

phone line to a remote location is used as the means of alarm, the alarm shall be activated in the event of a failure in the telephone line.

(b) The alarm shall be either a suitable audible or visual alarm and shall be so located as to be readily seen or heard.

(6) **EMERGENCY OPERATION.** (a) Provisions for emergency operation of lift stations shall be provided to prevent the discharge of raw or partially treated sewage to a surface water or to the ground surface and to prevent sewage backup into basements.

(b) Power must be available from at least two independent sources or, in the alternative, emergency power generating equipment or portable pumping equipment must be available.

Note: It is recommended that a point of connection to the discharge force main be installed at a point where portable pumping units can be connected.

(7) **FORCE MAINS.** (a) *Velocity.* A velocity in excess of two feet per second shall be maintained in force mains.

(b) *Air relief valve.* An air relief valve shall be placed at high points in the force main to prevent air locking.

(c) *Termination.*

Note: The department recommends that force mains enter gravity sewer manholes at a point not more than 2 feet above the spring line of the outgoing sewer.

History: Cr. Register, November, 1974, No. 227, eff. 12-1-74.

NR 110.15 General requirements for sewage treatment works.

(1) **QUALITY OF EFFLUENT.** (a) For purposes of design, the minimum allowable level of treatment shall be that level of treatment which results in the removal of 90% of the 5-day biochemical oxygen demand (BOD₅) and 90% of the suspended solids (SS).

Note: Higher levels of treatment may be required depending on the characteristic of the waste being treated, the low flow in the receiving stream or the water quality standards of the receiving stream.

(b) Existing treatment plants capable of removing at least 85% of the BOD₅ and SS and capable of producing an effluent quality of less than 30 mg/l of BOD₅ and SS on a monthly average will be allowed to remain in service for the design life of the plant if water quality standards can be met in the receiving water.

(c) All effluents discharged to a receiving surface water, except from stabilization ponds, shall be properly disinfected in accordance with NR 111.23.

(2) **DESIGN PERIOD.** Sewage treatment plants shall be designed to provide for the estimated population 20 years hence.

Note: The department will waive this requirement upon a demonstration to its satisfaction that a lesser design period is more cost-effective.

(3) **PLANT LOCATION.** (a) Sewage treatment processes, except for lagoon systems, shall be located on sites not less than 500 feet from the nearest inhabited dwelling. Aerated lagoon treatment system shall be located not less than 750 feet from inhabited dwellings and stabilization ponds shall be located not less than 1,500 feet from inhabited dwellings.

(b) Existing treatment facilities which when constructed met the above distance requirement but which have since been encroached upon by residential, commercial or industrial development, shall be subjected to the above requirement at the time of expansion of the facility.

Note: The department may waive this requirement on a case-by-case basis. However, it is recommended that the municipality consider either the purchase of sufficient lands surrounding the plant site or the use of zoning to prevent encroachment of residential, commercial or industrial developments.

(c) All treatment plants and ponds shall be located such that they are not subject to flooding. No plant or pond shall be located in a floodway. If the plant or pond is located in a floodplain, it shall conform to chapter NR 116. The plant or pond shall be accessible at all times.

(4) NEW PROCESSES, METHODS AND EQUIPMENT.

Note: It is the policy of the department to encourage the development of new methods or equipment for treatment of sewage wastes. However, where new processes, methods or equipment are proposed and where limited data is available which demonstrates the performance of the equipment, the department may require the posting of a performance bond by the manufacturer.

(5) **SEWAGE FLOW.** Unless satisfactory justification is given for using a different value, new sewage treatment systems shall be designed for an average daily flow of 100 gallons per capita, and for anticipated daily flows from industrial waste contributors. Modifications or expansions of existing treatment systems shall be based on gaugings of the present sewage flow, plus allowance for estimated future increase.

(6) **BOD₅ AND SS.** Unless satisfactory justification is given for using different values, sewage treatment systems shall be designed based on a BOD₅ contribution of 0.17 pounds per capita per day and SS contribution of 0.20 pounds per capita per day and anticipated industrial waste contributions.

(7) **DESIGN LOADING.** The design of treatment units shall be based on an average rate of sewage flow per 24 hours except where significant deviation from normal diurnal flow pattern exists. Industrial waste design flows shall be determined from the observed rate of flow during the significant period of discharge. The following factors shall be evaluated in determining the design flow of the sewage treatment plant:

- (a) Peak flow rates occurring over significant time periods;
- (b) Data from similar municipalities in the case of new systems;
- (c) Wet weather flows. Excessive clear water must be eliminated at its source and must not be included in the plant design;
- (d) Recirculation.

(8) **DESIGN OF CONDUITS.** All piping and channels shall be designed to carry the maximum flows. The incoming sewer shall be designed to operate without surcharge. Pockets, corners and other dead areas where solids can accumulate must be eliminated.

(9) **ARRANGEMENT OF UNITS.** All treatment units shall be arranged to provide operating convenience and flexibility, and to facilitate installation of future units.

(10) **BY-PASSES.** Complete plant by-passes shall not be provided. By-passing of individual units for maintenance purposes is permissible.

During periods of maintenance, the minimum degree of treatment shall be solids settling and effluent disinfection.

(11) **TREATMENT DURING CONSTRUCTION.** During construction of new facilities, treatment shall be maintained at the same level as that which existed prior to the start of construction.

(12) **CONSTRUCTION MATERIALS.** Materials shall be selected that are compatible with the characteristics of the sewage wastes.

Note: Dissimilar metals should be avoided to minimize galvanic action.

(13) **PAINTING.** (a) The use of paints containing lead is prohibited. In order to facilitate the identification of piping, the following color scheme shall be utilized:

1. Sludge line—brown;
2. Gas line—red;
3. Potable water line—blue;
4. Chlorine line—yellow;
5. Sewage line—gray;
6. Compressed air line—green;
7. Nonpotable water line—blue with 6-inch red bands spaced 30 inches apart.

(b) In addition to the color code, each pipe shall be adequately labeled with a minimum of 2 labels in each room, crawl space or compartment.

(14) **OPERATING EQUIPMENT.** All necessary tools and accessories for the plant operator's use shall be provided. Storage space and a work area shall also be provided.

(15) **EMERGENCY POWER.** A standby power source shall be provided at each sewage treatment plant in the form of connection to 2 independent power sources or by providing an emergency power generator. Sufficient emergency power shall be supplied to provide a minimum treatment equivalent to solids settling and effluent disinfection at all times.

(16) **WATER SUPPLY.** An adequate supply of potable water shall be provided for use in the laboratory. No connections shall be made which might cause contamination of a potable water supply.

(a) *Direct connections.* Potable water from a public supply may be used directly at points above grade for the following hot and cold supplies: lavatory sink, water closet, laboratory sink, shower, eyewash fountain and drinking fountain. Hot water for any of the above shall not be taken directly from a boiler used for supplying hot water to a sludge heat exchanger or digester heating coils.

(b) *Indirect connections.* Where a potable water supply is to be used for any other purpose than those listed in paragraph (a), a break tank, pressure pump and pressure tank or a backflow preventer shall be provided.

1. Break tank. Potable water shall be discharged to the break tank through an air gap at least 6 inches above the maximum flood line or the spill line of the tank, whichever is higher. A sign shall be permanently posted at every hose bib, faucet or sill cock located on the water system beyond the break tank to indicate that the water is not safe for drinking.

2. Backflow preventer. a. Backflow preventers may be used to protect the potable water supply provided that the following conditions are met:

i. Detailed plans and specifications covering the unit and its installation are approved by the department of health and social services, plumbing section, before installation.

ii. The installation is made above grade in a location accessible for testing, inspection and maintenance, and is protected from freezing and flooding.

iii. The unit is installed immediately downstream of the meter prior to any branches off the service line.

b. The following protective devices shall be installed where backflow preventers are used:

i. Chlorinator water supply. A vacuum breaker shall be installed downstream of the last water supply shutoff valve and at an elevation higher than the chlorinator.

ii. Hose bibs and approved yard hydrants. An approved combination backflow-siphon breaker shall be provided.

iii. Sinks or lavatories. A vacuum breaker located 6-7½ feet above the sink or, if located at sink elevation, an anti-hose connection on the faucet shall be required.

iv. Pump bearing lubrication. A vacuum breaker shall be provided downstream of the shutoff valve and above the elevation of the pumps. Additionally, a 1/8" to 1/4" bleed line shall be installed that will allow free discharge to a storm sewer or to the ground surface.

(c) *Separate potable water supply.* Where it is not possible to provide potable water from a public water supply, a separate potable water supply must be provided.

Note: If a separate well is provided, the well specifications and usage must be approved by the private water supply section of the department.

(d) *Separate nonpotable water supply.* Where a separate nonpotable water supply is provided, a break tank or backflow preventer will not be necessary, but all water outlets must be posted with a permanent sign indicating the water is not safe for drinking.

(17) SANITARY FACILITIES.

Note: It is recommended that a toilet, shower and lavatory be provided.

(18) LABORATORY SPACE AND EQUIPMENT. All treatment works should include a laboratory for making the necessary analytical determinations and operating control tests. Equipment necessary for making the various determinations required by the department should be provided. In lieu of laboratory testing at the plant site, a suitable contract with a neighboring plant or independent laboratory is acceptable.

(19) **FLOW MEASUREMENT.** Equipment for flow measurement, totalizing and recording shall be provided for the total waste flow.

Note: It is recommended that measurement of other flow streams within the plant be done in aid of plant operation.

(20) **FLOOR SLOPE.** Floor surfaces shall be sloped adequately to a point of drainage.

(21) **SAFETY.**

Note: Although safety regulation is beyond the scope of these rules, the department recommends that adequate provision be made to effectively protect the operator and visitors from hazards. It is further recommended that the Safety and Health Rules set forth in Chapter IND 1000, Wisconsin Administrative Code, and the appropriate federal and local safety codes be adhered to in the operation of the plant. The following are specific measures which might be taken to enhance the safe operation of the plant:

- (a) Enclosure of the plant site with a fence to discourage entrance of animals or unauthorized persons.
- (b) Installation of hand rails and guards where necessary.
- (c) Provision of first aid equipment.
- (d) Posting of "No Smoking" signs in hazardous areas.
- (e) Provision of protective clothing and equipment such as gas masks, goggles, gloves.

History: Cr. Register, November, 1974, No. 227, eff. 12-1-74; r. and recr. (1) (c), Register, March, 1978, No. 267, eff. 4-1-78.

NR 110.16 Screening devices. (1) **APPLICABILITY.** All sewage treatment plants shall provide protection for pumps and other equipment by installing coarse bar racks or screens, comminutors or mechanically cleaned bar screens. All equipment shall be readily accessible for maintenance. A screening device shall precede grit chambers.

(2) **ACCESS.** Screening devices shall be provided with convenient access, adequate lighting and ventilation, and convenient and adequate means for removing screenings when necessary.

(3) **SEPARATION FROM OTHER EQUIPMENT IN BUILDING.** Screening devices installed in a building where other equipment or offices are located shall be separated from the rest of the building, provided with separate outside entrances, and provided with adequate means of ventilation.

(4) **DESIGN AND INSTALLATION.** (a) *Nonmechanical screens.* Clear openings between bars shall not exceed two inches. Design and installation of bar screens shall be such that they can be conveniently cleaned.

(b) *Mechanical screens.* Clear openings for mechanically cleaned screens may be as small as adequate for conditions.

(c) *Velocities.* For hand raked bar screens the screen chamber should be designed to provide a velocity through the screen of approximately one foot per second at average rate of flow. For mechanically cleaned screens maximum velocities during wet weather periods shall not exceed 2.5 feet per second.

(d) *Invert.* The screen channel invert must be at least 3 inches below the invert of the incoming sewer.

(e) *Slope.* Hand-cleaned screens, except those for emergency use, must be placed on a slope of 30 to 45 degrees with the horizontal.

(5) **CHANNELS.** The channel preceding and following the screen shall be shaped to minimize settling of solids. Fillets shall be installed as necessary. Channels shall be equipped with the necessary gates to divert flow from any one screening unit. Methods for dewatering each unit must be provided.

(6) **SAFETY DEVICES.** All mechanical units which are operated by timing devices shall be provided with auxiliary controls which will activate the cleaning mechanism at predetermined high-water marks or differentials in head.

(7) **HANDLING SCREENINGS.** Adequate facilities must be provided for removal, handling, storage, and disposal of screenings in a sanitary manner. Hand-cleaned screening facilities must include an accessible platform from which the operator may rake screenings. Suitable drainage facilities must be provided both for the platform and for storage areas.

(8) **AUXILIARY SCREENS.** Where mechanically operated screening or comminuting devices are used auxiliary hand-cleaned screens shall be provided. Plant design must provide for the automatic diversion of the entire sewage flow through the auxiliary screens should the regular units fail.

History: Cr. Register, November, 1974, No. 227, eff. 12-1-74.

NR 110.17 Grit removal facilities. (1) **APPLICABILITY.** Grit removal facilities are recommended for all sewage treatment plants, and are required for plants receiving sewage from combined sewers or from sewer systems receiving substantial amounts of grit.

(2) **TYPE AND NUMBER OF UNITS.** Grit removal facilities must have at least two hand-cleaned units, or a mechanically cleaned unit with a bypass. Where aerated grit chambers are proposed, detailed design information and necessary supporting documents shall be provided with the plans.

(3) **DESIGN FACTORS.** (a) *Inlet.* Inlet turbulence shall be minimized.

(b) *Velocity and detention.* Channel-type chambers shall be designed to provide controlled velocities of one foot per second. The detention period shall be based on the size of particle to be removed.

(c) *Grit washing.* All facilities not provided with positive velocity control shall include means for grit washing to further separate organic and inorganic materials.

(d) *Drains.* Drains or other means for dewatering each unit must be provided.

History: Cr. Register, November, 1974, No. 227, eff. 12-1-74.

NR 110.18 Settling tanks. (1) **INLETS.** Settling tank inlets shall be designed to dissipate the inlet velocity, to distribute the flow equally and to prevent short-circuiting. Channels shall be designed to maintain a velocity of at least one foot per second at one-half of design flow. Corner pockets and dead ends shall be eliminated and corner fillets or channeling used where necessary. Elimination or removal of floating materials in inlet structures having submerged ports shall be required.

Register, March, 1978, No. 267
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