

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

WASTE TRANSFER

(Number)

CODE 634

DEFINITION

A system using structures, conduits or equipment to convey byproducts (wastes) from agricultural operations to points of usage.

PURPOSE

To transfer agricultural material associated with production, processing, and/or harvesting through a hopper or reception pit, a pump (if applicable), a conduit, and/or hauling equipment to:

- a storage/treatment facility,
- a loading area, and/or
- agricultural land for final utilization as a resource.

CONDITIONS WHERE PRACTICE APPLIES

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

Material generated by livestock production or agricultural product processing and a conveyance system is necessary to transfer the byproducts 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 hauling nutrients from one geographical area with excess nutrients to a geographical area that can utilize the nutrients in an acceptable manner.

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, gravity drop structures, manure pumps, and conduits should be located a minimum of 100 feet from a potable water well, spring or reservoir and installed a minimum of one foot above bedrock and seasonal high water table. The design shall consider the safety of humans and animals during construction and operation. Excavation near or under building foundations may require shoring and support to protect the building and workers during construction.

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 earth and hydrostatic loading in accordance with practice standard Waste Storage Facility, Code 313. Covers, when needed, shall be designed to support the anticipated dead and live loads.

Reception Pits. A reception pit is a temporary storage facility that will store manure for 3 to 14 days. The manure in a reception pit is generally transferred to the storage facility by means of PTO or electric pump.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service [State Office](#) or visit the [electronic Field Office Technical Guide](#).

Reception pits shall be sized to contain a minimum of **three** full day's production. For reception pits receiving runoff, sufficient storage shall be provided to also contain the volume of runoff from the 25-year, 24-hour storm plus any required freeboard and emergency storage.

Openings to structures to receive material 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.

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 all materials flow into the structure and shall be adequately anchored.

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. Pre-cast concrete structures shall comply with ASTM C-478 Precast Reinforce Concrete Manhole Sections.

The size of the gravity drop structure shall be based upon the type of collection system used to collect the manure from the barn, how frequently the manure is collected, and the anticipated consistency of the manure. The gravity drop structure shall have a minimum storage capacity as shown in Table 1. Where the depth used in the storage calculation is from the top of the drop structure to the maximum operating elevation of the waste storage facility (top minus freeboard).

Table 1 – Gravity Drop Structure Capacity

Housing Type	Days Storage
Stanchion Barn	1
Freestall Barn	1/2

When manure is scraped by front-end loader or alley scrapers, a grate shall be provided with the necessary opening for manure flow into the structure shall be provided.

Permanent barriers such as covers gates, fences, etc. shall be installed to ensure adequate safety for human and livestock traffic. Warning signs shall be posted at the drop structure to indicate the potential dangers of toxic gases.

Curbing, which is at least 12 inches high, shall be installed across from the loading side of the grate to ensure total manure flow into the drop structure. The curbing must be adequately anchored and designed against over turning forces by the scraping equipment. The drop structure inlet shall be flush with or slightly lower than the barn floor level.

The outlet of the drop structure shall be shaped 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 recommended.

The drop structure should be located in the building or enclosed to minimize freezing and drying problems. The area around the drop structure may have to be heated during cold weather to prevent manure from freezing.

Pipelines. Design of pipelines shall be in accordance with sound engineering principles considering the waste material properties, management operations, exposure, etc. The minimum pipeline capacity from collection facilities to storage/treatment facilities shall be the maximum peak flow anticipated.

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 nutrient utilization.

Pipelines used for transferring material to an irrigation system shall meet the requirements of NRCS conservation practice standard, Irrigation Water Conveyance, Pipeline, Code 430.

All pipes shall be designed to convey the required flow without plugging, based on the type of material and total solids content. To minimize settling of solids in the pipeline, design velocities

shall be between 3 to 6 feet per second. Fluid velocities shall not exceed 5 feet per second if pipe is not buried or securely tied down.

Pipelines shall be installed with appropriate 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 shall meet or exceed the pump manufacturer's recommendations. Pipe must meet or exceed anticipated internal and external loads.

In all systems where the top of the reception pit is below the maximum operating level of the storage facilities, manually operated valves or other devices shall be installed to prevent the reverse flow of manure through the pipe and pump. Also, a corrosion resistant flap gate shall be installed at the outlet of the pipe, unless the pipe will be used for both loading and unloading of the manure storage facility. The flap gate shall be able to open more than 90 degrees and close by gravity. This shall be in addition to the check valve normally installed as an integral part of the loading pump. Valves and other devices should also be considered on all systems to allow for maintenance and repair of the reception pit, pump and other appurtenances.

When transfer pipes are buried, they shall be installed below frost elevation. If the 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. 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. Insulation of above ground pipes may be necessary to prevent freezing.

Gravity Transfer Pipes. The transfer pipe is a conduit used to transfer manure and liquid waste by gravity from a gravity drop structure to a waste storage facility. All pipes must have watertight couplings for the maximum anticipated head over the pipe and meet or exceed the requirements of the applicable standard specifications as follows:

<u>Pipe Material</u>	<u>Specification</u>
High Density Polyethylene (HDPE)	ASTM D 3350
Polyvinyl Chloride (PVC)	ASTM D 3754 or ASTM F 679
Concrete	ASTM C 76
Steel	ASTM A 53, or ASTM A 134, or ASTM A 135, ASTM A 139

All pipes shall be new, unless otherwise approved by the State Conservation Engineer. Pipe with corrugations or similar interior and asphalt coated pipe shall not be used. 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 without bell and spigot ends shall be welded.

Pipe must meet or exceed anticipated internal and external loads. The minimum earth cover over the pipe shall be four feet or insulation provided to protect against freezing.

For dairy manure, the maximum pipe length shall be 250 feet for manure with no bedding added. 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 if water is added to the manure at the inlet of the pipe. Longer pipe lengths can be considered if water is added to the manure and mixed by an agitator or pump before the manure is released into 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 or sand bedding. Where possible, the gravity pipe should be installed on five percent slope or flatter. The maximum length of the pipe should be reduced by 50 feet if gravity pipes are installed on slopes steeper than five percent. The maximum pipe slope shall be 12 percent.

Clean-out access shall be provided for gravity pipelines at a maximum interval of 150 feet unless an alternative design is approved by the design engineer. Gravity pipelines shall not have horizontal curves or bends except minor deflections (less than 10 degrees) in the pipe

joints unless special design considerations are used.

In a gravity flow pipe system, a minimum head is required, depending upon the consistency of the material: 5 feet for heavily bedded manure, 4 feet for slurry or semi-solid manure, and 1 foot for liquids and liquid manure and wastewater. Minimum head shall be increased by one foot when the length of pipe exceeds 100 feet. The head shall be measured from the top of the drop structure to the maximum operating elevation of the waste storage facility.

The pipe outlet invert elevation shall be a minimum of one foot above the storage bottom. Undulation in the pipe grade shall be avoided. In locations where there pipe grade changes more than two percent, the pipe shall be vented to prevent vapor lock. The outlet end of the pipe should have sufficient cover of manure to prevent freezing during cold weather. The end section of the pipe shall be sufficiently anchored to prevent movement of the section into the storage facility. A headwall or deadman anchors may be required.

For dairy manure, the minimum pipe diameter shall be 24 or 30 inches for systems with the minimum head greater than six feet. In situations where a sluice gate is installed at the gravity hopper and water is added to the manure and thoroughly agitated before it is released, smaller diameter pipe may be considered.

For swine and veal manure with no bedding, a "flush-type" system is recommended to prevent the build up of solids. The minimum diameter pipe shall be 6 inches for pipe slopes greater than 1.0 percent and ten inches for pipe slopes between 0.5 to 1.0 percent. The minimum pipe diameter for scraper type systems shall be 12 inches. The pipe should enter the manure storage facility at approximately two feet above the bottom. The maximum grade shall be 12 percent.

For milkhouse and parlor wastewater, 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 settling tank (grease trap) is recommended near the inlet of the pipe to settle out solids.

Gravity Outlet Pipes. Due to the potential hazard of a significant spill and management requirements, gravity outlet pipes shall NOT be installed.

Other Conduits. Concrete lined ditches shall be designed in accordance with NRCS conservation practice standard Lined Waterway or Outlet, Code 468. A minimum design velocity of 1.5 feet per second shall be used.

Pumps. Pumps installed for transfer shall meet the requirements of NRCS conservation practice standard Pumping Plant, Code 533. Pumps shall be sized to transfer material at the required system head and volume. Type of pump shall be based on the consistency of the material and the type of solids. Requirements for pump installations shall be based on manufacturer's recommendations.

The outlet from the pump shall provide a smooth transition to the transfer pipe. Pumps and their appurtenances shall be enclosed to protect against rain and cold weather. The enclosure may also have to be heated to protect equipment from freezing. The pump enclosure shall be designed and installed in accordance to practice standard 313 - Waste Storage Facility and manufacturer's recommendations.

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

The minimum size tank for dairy operations with milking parlors shall be 1000 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. Tanks shall be pre-cast concrete or other durable materials. Precast concrete tanks shall comply with ASTM C-1227 Precast Concrete Septic Tanks. Provisions shall be made to install tanks above the seasonal high water table or be designed to withstand buoyant forces. Existing in place tanks may be used provided they are sound, intact and meet the size requirements of the operation.

Pumps shall be solid sewage handling type that will pump a minimum of two-inch solids. Sump pumps and effluent or chopper type sewage pumps shall not be used. Pumps and appurtenances shall be installed in accordance to manufacturer's specifications. Pumps shall be able to turn on and off by both float and manual switches. An alarm system shall be installed to warn when the pump is not working. Access to pump shall be considered for maintenance and repair.

Manure Stacker. The manure stacker is an elevator that transports solid and semi-solid manure and bedding from the barn (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 practice standard 313 - 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 by means of front end loader or other scraping equipment.

Push off ramps shall be constructed of concrete, masonry, wood, or other approved materials. Push off ramps shall be designed to withstand all anticipated vehicle, static, hydrostatic, dynamic and earth loads and in accordance to practice standard 313 - 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.

Solid/liquid waste separation. A filtration or screening device, settling tank, settling basin, or settling channel used to separate a portion of solids from the manure or liquid waste stream will be designed in accordance with NRCS conservation practice standard Solid/Liquid Waste Separation Facility, Code 632.

Safety. The system design shall consider 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 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. Products from diseased animals shall be handled in accordance with the recommendations of the state veterinarian.

Equipment leaving the farm shall be sanitized as appropriate to prevent the spread of disease.

Additional Criteria in Support of Agricultural Land for Final Utilization

Waste utilization. Nutrients shall be applied to the utilization area in amounts, uniformity, rates, and at a time consistent with the requirements of NRCS conservation practice standard Nutrient Management Code 590 or Waste Utilization, Code 633 as appropriate.

Hauling equipment. Equipment used for hauling material from one geographical area to another area shall be capable of hauling the material without spillage, leakage, or wind-blown losses during transport.

Irrigation. The irrigation of manure or wastewater shall include the pumping from the storage facility or reception pit to the field or filter area where it is applied to the land by sprinklers. Sprinkler applied manure contaminated water should normally contain less than four percent solids.

Irrigation pumps, conduits, sprinklers, and other appurtenances shall be designed, installed, maintained and operated in accordance to manufacturer's recommendation. The application of manure and wastewater shall not exceed the infiltration capacity and nutrient requirements of the soil and vegetation.

CONSIDERATIONS

General

Consider economics (including design life), overall nutrient 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.

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

Transfer Operations

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 transfer components.

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 material temperature.

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

Consider the potential for salt (struvite) deposits in smaller diameter pipes.

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

Vehicles used to transfer waste material should be sized to reduce the danger of rollover.

Where material is to be spread on land not owned or controlled by the producer, a nutrient management plan is recommended, establishing environmentally acceptable utilization of the material.

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.

OPERATION AND MAINTENANCE

An 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 operation and maintenance plan shall describe what actions will be taken to minimize flies and other insects during the transfer of material.

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

Pipelines used for transferring waste material should be flushed with clean water after use to reduce the risk of gas build up and pipeline explosion.

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

For the hauling of material from one geographical area to another, record keeping by the producer or his/her designated representative will be required and may include such items as:

- the type, nutrient content, and amount of material transferred;
- the solids percentage of the material;
- the date of the transfer;
- the name and address of the source and destination of the material; and
- the condition of the material as left at the destination (spread, stockpiled and covered, etc.).

The protective cover or barrier for the hopper or drop structure inlet shall be maintained to provide safety for animal and human traffic. If the cover or barrier is removed to facilitate cleaning, it 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 transfer system.

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.