

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

MANURE TRANSFER
(No.)

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 (if applicable), and a conduit to;

- a manure storage/treatment facility,
- a loading area, and
- to agricultural land for final utilization. This includes application of manure to the utilization area.

CONDITIONS WHERE PRACTICE APPLIES

The manure transfer component is a part of a planned agricultural manure 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.

CRITERIA

General Criteria

Manure transfer components shall comply with all federal, state, and local laws, rules and

regulations. The Alabama Department of Environmental Management (ADEM) Rules require owners/operators of animal feeding operations (AFOs) and associated waste management systems to fully implement and regularly maintain effective best management practices (BMPs) that meet or exceed NRCS technical standards and guidelines to prevent discharges and to ensure groundwater and surface water quality. AFO owners/operators who fail to implement BMPs or whose facilities discharge or will discharge to "waters of the state" can be required by ADEM or the Environmental Protection Agency to implement effective corrective actions immediately. If preventive or effective actions are not fully implemented in a timely manner, civil penalties may be incurred by the owners/operators.

Structures - All structures, including those which provide a work area around pumps, will be designed to withstand the anticipated static and dynamic loading. The structure shall withstand earth and hydrostatic loading in accordance with NRCS conservation practice standard Code 313 -Waste Storage Facility. The minimum thickness of component elements of concrete structures shall also be in accordance with NRCS conservation practice standard, Code 313 - Waste Storage Facility. When seeded, covers shall be designed to support the anticipated dead and live loads.

Reception pits shall be sized to contain one full day of manure production.

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.

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 total manure flow into the structure and be adequately anchored.

Pipelines - Design of pipelines shall be in accordance with the NRCS conservation practice standard, Code 430 - Irrigation Water Conveyance. The minimum pipeline capacity from collection facilities to storage/treatment facilities shall be the maximum flow anticipated on a daily basis. The minimum pipeline capacity from storage/treatment facilities to utilization areas shall insure the storage/treatment facilities can be emptied within the time limits stated in the management plan for manure utilization. Pipelines shall be designed to have a minimum of 2 feet per second and a maximum of 6 feet per second velocity except where ruminant manure is transferred in a gravity system; in which case velocities can be reduced if a minimum of 5 feet of head is provided on the pipe system.

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. Gravity pipelines shall not have horizontal curves or bends except minor deflections (less than 10°) in the pipe joints unless special design considerations are used.

Other Conduits - Concrete lined ditches shall be designed in accordance with NRCS conservation practice standard, Code 428A - Irrigation Water Conveyance - Non-reinforced Concrete Ditch and Canal Lining. A minimum design velocity of 1.5 feet per second shall be used.

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

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 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.

Gravity discharge pipes used for emptying a storage/treatment facility shall have a minimum of two gates or valves, one of which shall be manually operated.

Tractors or other vehicles used to tow manure spreaders or tank wagons shall be sized to reduce the danger of roll-over.

Additional Criteria for Land Application

Application - Fields with inadequate buffers between the application site and streams, wells, wetlands, sinkholes, public roads, non-producer dwellings, or public use areas will not be planned for land application.

Wastewater shall not be applied within 3 days of a predicted rain or 2 days after a rain of 0.5 inch or more. The application rates of the irrigation equipment shall not exceed either the intake rate or the available water holding capacity of the soil. Soils with slow intake rates will require irrigation only during soil surface roughening to ensure intake of the wastewater, or possibly soil injection.

Manure or wastewater shall be applied either to land with actively growing crops or to cultivated land with incorporation as close to the planting date as possible in amounts and at a time consistent with the manure management plan. Application shall be based on nutrients according to NRCS conservation practice standard, Code 590 - Nutrient Management or Code 633, Waste Utilization.

Sprinklers - Sprinklers or sprinkler systems shall be designed in accordance with NRCS conservation practice standard, Code 442 - Irrigation System, Sprinkler. Sprinkler system design capacity shall be adequate to apply the required volume of manure at a rate and uniformity that shall prevent runoff and meet the nutrient needs of the plants. Nozzle size shall be appropriate for the consistency of the manure applied. Proper agitation equipment is necessary to mix effluent and solid wastes into a slurry for irrigation. Sprinkler applied, manure contaminated water, shall normally contain less than 2 percent solids unless provisions are made for straining or filtering before application.

Solid set systems shall have pipelines buried a minimum of 18 inches. Design nozzle pressure shall be a minimum of 50 psi. Pressure differences among sprinklers in the system shall not exceed ± 10 percent of the designed sprinkler operating pressure. Sprinkler spacing for solid set systems shall be 60 percent of the sprinkler wetted diameter.

Traveling gun systems shall be equipped with engine powered travel drives and traveling gun speed control. Travel lane spacing for traveling guns systems shall be 70 percent of the nozzle throw diameter at the design pressure.

Spreaders - Manure spreaders and/or tank wagons shall have adequate capacity to ensure the emptying of storage/treatment facilities within appropriate time periods as stated in the system operation and maintenance plan.

Other - Gated pipe and other appurtenances used in conjunction with gravity application shall be designed to ensure uniform application amounts.

Additional Criteria for Effluent Wastewater Irrigation.

Effluent irrigation is for the liquid only portion of the wastewater.

Nozzle diameters for solid set sprinkler systems shall be a minimum $\frac{1}{4}$ inch.

Effluent pumped out on a regular basis shall be applied according to lab analysis of the nutrients or according to acceptable field tests. Collect

liquid samples from several locations, 6 inches below the surface, and 10 to 15 feet away from the bank or from the recycle system flush tanks.

The system design shall include a strainer on the suction line. The suction intake shall be floated or otherwise located at least 18 inches below the liquid surface in order to withdraw the most solids-free liquid. The pump and intake shall be located as far from the inlet pipe as possible.

Additional Criteria for Slurry Wastewater Irrigation

A slurry is created by agitation of the effluent wastewater and solids (sludge).

The solids content of the slurry will determine the type of impeller selected for the pump system (refer to ACES, Circular ANR-953).

Field nitrogen test kits are the preferred method to determine on-site waste analysis during agitation and pumping. When test kits are unavailable, refer to Guide Sheet No. AL 47, Lagoon Renovation and Closure, for typical nitrogen contents in agitated lagoons.

CONSIDERATIONS

General Considerations

Utilization of topography to generate head to reduce pumping requirements;

Economics (including design life), overall manure management system plans, and health and safety factors;

Possible contamination of domestic water systems and ground water;

Loading and unloading of equipment in the vicinity of the manure transfer components;

Subsurface conditions, i.e., depth to bedrock, water table, etc.;

When applicable, compatibility to joint use of manure transfer with irrigation system design requirements;

System for flushing pipelines with clean water;

Provisions for cleaning out solids deposition in ditches;

Pipe pressure rating adjustments required based on manure temperature.

Corrosion resistance and water tightness in the selection of pipe material and joints;

Need for appropriate check valves, anti-siphon protection and open-air breaks;

Sanitation needs of all conveyance equipment that leaves the farm in order to prevent the spread of disease;

Potential for salt (struvite) deposits in smaller diameter pipe.

Other Considerations

Odor Control. Wastewater irrigation should be performed at times of minimal wind in order to minimize the effect of odor. Wastewater irrigation should not be performed when wind direction and velocity would cause drift towards residences, public areas, or roads.

Intake into the soil. Manure applications should be avoided that seal the soil surface and prevent wastewater intake.

Runoff control. A properly designed and operated wastewater irrigation system should result in no runoff. Buffer zones and riparian forest buffers can be utilized to control incidental runoff that may occur.

Buffers. Because of the odor and nuisance potential associated with animal manures and other wastes, buffers should also be considered near public residential areas. These buffers mainly provide separation distance. However, vegetation screens such as trees keep the application site from public view and may even influence air movement.

Field location. Wastewater irrigated fields should be located as far as practical from neighboring residences, recreational areas, and other conflicting land uses. The location of the field relative to lakes, streams, wells, and ground

water aquifers should be considered in field selection.

Farm tractors. Farm tractors used to power an agitator or pump could easily require 125 to 150 horsepower.

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

Operation and maintenance shall be in accordance with the requirements specified in the overall operation and maintenance plan required by the applicable conservation practice standard (e.g., Code 313 - Waste Storage Facility, or Code 359 - Waste Treatment Lagoon).

Wastewater should not be allowed to rise above the maximum design level of the lagoon or waste storage pond in order to maintain the emergency capacity for the 25-year, 24-hour storm. Wastewater irrigation shall be scheduled during the dry times of the year to lower the liquid level in a lagoon to the minimum treatment level. This provides the capacity needed to store the winter and spring rains and the wastewater that accumulates during the time of the year when irrigation cannot be scheduled.

When design sludge storage is full, the sludge should be removed from lagoons with thorough agitation and pumping of the slurry. Pump-out time period may be variable dependent upon the type of livestock operation, age of the lagoon, and management conditions. Sludge accumulation should be monitored annually. Agitating of lagoons or storage ponds should start at least 24 hours before pumping is to begin. Relocate the agitation device at least once an hour. Angle the agitator at 45° to the bank for best circulation motion of the contents and to speed up agitation. Continuously agitate the lagoon or storage pond contents throughout the pumping out procedure.

Pipelines and other components of the slurry irrigation system can be effected by the corrosive nature of the wastewater. Therefore, after the system is used to apply slurry, it should be flushed with clean water.

Slurry is abrasive and can cause the pump to become worn with time. Impellers and other parts should be routinely checked for excessive wear and replaced according to the manufacturer's recommendations. Bearings with grease fittings should be lubricated on a regular basis.

Sprinkler nozzles can become worn due to the abrasive nature of slurry. Therefore, the nozzle diameter should be routinely checked for tolerance and replaced as needed in order to maintain design application uniformity. Sprinklers equipped with grease fittings should be lubricated on a regular basis. Impulse arms not properly operating should be repaired or replaced. Improper rotation of the sprinkler will result in the intake rate of the soil being exceeded resulting in runoff and/or erosion.

REFERENCES

Circular ANR-925, Calibrating Traveling Guns for Slurry Irrigation, Alabama Cooperative Extension System.

Circular ANR-953, Using Irrigation to Renovate Livestock Lagoons, Alabama Cooperative Extension System.

Circular ANR 996, Solid Set Wastewater Irrigation System for Controlled Grazing, Alabama Cooperative Extension System.

AL NRCS Guide Sheets

Guide No. AL 47, Lagoon Renovation and Closure

Guide No. AL 48, Buffers for Waste Applications

Guide No. AL 59, Wastewater Irrigation

AL NRCS Conservation Practice Standards

Irrigation Water Conveyance - Non-reinforced Concrete Ditch and Canal Lining, Code 428A

Irrigation System, Sprinkler, Code 442

Irrigation Water Conveyance, Code 430

Nutrient management, Code 590.

Pumping Plant for Water Control, Code 533.

Waste Storage Facility, Code 313

Waste Treatment Lagoon, Code 359

Waste Utilization, Code 633