TITLE 35: ENVIRONMENTAL PROTECTION

SUBTITLE E: AGRICULTURE RELATED WATER POLLUTION

CHAPTER II: ENVIRONMENTAL PROTECTION AGENCY

PART 560
DESIGN CRITERIA FOR FIELD APPLICATION OF LIVESTOCK WASTE

SUBPART A: INTRODUCTION

Section

SUBPART B: DESIGN CRITERIA

Section

AUTHORITY: Implementing and authorized by Section 4(m) of the Environmental Protection Act (Ill. Rev. Stat., 1981, ch. 111 1/2, par. 1004(m)), and authorized by Rule 105(a) of Chapter 5 (35 Ill. Adm. Code 502.305(a)).

SOURCE: Filed April 5, 1976, effective April 15, 1976; codified at 6 Ill. Reg. 10558.

SUBPART A: INTRODUCTION

Section 560.101 Purpose

a) The subject of Chapter 5 of the Illinois Pollution Control Board Rules and Regulations (Title 35, Subtitle E, Chapter I) is Livestock Wastes. Rule 104(e) of Chapter 5 (35 Ill. Adm. code 501.405) calls for the adoption of guidelines for livestock waste application to land.

b) This technical policy statement has been developed in response to Rule 104(e) (35 Ill. Adm. code 501.405), which reads as follows:

> Field Application of Livestock Waste. The quantity of livestock waste applied on soils shall not exceed a practical limit as determined by soil type, especially its permeability, the condition (frozen or unfrozen) of the soil, the percent slope of the land, cover mulch, proximity to surface waters and likelihood of reaching groundwater, and other relevant considerations. These livestock waste application guidelines will be adopted pursuant to Rule 105, unless otherwise provided for by Board Regulations.

c) The application of livestock wastes to the land is an acceptable and established practice in Illinois. However, when wastes are not applied in a responsible manner, they can create pollutional problems. The emphasis in land application should be on waste utilization rather than waste disposal. Considering the nutrient value of livestock wastes there exist economic incentives for the efficient utilization of these nutrients. Environmental concerns should also dictate the wise management and use of livestock wastes.

d) The intent of this document is to present livestock waste application guidelines for the livestock producers of Illinois. The guidelines must of necessity be given in general terms and cannot apply to each particular farm situation. It is the responsibility of each individual who is applying livestock wastes to land to do so in a manner which will not cause pollution problems. In some cases, this may require either more or less stringent application restrictions than indicated by these guidelines.

SUBPART B: DESIGN CRITERIA

Section 560.201 Nutrient Loading

a) Livestock waste application should not exceed the agronomic nitrogen rate, which is defined as the annual application rate of nitrogen that can be expected to be required for a reasonable anticipated crop yield. It should be recognized that, in most cases, if the agronomic nitrogen rate is met, the phosphorus applied will exceed the crop requirements. Thus, in order to make the best use of phosphorus resources, it may be advisable to apply wastes at the agronomic phosphorus rate. It will be considered acceptable, however, to apply at the nitrogen rate. Appendix A contains some general information on agronomic fertilization rates for various Illinois crops.

b) The nutrient contents of livestock wastes are highly variable even on an individual farm. The best way to determine nutrient contents is to perform an actual chemical analysis. Table 1 and Table 2 are intended to serve only as an aid in estimating the nutrient value of various forms of livestock waste.

c) The values in Table 2 may be used to approximate the amount of nitrogen applied in the soil when application is by either of the following methods:

1) Soil injection

2) Surface application immediately followed by incorporation.

d) When livestock waste is surface applied and allowed to dry before incorporation, some ammonia nitrogen loss can be expected. This loss may be in the range of 25 to 50 percent of the total nitrogen applied. Greatest losses may be expected for wastes with high ammonia nitrogen contents, such as poultry manure or liquid swine manure. The nitrogen values in Table 2 may be reduced by 25 to 50 percent to approximate the amount of nitrogen actually reaching the soil when surface application is used.

e) Not all of the organic nitrogen applied in any one year becomes available for crop use during that year. After a series of approximately equal annual applications (perhaps five years), the nitrogen applied in a year is about equal to the amount of nitrogen available to the crop for that year. For example, if organic nitrogen is applied each year at a rate of 150 pounds per acre, the nitrogen annually available to the crop would reach a level of 150 pounds per acre after about five years. However, until this equilibrium is reached, greater annual application rates are needed in order to meet crop requirements.

f) Table 3 provides estimates of annual nitrogen production for various waste management systems and the corresponding number of animal units needed to provide 100 pounds of nitrogen per year. These values consider nitrogen losses during storage and handling, but do not take into account the availability of nitrogen to the crop after application is made. The values in Table 3 can be used as an aid in determining the adequacy of the land area for manure utilization for a given livestock enterprise.

Section 560.202 Method of Application

Surface application may be used when the land slope is no greater than 5% or when the yearly average soil loss is less than 5 tons per acre (regardless of slope) as determined by the Universal Soil Loss Equation (see Appendix B). Injection or surface application with immediate incorporation should be used when the land slope is greater than 5% and the yearly average soil loss is greater than 5 tons/acre. However, even at land slopes less than 5%, soil losses and associated pollution may reach an unacceptable level.

Section 560.203 Proximity to Water

Livestock waste should not be applied within 200 feet of surface water unless the water is upgrade or there is adequate diking. There should be a vegetative strip between the application area and any surface water. Waste should not be applied within 150 feet of any water well. Conservative loading rates should be used in the case of a high water table or shallow earth cover to fractured bedrock. Caution should be exercised in applying wastes, particularly on porous soils, so as not to cause nitrate or bacteria contamination of ground waters. Such shallow ground waters are often the source of private wells in rural areas.

Section 560.204 Flooding

Livestock waste should not be applied in a 10 year flood plain unless the injection or incorporation method of application is used.

Section 560.205 Waterways

Livestock waste should not be applied in waterways.

Section 560.206 Frozen or Snow-Covered Ground

Waste application on frozen or snow-covered land should be avoided. If wastes are spread on frozen or snow-covered land, such application should be limited to land areas on which:

a) Land slopes are 5 percent or less, or

b) Adequate erosion control practices exist.

Section 560.207 Rainfall

Livestock waste should not be applied during a rainfall or to a saturated soil. Application should not be made by spraying immediately after a rainfall event. Judgment should be used in planning waste applications in conjunction with weather patterns.

Section 560.208 Odors

It should be recognized that odors from improperly stored or applied livestock wastes can seriously interfere with the enjoyment of life and property for people living in the area. Although there will be some odors associated with land application of livestock wastes, soil injection or incorporation can significantly reduce these odors. Consideration of climatic conditions and judicious selection of application areas can also help to maintain desirable relationships with neighbors.

Section 560.APPENDIX A Agronomic Fertilization Rates for Various Illinois Crops

POUNDS OF NUTRIENT

CROP	AVAILABLE N	P_2O_5	K_2O
Corn for grain	1.3/bu.	.55/bu.	0.28/bu.
Corn silage	7.5/T	3.1/T	9.4/T
Wheat (1)	2.3/bu.	0.68/bu.	2.0/bu.
Oats (1)	1.1/bu.	0.40/bu.	1.5/bu.
Barley (1)	1.5/bu.	0.55/bu.	1.0/bu.
Rye (1)	2.2/bu.	0.69/bu.	1.8/bu.
Grain sorghum for grain	2.0/100 lbs.	0.75/100 lbs.	0.38/100 lbs.
Grain sorghum for silage	7.5/T	3.1/T	9.4/T
Tall fescue	39/T	19/T	53/T
Bromegrass	33/T	13/T	51/T
Sorghum-Sudan	40/T	15/T	59/T
Orchard Grass	50/T	17/T	63/T
Timothy	38/T	14/T	63/T
Reed Canary Grass	55/T	13/T	50/T
Alfalfa	(2)	10/T	60/T
Clovers	(2)	15/T	60/T
Soybeans	(2)	1.1/bu.	2.4/bu.

(1) If straw is removed.

(2) Legumes can obtain most of their N from the air and are normally not fertilized with N. However, if included in a crop rotation with nitrogen using crops, they will use the available N in the soil and not fix N from the air. Therefore, it can be assumed that they will remove as much N as corn for grain would in the same rotation.

This information is general in nature and may not reflect an accurate recommendation for all areas or soil types of the State. Any recognized fertility recommendation for Illinois crops, climate and soils is acceptable in lieu of these general figures. In order to obtain more accurate recommendations for phosphorus and potassium, soil testing should be done.

Section 560.APPENDIX B

Universal Soil Loss Equation

The Universal Soil Loss Equation is a mathemetical formula which can be used to predict average soil loss in tons per acre per year under various field conditions. It gives consideration to rainfall (R), soil type characteristics (K), length and steepness of slope (LS), cropping system (C), and erosion control practices (P) such as contouring, strip cropping, terracing and straight row farming. Each of the factors is determined for a specific field condition. Research data from sources such as the Agricultural Research Service and various universities as well as field experiences of the Soil Conservation Service and others have been incorporated. Basic climatic data including rainfall information from the Weather Bureau are used.

Information on the Universal Soil Loss Equation may be obtained from local offices of the following governmental agencies: University of Illinois Cooperative Extension Service, Soil Conservation Service, Soil and Water Conservation Districts, and regional offices of the Illinois Environmental Protection Agency.

TABLE 1

Approximate Quantitites of Total Manure, Nitrogen, Phosphorus and Potassium Excreted by Different Livestock Species

LIVESTOCK TYPE	Fresh Manure (gal/day)	N (lb/day)	P_2O_5 (lb/day)	P (lb/day)	K_2O (lb/day)	K (lb/day)
Beef Cattle 1,000 lb., body weight	7.5	0.34	0.25	0.11	0.29	0.24
Dairy Cow 1,000 lb., body weight	11	0.41	0.17	0.074	0.32	0.27
Swine 100 lb., body weight	1	0.045	0.034	0.015	0.036	0.030
Poultry (layers) 4 lb., body weight	0.028	0.0029	0.0026	0.0011	0.0015	0.0012

TABLE 2

Approximate Nutrient Content of Wastes from Management Systems

	Nitrogen as N		Phosphorus as P_2O_5		Potassium as K_2O	
	lb/1000 gal	lb/ton*	lb/1000 gal	lb/ton*	lb/1000 gal	lb/ton*
BEEF:						
Pit Storage	25-50		19		30	
Open Lot-Runoff	0.5-5.0		0.7-9.7		1.2-6.5	
Open Lot-Solids		10-12		9		13
Bedded Confinement-Solids		10-15		5-15		10-20
Anaerobic Lagoon	10-15		10-20		25-30	
Oxidation Ditch	10-25		15-20		15-20	
SWINE:						
Pit Storage	30-55		27		34	
Open Lot- Runoff	0.5-5		0.5-10		1-7	
Open Lot-Solids		10-12		9		13

Bedded Confinement Solids		10-15			5-15			10-20
Anaerobic Lagoon	10-15			10-20			25-30	
Oxidation Ditch	10-25			15-20			15-20	
DAIRY:								
Pit Storage	20-40			10-15			20-30	
Open Lot-Runoff	0.5-5			0.5-5			1-5	
Open Lot-Solids		7-10			1.6-4.6			6.9-6
Bedded Confinement Solids		10-15			5-10			10-15
Anaerobic Lagoon	10-15			5-10			20-25	
POULTRY:		25			25			12

*At approximately 50% moisture content

TABLE 3

Approximate New Yield of Nitrogen for Various Waste Management Systems

	Approximate Annual Net Yield of Nitrogen per Animal Unit (lb)	Approximate # of Animal Units Needed to Provide 100 lb of Nitrogen per Year
BEEF (1000 lb. Animal Unit)		
Pit Storage	43-87	1.1-2.3
Open Lot-Solids & Runoff	50-62	1.6-2.0
Bedded confinement - Solids	74-87	1.1-1.4
SWINE (100 lb. Animal Unit)		
Pit Storage	6-12	8.3-16.7
Open Lot-Solids & Runoff	7-8	12.5-14.3
Bedded Confinement-Solids	10-12	8.3-10.0
DAIRY (1000 lb. Animal Unit)		
Pit Storage	52-105	1.0-1.9
Open Lot-Solids & Runoff	60-75	1.3-1.7
Bedded Confinement-Solids	90-105	1.0-1.1
POULTRY (4 lb. Animal Unit)	0.4-0.6	167-250