

TITLE 35: ENVIRONMENTAL PROTECTION

SUBTITLE C: WATER POLLUTION

CHAPTER II: ENVIRONMENTAL PROTECTION AGENCY

PART 372

ILLINOIS DESIGN STANDARDS FOR SLOW RATE LAND
APPLICATION OF TREATED WASTEWATER

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AUTHORITY: Implementing and authorized by Sections 4(h) and 39(a) of the Environmental Protection Act [415 ILCS 5/4(h) and 39(a)].

SOURCE: Adopted at 19 Ill. Reg. 1297, effective January 31, 1995.

Section 372.100 Purpose

The purpose of this Part is to establish design standards and permit application requirements for wastewater treatment systems involving the non-discharging low-rate application of wastewater to land.

Section 372.110 Scope and Applicability

- a) These design standards apply to non-discharging low-rate land application of secondary and tertiary treated domestic wastewater to land upon which crops, turf or trees are grown. These design standards are to be used in the preparation of all engineering documents.
- b) A preliminary engineering report must be submitted to the Agency for review and approval prior to the preparation and submission of plans and specifications or permit applications.
- c) Detailed design requirements for treatment, transport and storage facilities are contained in 35 Ill. Adm. Code 370, Illinois Recommended Standards for Sewage Works.

SUBPART B: SITE SELECTION CONSIDERATIONS

Section 372.200 General

The preliminary engineering report required under subsection 372.110(b) shall address all of the elements contained in this Subpart B, as well as any of the planning elements of Subparts C through E that are applicable to the feasibility of the project for which the preliminary engineering report is submitted.

Section 372.210 Site Location

- a) General
The following factors shall be considered in the selection of the site:
 - 1) Present and proposed land use regarding residences, buildings, developments, public access areas, for the site and adjoining properties;
 - 2) Present and proposed water supply wells;
 - 3) Surface waters and waterways, wetlands and 10-year floodplains;
 - 4) Subsurface drainage tiles and storm sewers;
 - 5) Abandoned wells and shafts;
 - 6) Buffer zones;
 - 7) Area for expansion of the wastewater treatment and land application systems;
 - 8) Depth to groundwater;
 - 9) Depth to bedrock; and
 - 10) Topography.
- b) Well Setback Requirements
The location of the treatment facilities and land application area with respect to wells shall be in conformance with the setback zone requirements of the Illinois Groundwater Protection Act [415 ILCS 55].
- c) Topography
 - 1) Cultivated Fields
Slopes on cultivated fields shall be limited to 4% unless runoff control measures such as berms, collection ditches or

- check dams are provided.
- 2) Sodded Fields and Forested Areas
Slopes on sodded fields and forested areas shall be limited to 8% unless runoff control measures such as berms, collection ditches or check dams are provided.
 - 3) Steep Slopes
For slopes steeper than those covered under subsections (c)(1) and (2) above, the engineering documents shall include the runoff control measure recommendations of the Soil Conservation Service (SCS) or county soil conservation district.
 - d) Location to Surface Water
Treated wastewater shall not be applied or discharged to wetlands, streams, waterways or other surface waters. Floodplains which have a flood return frequency of less than 10 years shall not be used for land application unless alternate application sites or additional lagoon storage is provided. Storage shall be designed in accordance with Section 372.420.
 - e) Depth to Groundwater
The system design shall be based on rational calculations that take into account that treated wastewater is not to be applied when groundwater is within 4 feet of the ground surface. The design shall include storage capacity for such high groundwater periods and such periods shall be accounted for in the computation of the available treated wastewater application days. The design shall also take into account the effect that the application of additional water will have on groundwater levels.
 - f) Depth to Bedrock
For land application of treated wastewater the proposed site shall have a minimum of 10 feet of earth cover over bedrock, unless the preapplication treatment system complies with Section 372.400(b).

Section 372.220 Hydrogeology and Soils

- a) General
The engineering documents shall contain information on location, geology, groundwater, soil characteristics, ground slopes, area for expansion, and any other factors that will affect the feasibility and acceptability of the proposed land application system. Data shall be obtained from available and identified sources or onsite investigations.
- b) Geology
Geological conditions present at the land treatment site and their potential effects, including depth to bedrock, thickness of surficial deposits, and the presence of any special conditions must be described. The major geological factors which shall be considered are:
 - 1) Structure, weathering and fracturing of bedrock;
 - 2) Lithology;
 - 3) Texture; and
 - 4) Soil profile.
- c) Groundwater
The following data and information for the proposed site shall be provided:
 - 1) Depth to the seasonal high groundwater table and the duration of seasonal variations;
 - 2) Identification and depth to each aquifer based on Illinois

State Water Survey data or other available well drilling logs or boring records for the area;

- 3) Direction of groundwater movement and the location of any points of groundwater resurfacing;
 - 4) A chemical analysis of the existing groundwater quality for those parameters set out in Section 372.500(d) which may be affected by the application of treated wastewater; and
 - 5) An evaluation of the effects of the applied treated wastewater on groundwater movement and quality.
- d) Soil Characteristics
- The soil at the proposed site must be evaluated based on on-site surveys and the most up-to-date published soil survey for:
- 1) Types and texture classifications;
 - 2) Mantle thickness;
 - 3) Chemical characteristics;
 - 4) pH;
 - 5) Nutrient levels including nitrogen and phosphorus;
 - 6) Cation exchange capacity;
 - 7) Subsurface soil characteristics;
 - 8) Soil borings to a minimum depth of 10 feet; and
 - 9) Permeability of the most impermeable layer of the soil mantle at each soil boring location.

Section 372.230 Buffer Zone

- a) Non-Spray Surface Application
For non-spray surface application of treated wastewater using gated pipes, subsurface irrigation, or equivalent methods, the area wetted by the treated wastewater shall not encroach on any wetlands, streams, waterways, surface waters, public road rights of way or residential lot lines.
- b) Spray Irrigation
For spray irrigation of treated wastewater, the outer edge of the area wetted by the spray mist shall not be closer than the following distances from any residential lot line including application under design maximum wind conditions with peripheral spray units operating (refer to Section 370.300 (c)(1)(C)):
 - 1) 200 feet, unless the requirements in (b)(2) or (b)(3) of this Section are met;
 - 2) 25 feet, if the application area is surrounded by a fence with a minimum height of 40 inches; or
 - 3) No distance restriction when the application area is:
 - A) a golf course, if the application occurs only during the hours between dusk and dawn; or
 - B) a restricted access area (an area to which public access is controlled), if the application and its associated drying time occur during a period when the area is closed to the public.

The outer edge of the area wetted by spray mist shall not encroach on any wetlands, streams, waterways or other surface waters or public road rights of way under design maximum wind conditions. The engineering document shall provide engineering data for the spray equipment specified on design pressure, wind velocity, height of the spray, spray mist drift distances at design operating pressures and wind velocities with peripheral spray units operating.

Section 372.240 Loading Factors on Application Fields

- a) General
The size of the application area shall be based on the limiting characteristic of the treated wastewater and the site. Balances shall be calculated and submitted for water, nitrogen, phosphorus, and 5 Day Biochemical Oxygen Demand (BOD[5]). Loading rates must be established for each parameter. The critical loading rate will determine the application area required.
- b) Water Balance
 - 1) The water balance for the application site shall include the applied treated wastewater, runoff from adjacent areas, precipitation, evapotranspiration, permeability, groundwater recharge rate and effect on water table depth and subsurface tile drainage. The system shall be designed so that runoff does not occur as a result of treated wastewater application. Treated wastewater shall not be applied during precipitation events; however, runoff in response to precipitation is acceptable. The water balance shall be calculated on a rational basis for each month and exclude the days on which application cannot occur due to rainfall, frozen or wet ground conditions, cropping practices, high groundwater conditions or wind in excess of design conditions.
 - 2) The design shall provide for alternate wetting and drying periods in order to maintain aerobic conditions in the topsoil, as well as to maintain a viable cover crop.
 - 3) The design daily percolation rate shall not exceed 10% of the minimum soil permeability at the site. The percolation rate calculations shall exclude the days on which application cannot occur due to rainfall, frozen or wet ground conditions, cropping practices, high groundwater conditions or wind in excess of design conditions.
- c) Nitrogen Balance
 - 1) On an annual basis, the total nitrogen applied in the treated wastewater shall be within agronomic rates and shall be accounted for by crop uptake, volatilization, denitrification, adsorption, mineralization and metal precipitation. Any application of chemical fertilizer must be accounted for in the design.
 - 2) Land application areas shall be managed according to normal agricultural and horticultural practices, including but not limited to cultivated farmland with harvest, fallow land, set-aside programs, pasture land, golf courses, sod farms, urban parks, or forest preserves.

Section 372.250 Project Layout

A single topographic map of the proposed project and the area within 2,500 ft. of the project shall be submitted as a part of the engineering design. Segmented maps may be provided for large projects. The topographic map shall show the following information:

- a) Application area boundaries including buffer zones;
- b) Treatment and storage facilities;
- c) Piping and layout of the irrigation system;
- d) Present and proposed land use regarding residences, buildings, developments, public access areas, etc;
- e) Present and proposed water supply wells and abandoned wells and

- shafts;
- f) Direction of groundwater movement and any points of groundwater resurfacing;
 - g) Surface waters and waterways, wetlands and 10-year floodplains;
 - h) Subsurface drainage tiles and storm sewers; and
 - i) Slopes of the application areas.

SUBPART C: APPLICATION SYSTEM

Section 372.300 Equipment Design

- a) General Requirements
 - 1) The design of all application systems shall provide facilities to assure uniform distribution of the treated wastewater over the disposal area.
 - 2) Sufficient spare equipment and parts shall be available to assure continuity of application during application periods.
 - 3) A single irrigation pumping unit may be utilized if a spare pump in working condition is available in dry storage.
 - 4) The design shall provide for draining all pipes and equipment to prevent freeze damage.
- b) Non-Spray Surface Application Systems

Non-spray surface application systems which provide for even distribution of wastewater effluent on the land site may be utilized, including ridge and furrow, gated pipe, or equivalent systems. These systems may be mobile or fixed on the site. They shall be designed to minimize clogging and to allow for ease of maintenance.
- c) Spray Irrigation Systems
 - 1) Spray Equipment
 - A) Fixed head systems and center pivot rigs may be utilized. A permanent connection point must be provided for each setting of moveable spray irrigation equipment. The design shall include provisions for shutting off the peripheral spray heads to prevent drift of spray beyond the application area under design wind conditions.
 - B) The irrigation system controls shall be simple and be protected from lightning damage.
 - C) The design maximum wind velocities shall be 15 MPH in urban and residential areas and 25 MPH in agricultural areas.
 - 2) Nozzle Pressure Regulation

Regulation of nozzle pressure to compensate for field elevations and line losses shall be provided.

Section 372.310 Runoff Control

The design shall provide for control of the application intensity to prevent runoff in response to treated wastewater application on all parts of the application field. In order to minimize runoff during precipitation events, the exclusion of runoff from adjacent areas shall be considered.

Section 372.320 Application Area Access Control

The entire application area and buffer area shall be posted at 100 yard intervals around the perimeter identifying the area as a "Treated

Wastewater Application Area". The application area shall be fenced to prevent access by children and unauthorized personnel unless the pretreatment provided meets the urban area pretreatment requirements of Section 372.400(b) or the land application system is located in an agricultural area or a forested area that does not have general public access.

SUBPART D: PREAPPLICATION TREATMENT AND STORAGE

Section 372.400 Degree of Treatment Required Relative to Application Area

- a) Agricultural Areas
Agricultural or forested areas that do not have public access shall provide at a minimum a two cell lagoon system or a mechanical secondary treatment facility.
- b) Urban Areas
Urban parks, forest preserves and golf courses and other areas with public access shall utilize as a minimum a two cell lagoon system with tertiary sand filtration and disinfection or a mechanical secondary treatment facility with disinfection.

Section 372.410 Preapplication Treatment Plant Design

- a) Design and Construction Requirements
All preapplication treatment systems shall be designed and constructed in accordance with 35 Ill. Adm. Code 370, Illinois Recommended Standards for Sewage Works.
- b) Screening
All treatment systems except those requiring tertiary filtration must have a screening device sized to minimize plugging of the spray nozzles following the storage lagoon prior to the irrigation distribution system.

Section 372.420 Storage

- a) Storage Volume
All land application systems must provide adequate storage, with adequacy being determined using either of the following methods, except that those facilities that do not generate wastewater year round must use Method I:
 - 1) Method I
Adequate storage shall be based on a rational design that must include capacity for the wettest year with a 20-year return frequency. The volume provided shall be sufficient to hold flows received during the following periods:
 - A) When the soil is frozen, including subsoil frost layers;
 - B) When there is an ice or snow cover on the ground;
 - C) When the soil temperature at 4" depth is less than 40 F;
or the mean air temperature is less than 35 F;
 - D) When the ground is saturated or there is standing water (as from late winter snowmelt or spring rains);
 - E) When the groundwater table is within 4 feet of the surface;
 - F) During days when precipitation exceeds 0.1 inch;
 - G) During agricultural and horticultural practices;
 - H) During days set aside for equipment maintenance;

- I) During days when the design maximum wind velocity is exceeded; and
 - J) When the soil is barren, except for seeded areas, areas with growing crops, or areas with a trashy cover to prevent erosion.
- 2) Method II
The minimum storage capacity, by volume, shall be capable of storing at least 150 days production of wastewater, at design average flow, except that in southern Illinois areas (defined as all areas south of Interstate 70) a minimum of 120 days storage capacity shall be provided.
- b) Design and Construction Requirements
The storage lagoon must be designed and constructed in accordance with 35 Ill. Adm. Code 370, Illinois Recommended Standards for Sewage Works.

Section 372.430 Treatment and Storage Area Access Control

The entire treatment and storage lagoon area shall be enclosed with fencing to preclude livestock and prevent access by the general public. Warning signs shall be posted at 100-yard intervals on exterior fences designating the area as a "Wastewater Treatment Facility". A vehicle access gate of sufficient width to accommodate mowing equipment and maintenance vehicles shall be provided. All access gates shall be provided with locks.

SUBPART E: MONITORING REQUIREMENTS

Section 372.500 Groundwater Monitoring

- a) General
 - 1) Saturated zone groundwater monitoring shall be provided for all land application systems. A minimum of three groundwater monitoring wells must be provided, one upgradient for determining background concentrations and two downgradient in the dominant direction of groundwater movement from the land application system.
 - 2) Provision shall be made for sampling of the discharge from any drainage tiles underlying the application area.
- b) Potable Water Supply Wells
Where the project site is within 1,000 feet of existing potable water wells but the wells are outside the minimum setback zone of the Illinois Groundwater Protection Act [415 ILCS 55], groundwater monitoring wells must be provided between each potable water well and the land application system.
- c) Monitoring Well Design
The monitoring wells shall be constructed with provisions for sampling at the surface of the water table and at 5 feet below the water table at each monitoring site.
- d) Testing and Monitoring Equipment
Provision shall be made for testing groundwater for nitrates, ammonia nitrogen, chlorides, sulfates, pH, total dissolved solids, phosphate, and coliform bacteria as specified by the Agency permit for the project to measure compliance with groundwater standards. Testing shall be performed in accordance with 40 CFR 136 (1992) (no later amendments or editions), and may be done either at an onsite laboratory or through a contractual arrangement with an offsite laboratory.

Section 372.510 System Flow and Stored Volume Measurement

a) System Flows

Plant influent and effluent irrigation flow measurement shall be provided. Flow measurement shall not be less than elapsed time meters used in conjunction with pumping rate tests or calibrated weirs. All flow measurement equipment shall be sized to function effectively in the full range of flows expected and shall be protected against freezing.

b) Stored Volume Measurement

A staff gauge shall be provided in the storage lagoon located near the draw-off structure and must be easily read from the lagoon dike.

c) Monitoring Systems

Monitoring equipment for wastewater application sites shall include equipment for measuring air temperature, soil temperature, precipitation, wind speed and direction, and depth to groundwater.