**Section 370.520 Design**

a) Type of Treatment

1) As a minimum, the following items shall be considered in the selection of the type of treatment:

A) Present and future effluent requirements.

B) Location and local topography of the plant site.

C) The effects of industrial wastes likely to be encountered.

D) Ultimate disposal of sludge.

E) System capital costs.

F) System operating and maintenance costs and basic energy requirements.

G) Existing unit process performance and capacity.

H) Process complexity governing operating personnel requirements.

I) Environmental impact on present and future adjacent land use.

2) The plant design shall provide the necessary flexibility to perform satisfactorily within the expected range of waste characteristics and volumes.

b) Required Engineering Data for New Process Evaluation

1) The policy of the Agency is to encourage rather than obstruct the development of any methods or equipment for treatment of wastewaters. The lack of inclusion in these standards of some types of wastewater treatment processes or equipment should not be construed as precluding their use. The Agency may approve other types of wastewater treatment processes and equipment under the condition that the operational reliability and effectiveness of the process or device shall have been demonstrated with a suitably-sized prototype unit operating at its design load conditions, to the extent required.

2) To determine that such new processes and equipment have a reasonable and substantial chance of success, the Agency will require the following:

A) Monitoring observations, including test results and engineering evaluations, demonstrating the efficiency of such processes.

B) Detailed description of the test methods.

C) Testing, including appropriately-composited samples, under various ranges of strength and flow rates (including diurnal variations) and waste temperatures over a sufficient length of time to demonstrate performance under climatic and other conditions which may be encountered in the area of the proposed installations.

D) Other appropriate information.

3) The Agency will require that appropriate testing be conducted and evaluations be made under the supervision of a competent process engineer other than those employed by the manufacturer or developer.

c) Design Loads

1) Hydraulic Design

A) New Systems

Plans for sewage treatment plants to serve new sewer systems for municipalities or sewer districts shall be based upon a design average daily flow of at least 100 gallons per capita, to which must be added industrial waste volumes. The design also shall include appropriate allowance for flow conditions determined under Section 370.122.

B) Existing Systems

Where there is an existing sewer system, the volume and rates of the existing sewage flows shall be determined. The determination shall include both dry weather and wet weather flows. At least one year's flow data should be used to determine the design flows that are defined in Section 370.220.

C) Treatment Plant Design Capacity

The treatment plant capacity shall be rated on the design average flow, selected after any sewer system rehabilitation, plus appropriate future growth. The design of treatment units that are not subject to peak flow requirements shall be based on the design average flow. For plants subject to high wet weather flows or overflow detention pumpback flows, the design maximum flow that the plant is to treat on a sustained basis must be specified.

2) Organic Design

A) New Systems Minimum Design

i) Domestic waste treatment design shall be on the basis of at least 0.17 pounds of biochemical oxygen demand (BOD5) per capita per day and 0.20 pounds of suspended solids per capita per day.

ii) When garbage grinders are used in areas tributary to a domestic treatment plant, the design basis should be increased to 0.22 pounds of BOD5 and 0.25 pounds of suspended solids per capita per day.

iii) Domestic waste treatment plants that will receive industrial wastewater flows shall be designed to include these industrial waste loads.

B) Existing Systems

When an existing treatment works is to be upgraded or expanded, organic design shall be based upon the actual strength of the wastewater as determined from measurements taken in accordance with subsection (c)(1)(B), with an appropriate increment for growth as determined under the provisions of subsection (c)(2)(A).

3) Shock Effects

Domestic waste treatment designs shall consider and take into account the shock effect of high concentrations and diurnal peaks for short periods on the treatment process, particularly for small waste treatment plants serving institutions, restaurants, schools, etc.

4) Design by Analogy

Data from similar existing systems may be utilized in the case of new systems; however, thorough investigation and adequate documentation shall be made to establish the reliability and applicability of such data.

d) Conduits

1) All piping and channels shall be designed to carry the maximum expected flows. The incoming sewer shall be designed for unrestricted flow. Bottom corners of the channels must be filleted. Conduits shall be designed to avoid creation of pockets and corners where solids can accumulate.

2) Suitable gates should be placed in channels to seal off unused sections which might accumulate solids. The use of shear gates is permitted where they can be used in place of gate valves or sluice gates. Non-corrodible materials shall be used for these control gates.

e) Arrangement of Units

Component parts of the plant should be arranged for greatest operating convenience, flexibility, economy, continuity of maximum effluent quality, and so as to facilitate installation of future units.

f) Flow Division Control

Flow division control facilities shall be provided as necessary to insure organic and hydraulic loading control to plant process units and shall be designed for easy operator access, change, observation, and maintenance. The use of head boxes equipped with sharp-crested weirs or similar devices are recommended. The use of valves for flow splitting is not acceptable. Appropriate flow measurement shall be incorporated in the flow division control design.

g) Load Equalization and Attenuation

1) Equalization of hydraulic and organic loads to downstream treatment units is recommended where the peak hourly load exceeds 300% of the design average load. Particular attention shall be given to equalization of pumped flows to limit hydraulic surges on downstream units.

2) Plants proposed to receive sewage wastes from only institutions (motels, schools, hospitals, nursing homes, etc.) or industries which discharge substantially the total flow in 12 hours or less, shall be designed to include flow equalization. Where flow equalization facilities are provided, the design shall include adequate aeration and mixing equipment to prevent septicity.

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