**Section 370.930 Waste Stabilization Ponds and Aerated Lagoons**

a) Supplement To Engineer's Report

1) The engineer's report shall contain pertinent information on location, geology, soil conditions, area for expansion, and any other factors that will affect the feasibility and acceptability of the proposed treatment.

2) Supplementary Field Survey Data

 The following information must be submitted in addition to that required in Section 370.111:

A) The location and direction of all residences, commercial development, and water supplies within ½ mile of the proposed pond.

B) Soil borings to determine surface and subsurface soil characteristics of the immediate area and their effect on the construction and operation of a pond located on the site.

C) Data demonstrating anticipated percolation rates at the elevation of the proposed pond bottom.

D) A description, including maps showing elevations and contours of the site and adjacent area suitable for expansion.

E) Sulfate content of the water supply.

F) Identification of the location, depth and discharge point of any field tile in the immediate area of the proposed site.

b) Location

1) Distance From Habitation

 A pond site should be as far as practicable from habitation or any area which may be built up within a reasonable future period.

2) Prevailing Winds

 If practicable, ponds should be located so that local prevailing winds will be in the direction of uninhabited areas. Preference should be given sites which will permit an unobstructed wind sweep across the ponds, especially in the direction of the local prevailing winds.

3) Surface Runoff

 Adequate provisions shall be made to divert storm water around the ponds and otherwise protect pond embankments.

4) Ground Water Contamination

 The requirements of the Illinois Groundwater Protection Act [415 ILCS 55] shall be taken into account in the siting of ponds. Ponds should not be located proximate to water supplies and other facilities subject to contamination or located in areas of porous soils and fissured rock formations. If conditions dictate using such a site, then the potential for and the means necessary to combat groundwater contamination shall be critically evaluated in the engineer's report. In such locations, the Agency will require groundwater monitoring wells.

5) Geology

 Ponds shall not be located in areas subject to sink holes and mine subsidence. Soil borings and tests to determine the characteristics of surface soil and subsoil shall be made a part of preliminary pond site selection surveys. Gravel and limestone areas should be avoided; however, where conditions dictate locating ponds in such areas and the minimum separation between the pond bottom and gravel or limestone will be less than 10 feet, the Agency shall be contacted about the necessary precautions.

c) Basis Of Design

1) Organic Loading

A) Waste Stabilization Ponds

 The organic loading on each cell shall not exceed the loadings listed below. If more accurate design information for the particular type waste is not submitted and supported by the engineer, subsequent cells shall be sized for an organic loading of 25% of each preceding cell.

i) North of Illinois Highway 116 (Pontiac) 22 lbs. BOD per acre per day.

ii) Between Illinois Highway 116 and U.S. Highway 50, 26 lbs. BOD per acre per day.

iii) South of U.S. Highway 50 (Salem-Carlyle) 30 lbs. BOD per acre per day.

B) Aerated Lagoons

 The organic loading for aerated lagoons shall not exceed 0.5 lb. BOD[5] day per 1,000 cu. ft. first cell nor 0.3 lb. BOD[5] day per 1,000 cu. ft. on any subsequent cells. If more accurate design information for the particular type waste is not submitted and supported by the engineer, the second and third cells shall be sized for an organic loading of 25% of each preceding cell.

2) Depth

A) Waste Stabilization Ponds

 The minimum operating liquid depth for waste stabilization ponds should be 2 feet. The maximum operating liquid depth shall be based on design storage requirements and shall not be less than 5 feet.

B) Aerated Lagoons

 The design water depth for aerated lagoons should be 10 to 15 feet. This depth limitation may be altered depending on the aeration equipment, waste strength, climatic and geological conditions.

3) Aeration Requirements For Aerated Lagoons

A) Aeration systems shall be designed to provide, with the largest unit out of service, a minimum of 1,500 cu. ft. of air/lb. of BOD5 in the raw waste (1.5 lbs. of oxygen/lb. of BOD5 plus oxygen required to oxidize the ammonia present in the raw waste). The aeration equipment shall be located to ensure proper mixing and distribution of oxygen in proportion to oxygen demand in multiple cells. Splash type aerators with motors above the water surface may not be used.

B) Where hose type diffusers are used, the holes shall be of sufficient size to prevent plugging by dissolved solids incrustation.

4) Multiple Cells

 A minimum of two cells to be operated in series or parallel should be provided for all waste stabilization ponds when they are utilized as a part of the primary and secondary treatment process. The number of cells required for aerated lagoons are dependent upon the degree of treatment required. Refer to subsection (c)(6).

5) Pond Shape

 The shape of all primary cells should be such that there are no narrow or elongated portions. Round, square, or rectangular ponds with a length not exceeding 3 times the width are considered most desirable. No islands, peninsulas, or coves should be permitted. Dikes should be rounded at corners to minimize accumulations of floating materials.

6) Solids Removal

 All lagoon systems shall include effective solids removal facilities. Design criteria for acceptable solids removal facilities are contained in Subpart K. Other solids removal facilities may be approved in accordance with Section 370.520(b).

d) Construction Details

1) Embankments and Dikes

A) Material

 Embankments and dikes shall be constructed of relatively impervious materials and compacted to at least 90% Standard Proctor density to form a stable structure. Vegetation and other unsuitable material shall be removed from the area upon which the embankment is to be placed.

B) Top Width

 The minimum embankment top width should be 8 feet to permit access of maintenance vehicles. Lesser top widths will be considered for very small installations.

C) Maximum Embankment Slopes

i) Inner Slopes:

 3 horizontal to 1 vertical.

ii) Outer Slopes:

 3 horizontal to 1 vertical.

D) Minimum Embankment Slopes

i) Inner Slopes:

4 horizontal to 1 vertical. Flatter slopes are sometimes specified for larger installations because of wave action but have the disadvantage of added shallow areas conducive to emergent vegetation.

ii) Outer Slopes:

Outer slopes shall be sufficient to prevent surface runoff from entering the ponds.

E) Freeboard

 Minimum freeboard shall be 3 feet except for very small installations 2 feet may be acceptable.

F) Erosion Control Requirements

 For effective erosion control on the lagoon embankments, both seeding and riprap (or acceptable alternate) are required.

i) Seeding

Embankments shall be seeded from the outside toe to 1 foot above the high water line on the dikes, measured on the slope. Perennial type, low growing, spreading grasses that withstand erosion and can be kept mowed are most satisfactory for seeding of embankments. In general, alfalfa and other long rooted crops should not be used in seeding, since the roots of this type plant are apt to impair the water holding efficiency of the dikes. The County Agricultural Extension Agent can usually advise as to hardy, locally suited permanent grasses which would be satisfactory for embankment seeding.

ii) Riprap

Riprap (or acceptable alternate) shall be placed on the inner slope of the embankments from 1 foot above the high water mark to 1 foot below the low water level. Riprap shall be comprised of a two-layer system consisting of a minimum 4-inch layer of coarse aggregate that meets the Illinois Department of Transportation (IDOT) Standard Specification for Road and Bridge Construction adopted January 1, 1997 for the gradations in the range of CA-6 through CA-10 and a minimum 12-inch layer of stone. The rock layer shall consist of evenly graded material with a maximum weight of 150 pounds per piece and shall meet the IDOT gradations for rock of either Grade No. 3 or 4.

2) Pond Bottom

A) Uniformity

 Finished elevations shall not be more than 3 inches from the average elevation of the bottom. Shallow or feathering fringe areas usually result in locally unsatisfactory conditions.

B) Vegetation

 The bottom shall be cleared of vegetation and debris. Organic material thus removed shall not be used in the dike core construction. However, suitable topsoil relatively free of debris may be used as cover material on the outer slopes of the embankment.

C) Soil

 Soil used in constructing the pond bottom (not including the seal) shall be relatively incompressible and tight. Porous topsoil shall be removed. Porous areas, such as gravel or sandy pockets, shall be removed and replaced with well compacted clay. The entire bottom shall be compacted at or up to 4% above the optimum water content to at least 90% Standard Proctor density.

D) Seal

 The pond bottom and embankments shall be sealed such that seepage loss through the seal is as low as possible. Seals consisting of soils, bentonite or synthetic liners may be used, provided that the permeability, durability and integrity of the proposed material is demonstrated for anticipated conditions. The results of a testing program that substantiates the adequacy of the proposed seal shall be incorporated into or accompany the engineering report. Standard ASTM procedures or similar accepted testing methods shall be used for all tests.

i) A seal consisting of soil materials shall have a thickness of at least 24 inches and a permeability of less than 1x10-7 cm per second. Provision shall be made in the specifications for demonstrating the permeability of the seal after completion of construction and prior to filling the pond.

ii) For a seal that consists of a synthetic liner, seepage loss through the liner shall not exceed a quantity equivalent to seepage loss through a soil seal as described above.

E) Prefilling

 Prefilling the pond after completion of testing is recommended in order to protect the seal from weed growth, to prevent drying and cracking and to reduce odor during initial operation. The pond dikes must be completely prepared as described in subsection (d)(1)(F). Synthetic liners shall be protected from damage during installation and filling.

3) Influent Lines

A) Material

 Any generally accepted material for underground sewer construction will be given consideration for the influent line to the pond. The material selected should be adapted to local conditions. Special consideration must be given to the character of the wastes, possibility of septicity, exceptionally heavy external loadings, abrasion, the necessity of reducing the number of joints, soft foundations, and similar problems.

B) Manholes

 A readily accessible manhole shall be installed at the terminus of the trunk sewer or the force main, unless the force main discharges directly to the lagoon as described in subsection (d)(3)(H). The manhole shall be located as close to the dike as topography permits and its invert should be at least 6 inches above the maximum operating level of the pond to provide sufficient hydraulic head without surcharging the manhole. Surcharging of the sewer upstream from the inlet manhole is not permitted.

C) Grade

i) Influent line can be placed at zero grade and should be located along the bottom of the pond so that the top of the pipe is just below the average elevation of the pond bottom. The pipe shall have adequate seal below it.

ii) The laying of the influent pipe on the surface of the pond bottom is prohibited.

D) Point of Discharge

 Influent lines to the primary cell should terminate at approximately the third point farthest from the outlet structure. For interconnecting piping to secondary cells refer to subsection (d)(4)(B).

E) Flow Distribution

 Flow distribution structures shall be designed to effectively split hydraulic and organic loads proportionally to primary cells. Refer to Section 370.520(f).

F) Submerged Inlets

 Submerged inlet lines shall discharge horizontally into a shallow, saucer-shaped depression which should extend below the pond bottom not more than the diameter of the influent pipe plus 1 foot.

G) Discharge Apron

 The end of the discharge line should rest on a suitable concrete apron with a minimum size of 2 feet square.

H) Force Mains

 Force mains discharging directly to lagoons are permitted if the force main has a freefall discharge into the lagoon and is not turned upward at the point of discharge. The point of discharge shall be at approximately the third point farthest from the outlet structure and the pipe shall be sloped for drainage into the lagoon to avoid freezing.

I) Anti-Seep Collars

 Anti-seep collars shall be used on all piping passing through or under the lagoon embankments.

4) Outlet Structures and Interconnecting Piping

A) Outlet Structure

i) Outlet structures shall be designed to allow the operating level of the pond to be adjusted to permit operation at depths of 2 feet to the maximum depth. The design shall also allow effluent to be drawn from various depths below all operating levels. All structures and devices such as weirs, gates and valves shall be watertight and capable of being easily adjusted by the operator without the need of additional mechanical equipment. Wooden stop-planks are not acceptable for level control.

ii) Drawoff lines should not be located any lower than 12 inches off the bottom to control eroding velocities and avoid pickup of bottom deposits.

iii) A locking device should be provided to prevent unauthorized access to the level control facilities.

iv) When possible, the outlet structure should be located on the windward side to prevent short circuiting. The outlet structure shall be properly baffled to prevent the discharge of floating material.

v) Consideration must be given in the design of all structures to protect against freezing or ice damage under winter conditions.

B) Interconnecting Piping and Unit Bypass

i) Interconnecting piping and overflows should be constructed of materials that will withstand damage during construction and operation, giving special consideration to damage that may occur during compaction of embankments and damage to shallow piping. Piping shall be sized to allow transfer of maximum flows without raising the lagoon water level by more than 6 inches in the upstream cell. In no case shall interconnecting pipe be less than 8 inches in diameter. Interconnecting piping between cells should be valved or provided with other arrangements to regulate flow between structures and permit flexible depth control.

ii) The interconnecting pipe to the secondary cell should discharge horizontally near the lagoon bottom to minimize need for erosion control measures and should be located as near the dividing dike as construction permits.

iii) Piping and valves shall be provided so that each cell can be operated independently of any other cell. Provision shall be made for independent cell dewatering.

C) Anti-Seep Collars

 Anti-seep collars shall be used on all interconnecting and outlet piping passing through or under the lagoon embankments.

5) Miscellaneous

A) Fencing

 The pond area shall be enclosed with a suitable fence to preclude livestock and discourage trespassing. A vehicle access gate of sufficient width to accommodate mowing equipment shall be provided. All access gates shall be provided with locks.

B) Warning Signs

 Appropriate signs should be provided along the fence around the pond to designate the nature of the facility and advise against trespassing.

C) Flow Measurement, Sampling and Level Gauge

 Provisions for flow measurement and sampling shall be provided on the inlet and outlet. Pond level gauges shall be provided. The NPDES permit monitoring requirements for the facility shall be taken into account. Elapsed time meters on pumps or calibrated weirs may be used as flow measurement devices for lagoons.

D) Sludge Removal

When an existing lagoon is to be upgraded, the project design shall provide for removal of any sludge accumulation in the existing lagoon. The sludge removed shall be disposed of in accordance with IPCB regulations.

(Source: Amended at 21 Ill. Reg. 12444, effective August 28, 1997)