

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), a conduit, or hauling equipment 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. ***The system considers its components as an extension of the collection process, using either gravity or mechanical equipment to move the material from the point of origin to the point of utilization.***

Where manure/*litter* is generated by livestock/*poultry* production or processing and a conveyance system is necessary to transfer manure from the source to a storage /treatment facility and/or loading area, and from storage/treatment facility to an area for utilization. This includes hauling 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 NRCS conservation practice standard Nutrient Management, Code

590 or Waste Utilization, Code 633.

CRITERIA

General Criteria Applicable to All Purposes.

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

Design and construction activities shall comply with all federal, state, and local laws, rules and regulations governing pollution abatement, health and safety. The owner or operator shall be responsible for securing all required permits or approvals and for performing in accordance with such laws and regulations.

Permits may be required from the following agencies:

1. West Virginia Department of Health (WVDH)
2. West Virginia Department of Agriculture (WVDA)

Waste Consistency. The method selected to transfer waste largely depends on the percent solids of the waste product (see Table 1).

Liquid waste has a typical consistency of less than 3-6 percent solid material.

Slurry waste has fluid handling characteristics and requires special pumping equipment. This waste is often associated with confined feeding operations for cattle and swine and typically has a 3-15 percent solid content by weight. Slurry can be applied by using large nozzle guns or

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

Note: Bold italics - Information added or changes made in the National Conservation Standard by WV.

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standard irrigation equipment if properly agitated with fibrous material removed.

Semi-solid waste has a somewhat firm consistency with an average range of 10 to 22 percent solids by weight. Conveying semi-solid manure with long stalk bedding from stanchion, tie stall, or open housing is the same as solid manure unless milk parlor waste or other water is added creating slurry.

Table 1. Relative Handling Characteristics of Different Livestock Manure based on Percent Total Solids (wet basis) from Fig. 9-1 AWMFH

	Dairy	Swine	Poultry	Beef (feeders)
Descriptive Term	Approximate % solids (solids typically adjusted by animal type, hay, feed or bedding material)			
Liquid	0-4	0-6	0-5	0-4
Slurry	3-10	5-15	4-14	2-11
Semi-Solid	8-17	13-25	11-22	8-19
Solid	>14	>23	>20	>15
Note: Overlap of % of solids represents inconsistency in the descriptive term, unpredictability of material as well as indeterminate material viscosity.				

Manure/process waste may be considered solid when solids exceed 20 percent of the liquid by weight, although the percentage can be lower for dairy and beef operations. Solid manure is as-produced manure with a large amount of bedding, usually long stalk straw or hay.

Liquid waste and slurries can be transferred through open channels, pipes, portable conveyance equipment. Liquid waste shall be screened as necessary to remove fibers,

hair or small debris to eliminate potential clogging.

Piston or air pressure pumps can be used to transfer semi-solids through large pipes. Centrifugal, hollow ram, vacuum or other pumps are used to transfer liquid or slurry materials.

Semi solid and solid waste is often collected manually or with front-end loaders and transferred or transported and applied using dump trucks, open/ box manure or flail spreaders.

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 **conservation** practice standard Waste Storage Facility, Code 313. Covers, when needed, shall be designed to support the anticipated dead and live loads **in accordance with WV conservation practice standard Waste Storage Facility, Code 313 and Waste Facility Cover, Code 367.**

Reception pits shall be sized to contain a minimum of one full day's manure production. 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 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 and stormwater flow into the structure and be adequately anchored.

Pipelines. Design of pipelines shall be in accordance with sound engineering principles considering the type of 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 NRCS *WV* conservation practice standard, Irrigation Water Conveyance, Pipeline, Code 430.

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, typically 2 to 3 ft. /sec for manure slurries and not exceed 5 ft. /sec to minimize segregation of material.***

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 degrees) in the pipejoints unless special design considerations are used.

Where slurry manure is transferred in a gravity system, a minimum of 4 feet of head is required on the pipe system.

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.

Pipelines shall be installed with appropriate connection devices to prevent contamination of private or public water supply distribution systems and ground water.

Pipelines under pressure shall include appropriate check, flow control, anti-siphon protection valves and air/vacuum relief vents (at all high points and end of pipe).

Pressurized pipelines used for slurry water shall have end of line clean out valves or caps and shall be rinsed with clean water after use.

Gravity Transfer System. The operation of a gravity system depends on the consistency of the manure and the overall hydraulics of the system. Consistency is affected by the

type of manure, bedding or other materials and the amount of water or liquid present.

Depending on the type of livestock and location of system (adequate head) different gravity systems may be used. Lactating dairy herds with less than average (2-3 pounds/day/au) bedding are generally suitable for gravity systems.

Gravity systems should have a source of water or waste liquids available to flush the system as needed.

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.

Pump Transfer System. These types of systems utilize a temporary storage and pump to transfer the waste. Mechanical or hydraulic driven plunger (ram) pumps, centrifugal or vacuum type slurry (agitator) or electric pumps or submersible (waste water) pumps are used to agitate and transfer the waste. These systems are limited by working head and pipeline distances, as well as available power sources.

Power Take Off Driven pumps (PTO) receive power from a mounted or portable power source, operates in a vertical or angled position and is rated by horsepower and capacity for pumping. PTO pumps typically are used for loading and unloading manure and should deliver a minimum of 80 hp. The discharge hose can be used for agitating, loading or transferring waste.

Electric submersible pumps and assemblies installed in a sump, reception pit or waste storage facility shall be compatible with wastewater. For pumps handling manure transfer, a solids settling area is recommended to remove solids and trash prior to pumping. The pump's sump shall be a minimum size of 1.0' deep x 2.0' wide x length (depending on storage tank dimensions and/or pump manufacture recommendation). The reception pit storage volume is important to the performance and cyclic time of the pump. Keep the cycling period to a minimum but not longer than one cycle per 12 hour period. Consideration shall

be given to sludge buildup which can limit temporary storage capacity. Wastewater pumps shall be installed with float switches and alarm and wired directly into a power circuit.

Wastewater pumps shall be selected and specified based on intake and discharge capacity, total head, type of liquid to be transferred and maximum particulate size. The opening and access area to the pumps shall be designed for ease of operation and maintenance.

Vacuum pump systems operate by collecting waste on the vacuum side of the pump and transferring the liquid under pressure. These pumps are limited by a maximum suction head of 12 foot. Pumps installed for manure transfer shall meet the requirements of NRCS WV Conservation Practice Standard Pumping Plant for Water Control, Code 533. 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 and the type of bedding used. Requirements 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.

Warning signs, ladders, guard rails, shields, and other devices shall be provided to insure safety of humans and livestock. Fences shall comply with WV conservation practice code, Fence Code 378.

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. **Signs should be posted near hoppers and reception pits describing hazards associated with accumulated gases.**

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

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Bio-security. Manure from diseased *and non-diseased* animals shall be handled in accordance with the recommendations and/or *prescribed mandates* of the *West Virginia Dept. of Agriculture (WVDA) Commissioner of Agriculture and USDA APHIS Veterinary Service.*

The WVDA Bio-Security guidelines should be posted on the farm, preferably near the manure loading area, as a quick reference for the landowner, operator or transporter (see Attachment A).

Equipment entering or 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. Manure 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.

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

Where manure is to be spread on land not owned or controlled by the producer, the manure management plan, as a minimum, shall document the amount (volume and weight) of manure to be transferred, the nutrient content of the manure, the date of transfer, and who will be responsible for the environmentally acceptable use of the waste. Provisions shall be made to inform the receiver of the manure of the proper storage and/or utilization requirements.

Hauling equipment. Equipment used for hauling manure from one geographical area to another area shall be capable of hauling the manure without spillage, leakage, or wind-blown losses during transport. Hauling equipment shall meet all applicable local, state, and federal laws regarding highway transportation.

Weight limits of roads used for hauling waste shall be followed.

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CONSIDERATIONS

General

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

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 manure transfer components.

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

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

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 salt (struvite) deposits in smaller diameter pipes.

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 **pipelines**, concrete lined ditches, etc.

Off Farm Transfer/Transport

Consider route selection and timing of manure transfer to minimize impact of nuisance odors on others.

Consider documenting the primary travel route to be used to transport manure and include this with the operation's bio-security information.

Consider equipment type and covering of manure to minimize particulate matter generation during transport of manure.

Vehicles used to transfer manure should be

sized to reduce the danger of rollover.

Acceptance of Transferred or Transported Manure/Litter

Consider the following

- **Type of manure or litter; i.e. dairy, poultry, hog, etc.**
- **State of material; liquid, slurry, semi-slurry, or solid.**
- **Condition of material; fresh (not composted), composted manure waste, composted dead animals, composted paper, leaves or trash, or liquid slurry.**
- **Method of application; irrigation equipment, slurry tank, manure spreader.**
- **Current nutrient analysis of material to be spread and recommended application rates.**
- **Waste material to be stored or applied directly to the field at time of delivery.**
- **Location of source material and type of bio-security precautions taken.**
- **Delivery and application of transferred material meets or exceeds NRCS conservation standard practice guidelines.**

PLANS AND SPECIFICATIONS

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

Refer to WV conservation practice standards; Waste Storage Facility, Code 313; Irrigation Water Conveyance - Pipeline, Code 430, Pumping Plant for Water Control, Code 533 and Waste Facility Cover, Code 367 for additional standards and specifications. As a minimum the following criteria shall be met.

- 1) **Plans shall show at a minimum, site location, location and details of all appurtenances, dimensions, elevations, structural information, base and sub base information, cut and fill, pipeline profile, pump and pad design, manufacturer criteria, pump cut off and on elevations, freeboard, normal**

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operating elevation, location, erosion protection plan, setbacks, safety features, etc.

- 2) *Applicable West Virginia engineering standards and specifications will apply to components of the system.*
- 3) *All components for animal waste disposal systems must be developed with assistance from an engineer.*

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 *or handling* of manure, *examples follow*.

- *Use waste handling equipment in a safe manner. Clean after use and keep in good repair.*
- *Frequently clean screens, filters, grates or open boards to facilitate removal of liquid and drying of solids and to extend the life of the pumping facility in the solids holding area.*
- *Mosquito breeding can be controlled by adding larvicides.*
- *Thoroughly agitate slurry waste to facilitate complete unloading of the material.*
- *Add required water or re-cycled water to dilute slurry in order to meet liquid guidelines for an irrigation system.*
- *Spreader tanks should be equipped with flotation tires to reduce soil compaction.*
- *Avoid scraping frozen or dry manure into the tank.*
- *Sand, gravel or other abrasive materials should be kept out of the system.*
- *Prior to filling the manure tank, add 6 to*

12 inches of water to prevent manure from adhering to the bottom or sides of the tank.

- *Clean and disinfect personnel and equipment after contact with material.*

For the hauling of manure 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 manure transferred,
- *condition of material; fresh or green, composted litter, composted dead animals, dried manure, etc.)*
- the solids percentage of the manure,
- the date of the transfer,
- the name and address of the source and destination of the manure, and
- the condition of the manure as left at the destination (spread, stockpiled and covered, etc.).
- *cover solid material for transport.*
- *delivery route map.*

REFERENCES

- Agricultural Waste Management Field Handbook, "National Engineering Handbook 651.12", USDA-NRCS, April 1992*
- Waste Management Equipment -AWMFH Chapter 12, "National Engineering Handbook 651.12", USDA-NRCS, October 1997*
- Irrigation Pumping Plants, 210-VI-NEH 15 Chapter 8 (Irrigation Pumping Plants) and Chapter 11 (Sprinkler Irrigation)*
- Sprinkler Irrigation Systems, Mid West Planning Service -30, 1st edition 1999*
- WV Conservation Practice Standards; Nutrient Management, Code 590
Waste Utilization, Code 633
Waste Storage Facility, Code 313
Waste Facility Cover, Code 367
Irrigation Water Conveyance, Pipeline, Code 430
Irrigation System, Sprinkler, Code 442
Lined Waterway Code 468*

Pumping Plant for Water Control, Code 533
Waste Facility Cover, Code 367

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ATTACHMENT A
BIO-SECURITY FOR THE FARM



BIO-SECURITY FOR THE FARM

Recommended by the West Virginia Department of Agriculture

- Restrict vehicle traffic on the farm, and direct their routes.**
- Schedule and accompany all farm visitors. Limit areas to be visited.**
- Know each visitor's exposure to animals for the past four days.**
- Provide protective clothing and/or footwear for visitors. Footbaths optional.**
- Maintain a log of visitors and vehicles that enter the farm.**
- Wear clean, disinfected boots when visiting others' farms and stockyards.**
- Sanitize all equipment and trailers between visits.**
- Isolate all new animal additions by at least 300 YARDS from your other animals for 21 DAYS. Test before they enter the herd. Maintain strict entry and exit sanitation for all personnel in the isolation area.**
- Do not feed ruminant animals feeds containing animal by-products.**
- Remove and promptly dispose of fallen animals. (Bury, compost, incinerate, or have removed.)**
- Keep pets out of confined feeding facilities.**
- Be aware of all wildlife and pet movements, when possible.**
- Ban ALL known foreign food and food products from the farm.**
- Control rodents and flies thoroughly.**
- Report all suspicious activity and events to local authorities.**

EMERGENCY PHONE NUMBERS.

West Virginia Office of
 Emergency Services
 1-304-558-5380

West Virginia Environmental
 Response Team (ERT)
 1-304-558-5938

West Virginia Regional
 Poison Control Center
 1-800-222-1222

West Virginia State Police
 1-304-746-2100

Federal Bureau of
 Investigation (FBI)
 1-304-346-3232
 1-412-471-2000 (Pittsburgh)

West Virginia Department of Agriculture
 Commissioner of Agriculture
 1-304-558-2201

USDA APHIS Veterinary Service
 1-614-469-5602

National Response Center
 (Toxic chemical and oil spills)
 1-800-424-8802

This information will allow West Virginia farmers to respond more quickly to a disaster situation and help producers prevent and contain the spread of disease. As your Commissioner of Agriculture, I strongly urge you to evaluate your disaster prevention practices and develop habits that will protect you, your farming operation, and the public.

Gus R. Douglass, West Virginia Commissioner of Agriculture

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