**Section 370.1210 Ammonia Control**

a) General

Ammonia control can be accomplished by physical, chemical, biological and ion-exchange techniques. These criteria contain design standards for a limited number of biological types and configurations of ammonia control systems. Other types and configuration of systems will be evaluated in accordance with Section 370.520(b).

1) Process Selection

A) Biological systems, normally used to accomplish secondary levels of treatment, may be adapted to function as nitrification systems. In applications of the fixed growth processes staged biological treatment is normally provided. The single stage activated sludge process has been found to be reliable for nitrification and is more commonly used than the two-stage activated sludge process.

B) Because operating data and experience for the fixed growth processes for nitrification are not well established, expected performance in all cases shall be based upon experience at similar full scale installations or thoroughly documented prototype testing with the particular wastewater. The design shall provide the necessary flexibility to perform satisfactorily within the range of expected waste characteristics and temperatures.

2) Alkalinity and pH Control

Biological utilization of ammonia to produce nitrates is consumptive of available alkalinity in the ratio of 7.14 pounds alkalinity (as CaCO3) per pound of ammonia nitrogen (as N) oxidized. The determination of the need for added alkalinity must be calculated and included in the basis of design to be submitted with the plan documents for Agency approval. The following factors shall be taken into account in determining the amount of alkalinity to be added:

A) The available alkalinity in the raw wastewater and any sidestreams;

B) The total ammonia load (including sidestreams such as flows from digesters and sludge handling facilities) imposed on the process;

C) The alkalinity needed to maintain pH levels in the range of 7.2 to 8.4.

3) Load Equalization

Load equalization shall be considered to limit peak loadings of ammonia from plant sidestreams or slug sources on the sewer system. For the fixed growth biological nitrification processes, the ammonia loading peaks shall be limited to 150% of the design average ammonia loading value.

b) Intermittent Sand Filters

Intermittent sand filters, used in conjunction with various primary and secondary treatment systems, may be considered for use as a biological process to convert ammonia to nitrate.

1) Construction Details

The construction details are generally as described in Section 370.940(g).

2) Loading Criteria

A) Following Primary Treatment

The design loading criteria following primary treatment is described in Section 370.940(e), (f) and (h) except that reduced organic loadings should be considered to insure meeting effluent ammonia limitations.

B) Following Secondary Treatment

The design loading criteria following secondary treatment is described in Section 370.1130(b)(4) and (d)(3).

c) Suspended Growth Systems

1) Applicability

Suspended growth nitrifying systems may be designed as a single stage process with combined carboneous BOD removal and nitrogenous oxygen demand reductions or as the second stage of a two-stage process following a first stage activated sludge process or other types of biological treatment such as trickling filters.

2) Design Requirements

A) Aeration and Mixing

For nitrification, the oxygen requirement for oxidizing ammonia must be added to the requirement for carbonaceous BOD removal. The nitrogen oxygen demand shall be taken as 4.6 times the peak hourly ammonia (as N) content of the influent. In addition, the oxygen demands due to sidestream flows (digestion and sludge handling facilities and the like) must be considered due to the high concentrations of BOD and ammonia associated with such flows. Sufficient aeration and mixing capability shall be provided to maintain a sludge age of up to 20 days and a dissolved oxygen concentration in the aeration tank of at least 2 mg/l.

B) Power

Careful consideration should be given to maximizing oxygen utilization per unit of power input. Unless flow equalization is provided, the aeration system should be designed to match the peak hourly load variation while economizing on power input.

C) Temperature

Careful consideration shall be given in the design and selection of aeration and mixing equipment to minimize heat losses and to maintain sewage temperatures of at least 50º F in cold weather.

D) Chemical Feed

Where the ratio of ammonia to available alkalinity in the wastewater requires its use, chemical feed equipment shall be provided to maintain adequate alkalinity and a pH level between 7.2 and 8.4.

3) Single Stage Activated Sludge

In addition to the requirements of Section 370.920, the following criteria shall govern the design:

A) Organic Loading Organic loading shall not exceed 15 lbs/day of BOD5 per 1,000 cu.ft. of available tank volume.

B) Detention Time

The hydraulic detention time shall be a minimum of 8 hours based on the plant design average flow as determined by Section 370.520(c).

4) Activated Sludge Nitrifying Stage Following Secondary Treatment

The following subsections set out criteria in addition to the requirements of Section 370.920 for the activated sludge nitrifying stage following a first stage activated sludge or fixed growth process used for carbonaceous BOD removal.

A) Organic Loading

BOD5 concentration shall be limited to 20-50 mg/1.

B) Detention Time

The hydraulic detention time shall be a minimum of 6 hours based on the plant design average flow as determined by Section 370.520(c).

C) Special Design Requirement

The following requirements in addition to subsection (c)(3) above, shall be provided:

i) Bypass around the first stage process to allow discharge of raw or primary settled sewage to the second stage aeration tank as needed as a carbon source for control of the nitrification process.

ii) Careful consideration shall be given in the design and selection of covers and ventilation or aeration and mixing equipment to minimize heat losses in the first stage process and maintain sewage temperatures of at least 50º F in cold weather.

d) Fixed Growth Systems

1) Applicability

Nitrifying fixed growth systems may be used following activated sludge and fixed growth systems used for carbonaceous BOD removal.

2) Design Requirements

A) Peak Loadings

In addition to the requirements of Section 370.900, the design of fixed growth systems shall take into account the peak hourly ammonia content of the influent. The design shall provide for ammonia load equalization in accordance with subsection (a)(3) above.

B) Temperature

Adequate cover or housing of the nitrification units shall be provided and preceding systems shall be designed or upgraded to minimize heat losses to maintain sewage temperatures of at least 50º F in cold weather.

C) Ventilation for Process Air Requirements

Adequate ventilation shall be provided to satisfy the oxygen demand of the process. Refer to Section 370.900(e)(5).

D) Chemical Feed

Chemical feed equipment shall be provided to maintain adequate alkalinity concentrations and a pH level between 7.2 and 8.4 where the ratio of ammonia to available alkalinity in the wastewater requires its use.

E) Post-Process Settling

Settling tanks following nitrifying fixed growth systems shall be provided and designed in accordance with Subpart G. A single unit will be allowed if the applicable BOD and suspended solids effluent limitations can be met and other serious operational problems will not occur when the clarifier is temporarily out of service.

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