**Section 370.1120 High Rate Filtration**

a) Design Considerations

Care should be given in the selection of pumping equipment ahead of filter units to minimize shearing of flow particles. Consideration should be given in the plant design to providing flow-equalization facilities to moderate filter influent quality and quantity.

b) Pretreatment

A positive method shall be provided to control the suspended solids loading to the filters. Equipment for the feeding of chemical coagulant aids prior to secondary settling shall be provided unless other equally effective means of suspended solids control are used.

c) Multiple Units

Multiple units shall be provided. At least three units should be provided. Units shall be capable of independent operation and maintenance.

d) Filtration Rates

The peak hourly flow rate applied to the filter shall not exceed 5 gpm/sq. ft. of filter area, computed with one unit out of service.

1) Rate Controls

Controls shall be provided which allow adjustment and control of the rate of flow to each filter unit.

2) Flow Measurement

The flow to each filter shall be monitored by indicating equipment.

e) Accessibility and Maintenance

Each filter unit shall be designed and installed so that there is ready and convenient access to all components and the media surface for inspection and maintenance without taking other units out of service.

f) Housing

Housing of filter units shall be provided. The housing shall be constructed of suitable corrosion-resistant materials. All controls shall be enclosed, and the structure housing the filter, controls and equipment shall be provided with heating and ventilation adequate to minimize problems with excess humidity.

g) Construction Details

1) Underdrains

The underdrain system shall be designed for uniform distribution of flow of backwash water (and air, if provided) without danger of clogging from solids in the backwash water. A positive means of pressure relief shall be provided for the underdrain system to prevent structural damage by excessive backwash pressures. The selection of the underdrain system shall be based on demonstrated satisfactory field experience under similar conditions.

2) Media

The selection of proper media sizes and types depends upon the filtration rate selected, the type of treatment provided the influent to the filter, filter configuration, and effluent quality objectives. In dual or multi-media filters, media size and type selection must consider compatibility among media. Media shall be selected and provided to meet specific conditions and treatment requirements relative to the project under consideration. The selection and sizing of the media shall be based on demonstrated satisfactory field experience under similar conditions. All media shall have a uniformity coefficient of 1.7 or less. The uniformity coefficient, effective size, depth and type of media shall be set forth in the specification.

3) Appurtenances

The design of the filter appurtenances shall be based on demonstrated satisfactory field experience under similar conditions. The filters shall be equipped with the following:

A) Wash water troughs.

B) Surface wash, air scouring equipment or mechanical agitation designed to adequately remove entrapped solids from the media.

C) Equipment for measuring filter head loss.

D) Filter influent and effluent sampling points.

Also refer to subsections (h)(2), (h)(4) and (i) below.

h) Backwash

1) Rate and Duration

The backwash rate shall be adequate to fluidize and expand each media layer a minimum of 20 percent based on the media selected. Minimum and maximum backwash rates shall be based on demonstrated satisfactory field experience under similar conditions. The design shall provide for a minimum backwash period of 10 minutes. Excessive backwash rates may cause washout of the filter media.

2) Control and Flow Measurement

A positive means of shutting off flow to a filter shall be provided. Controls shall be provided which permit adjustment of both the backwash rate and the backwash period. Flow measurement of the backwash flow rate shall be provided. A staff gauge or wall mounted scale to allow use of the rise rate for flow measurement may be used.

3) Clearwell

A clearwell or other plant tankage isolated from unfiltered flows shall be provided as a source of backwash water. Filtered plant effluent shall be used as backwash water. The volume of storage provided shall be sufficient to allow sequential backwashing of at least 2 filter units at the design backwash rate.

4) Chlorination of Filter Backwash

Provision shall be made for periodic chlorination of filter backwash water (or filter influent) to control slime growths. The flows from the cleaning of the filters shall be returned to the head of the plant. Refer to subsection (h)(6)(A) below.

5) Backwash Pumps

Where used, backwash pumps shall be provided in multiple units, designed for independent operation and maintenance. Pumps shall be sized in accordance with subsection (h)(1) above to provide the required backwash rate with one unit out of service and should be of equal size. The total dynamic head of the pump shall be limited to that needed for the application so that undue stress of the underdrain system will not occur. Refer to subsection (g)(1) above.

6) Mudwell

A mudwell or other plant tankage shall be provided to hold backwash water from the filters. The volume provided shall be sufficient to hold the water generated by the backwashing of two filter units including the water in and above the filter media prior to filtration. Refer to subsection (h)(1) above. Filter backwash shall be returned to process or otherwise treated to insure compliance with applicable standards.

A) Return Rate

The rate of return of filter backwash to the treatment units shall not exceed 15 percent of the design average flow to the treatment units. Refer to subsection (j)(1) below and Section 370.520(g).

B) Mudwell Return Pumps

Backwash return pumps, where used, shall be provided in multiple units designed for independent operation and maintenance. The units shall be sized to provide the required pumping rate with the largest unit out of service. Refer to subsection (h)(6)(A) above.

i) Control Panel

Automatic controls shall be provided, with a manual override on the control panel for operating equipment, including each individual valve essential to the filter operation.

j) Miscellaneous Considerations

1) Return Backwash Loadings

The return of backwash water and solids will result in increases in the hydraulic and suspended solids loads to the preceding treatment units. Design of these units shall take into account the increased loads.

2) Oil and Grease

Filters at treatment plants treating wastewaters containing above normal concentrations of greases or similar materials should be of the gravity type. Facilities should be considered for the periodic addition of chemicals to remove greases in such cases.

3) Proprietary Equipment

Proprietary equipment not conforming to the requirements of this section will be evaluated on a case-by-case basis in accordance with Section 370.520(b).

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