shall be provided for pipes penetrating concrete walls.

Protect storage structure liners from hydrostatic pressures that may be caused by preferential flow paths along installed pipe.

If cold weather pipeline operation is planned, design transfer pipe to be: insulated, heated, buried below anticipated frost depth, constructed of freeze resistant material, or installed such that it can be drained after each use by gravity or compressed air. Install pipelines with appropriate backflow prevention devices to prevent return siphoning of waste.

Install air vents and vacuum relief valves where necessary to eliminate air locks, as well as to protect the pipe against negative pressures.

Pipelines-Pressure. Select pipe and appurtenance material that meets the design working pressure criteria of the system which also includes air and water pressures used to clear the pipe.

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. Where applicable, in order to minimize settling of solids in the pipeline, design velocities shall be between 3 to 5 feet per second. Pipelines shall be installed with appropriate water tight joints and connection devices to prevent contamination of private or public water supply distribution systems and groundwater.

Fluid velocities in a buried or secured pipelines may exceed 5 feet per second only if the pipeline is installed without gates or valves, and discharges freely to a tank or pond.

The 3 feet per second lower limit does not apply to a system that is powered by a pump such as a ram plunger or piston type pump that operates by pushing semi-solid waste material in a periodic stroke cycle.

The size, type, strength and pressure rating of pipe and fittings shall meet or exceed the pump manufacturer's recommendations or static head conditions. As a safety factor against surge, the working pressure at any point should not exceed 72 percent of the pressure rating of the pipe.

Provide thrust control designed in accordance with National Engineering Handbook (NEH) Part 636, Chapter 52 for all buried pressure pipe 4 inches and larger in diameter and all angled fittings and valves.

Install a check valve near the outlet of each pump except where backflow is incorporated into the design.

Provide a pressure relief valve near the pump(s) to protect the pipe against any pump shut-off head due to a blockage (unless the pump shut-off head is less than the working pressure of the transfer system) where appropriate.

Provide a pressure relief valve or properly sized water hammer arrestor on the pressure side of shut-off valves to protect against water hammer due to the sudden closing of a valve where appropriate.

Size pressure relief valves to be no smaller than ¼-inch for each inch of the pipe diameter. Set pressure relief valves to open at a pressure no greater than 5 psi above the transfer system working pressure.

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:

	Specification
Polyvinyl Chloride (PVC)	ASTM F 679 ASTM D1785 ASTM D3034 ASTM F794 ASTM D2241, SDR ≤ 32.5
Fiberglass	ASTM D 3754
Polyethylene (PE)	ASTM F894, F2648 ASTM D3035 ASSHTO M252, M294
Polypropylene (PP)	ASTM F2736
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 unless an alternative design is approved by the design engineer.

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 dead-man 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. The smallest diameter for flush systems shall be 12 inches. Discharge pipes from manure separators shall meet the manufacturer's recommendations.

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.

In a gravity flow design that transfers diluted sand laden manure, account for the process of sand settling out of the waste stream. The minimum gravity pipe flow velocity for diluted sand laden manure is 5 feet per second.

Other Conduits. The minimum design velocity for waste transfer in open ditches and channels is 1.5 feet per second.

A reinforced cast-in-place concrete lined ditch or channel for waste transfer will have a minimum concrete thickness of 5 inches.

Concrete used for conduits must be proportioned so that it is plastic enough for thorough consolidation and stiff enough to stay in place. A dense durable product is required.

Contraction joints in a concrete conduit, if required, must be formed transversely to a depth of about one-third the thickness of the lining at a uniform spacing in the range of 8 to 15 feet. Provide steel reinforcement or other uniform support to the joint to prevent unequal settlement.

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.

Pumps. Pumps installed for waste transfer shall meet the requirements of *Pumping Plant (PA533)*. 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 installation shall be based on manufacturer's recommendations.

Correct the total dynamic head for viscosity and specific gravity of the liquid waste used in pump selection. Reference AWMFH, Chapter 11, Waste Utilization, for increased friction losses caused by higher fluid viscosity and Chapter 12, Waste Management Equipment, for pump selection guidance.

Solid/Liquid Waste Separation. Use *Waste Separation Facility (PA632)* to design a filtration or screening device, settling tank, settling basin, or settling channel to separate a portion of the solids from the manure or liquid waste stream, as needed.

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 or as approved by the design engineer. The minimum tank size for pipeline/milk house systems shall be 500 gallons or as approved by the design engineer. 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 only be used for clean water with no solids. Sewage rated transfer pumps or equal (grinder pumps, chopper pumps) shall be used with liquids containing manure solids. 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 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 *Waste Storage Facility (PA313)* 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 *Waste Storage Facility (PA313).* Gates, fences, barriers, and other devices shall be installed to provide safety to humans and animals. Warning signs shall be posted at the push-off ramp.

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

Gypsum bedding, silage leachate, and other waste components containing high amounts of sulfur can produce excessive amounts of manure gases. These materials in combination with small reception pits/covered spaces can create dangerous manure gas situations unless the sulfur is restricted, special design techniques used, or safety precautions provided for these waste transfer elements.

Open structures shall be provided with covers or barriers such as gates, fences, etc.

Ventilation shall be provided for enclosed waste transfer systems as necessary.

Fencing components shall meet the requirements of *Fence (PA382).*

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.

Provide warning signs as necessary to warn of the danger of entry and to reduce the risk of confined spaces, agitation hazards, explosion, poisoning, or asphyxiation possible with the waste transfer system.

Identify pipes at risk to being damaged by equipment or livestock by placing fences or markers along the pipeline.

Barriers shall be placed on push-off ramps to prevent equipment, animals, and people from falling into waste collection, storage, or treatment facilities.

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

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 *Irrigation Pipeline (PA430)*, *Sprinkler System (PA442)*, and *Irrigation Regulating Reservoir (PA552)* 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 *Vegetated Treatment Area (PA635)* or *Constructed* Wetland *(PA656)*, as applicable.

Additional Criteria for Managing Silage Leachate and Runoff

Use low-flow collection devices, dilution, storage, or other acceptable methods to control fermentation leachate and runoff flow from the feed storage areas.

Follow the PA Design Guide 10, Design Guidelines for Silage Leachate and Runoff.

Refer to the Pennsylvania NRCS conservation practice standards for *Waste Storage Facility (PA313)* and *Storm Water Runoff Control (570)*. For sensitive sites refer to *Vegetated Treatment Area (PA635)*, *Waste Treatment (PA629)*, or a *Constructed Wetland (PA656)* for alternative options.

CONSIDERATIONS

General

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

Consider the timing and location of agitation and transfer activities to minimize odor formation and transport and to minimize the breeding of insects within the material.

When sand/lime is used as bedding material consider a system that allows access for cleanout and unplugging. The operator should be presented with potential risks, costs of more frequent cleanouts, and equipment O&M.

Consider covering and/or minimizing the amount or number of times the material is disturbed to reduce the likelihood of air emissions formation and release of particulate matter, volatile organic compounds, methane, and ammonia.

Consider abandonment, relocation, or additional flood proofing for *existing reception structures* located in flood prone areas. For additional information on flood proofing structures, see "Flood proofing Non-

Residential Structures," FEMA 102, May 1986, Federal Emergency Management Agency.

On Farm Transfer

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 waste 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 waste transfer pipelines with irrigation system design requirements.

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

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.

Consider installation of permanent above-ground or buried pipe to replace hoses and temporary pipe that is used on a regular basis to transfer waste.

Consider potential loss of loss of pipe integrity due to internal erosion by the materials being transported for a flow velocity exceeding 6 feet per second.

Consider designing the maximum flow area of a gravity pipe, for a flume system with dilute manure, at 50% of the pipe depth to maintain the scouring effect of the flow.

Positive displacement pumps should be considered for liquid waste with total solids exceeding 8%.

Consider increasing the total dynamic head up to 30% for pumping manure slurries with 3-8% total solids (wet basis).

Consider the use of a wet sump and agitation pump to reduce solids separation within the gravity reception structure.

Consider pump selection with a low RPM for manure slurries which contain abrasives such as sand.

Consider a semi-open impeller pump to handle manure slurry with straw, twine, hair and sludge. Pumps with cutting knives and re-circulation agitation capacity also reduce plugging.

Consider installing a clean-out or vent riser within 10 feet of the reception structure on gravity transfer systems in order to reduce the risk of air lock in the pipe.

Consider installing a locator wire in the trench with transfer pipelines.

Chemistry of waste material may need consideration for corrosion resistance and water tightness in the selection of pipe material and joints.

Consider the potential for struvite phosphate (magnesium ammonium phosphate), mineral deposition in smaller diameter pipes. Preventative measures may be needed, such as acid washing the pipe to prevent deposits.

Consider the need for additional check valves, clean-outs, vent risers, knife valves, anti-siphon protection, vacuum relief valves and open air breaks, as appropriate, on all transfer pipe systems.

Consider the use of leak detection methods and equipment for monitoring and periodic pressure testing of waste transfer systems installed in sensitive areas, having large daily flow volumes, long flow lengths or high flow pressures.

Consider installing a manually operated shut off valve for isolation purposes for gravity discharge pipe used for transferring waste from one structure to another.

Consider posting a warning sign on all risers indicating the transfer system pressure rating.

Silage Leachate and Runoff

Consider using additional conservation practices to impede seepage from silage bags from reaching nearby sensitive areas. Select appropriate locations for silage bags. Locate silage bags to avoid ponding of surface water. Regularly remove waste feed from silage bag staging areas.

PLANS AND SPECIFICATIONS

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

Pipeline construction and installation specifications may be taken from the National Engineering Handbook sections listed in the References.

NRCS acceptance requires the installer to performance testing on all components of the waste transfer system. Include the results in the as-built documentation as appropriate.

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.

Evaluate the overall functionality of the waste transfer system for possible malfunctions that could lead to a spill or release of waste material. Address the identified potential failures in the inspection procedures of the operation and maintenance plan. Prepare an emergency response plan to be implemented in the event of such a failure as a part of the O&M Plan**.**

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 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 and 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.

Loading areas for the manure should be capable of containing spills or directing spills back into the storage.

Hauling and spreading equipment should be calibrated on a regular basis.

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 or by the product supplier.

Silage Leachate

For silage leachate and runoff control sites the O&M plan shall be developed consistent with the purposes of the practice, intended life of the components, safety requirements, and the criteria for the design. At a minimum, the plan shall include:

- Handling and disposal practices for waste feed.
- Handling and disposal practices for snow associated with the feed storage area.
- Frequency for cleaning the floor of accumulated feed.
- Intervals for removing accumulated solids from the system components.
- Proper treatment and disposal practices for leachate and contaminated runoff.
- Schedule of inspections.

REFERENCES:

NRCS National Engineering Handbook, Title 210, Part 651, Agricultural Waste Management Field Handbook, Chapter 10, Agricultural Waste Management System Component Design.

NRCS National Engineering Handbook, Title 210, Part 651, Agricultural Waste Management Field Handbook, Chapter 11, Waste Utilization

NRCS National Engineering Handbook, Title 210, Part 651, Agricultural Waste Management Field Handbook, Chapter 12, Waste Management Equipment

NRCS National Engineering Manual, Title 210, Part 536.20, Design Criteria for Reinforced Concrete

NRCS National Engineering Handbook Title 210, Part 642, Chapter 2, National Standard Construction Specifications