Appendix A: Selected "10-States' Standards"

The following selected standards are derived from "Recommended Standards for Sewage Works", originally developed by the Great Lakes-Upper Mississippi River Board of State Sanitary Engineers. Since there are ten states in this board, the publication is commonly referred to as "10-States' Standards."

The standards are subject to change, and this summary is not complete. The items listed here are merely meant to be representative of good wastewater plant design in colder areas of the U.S.

- **Hydraulic Load:** 100 gallons per capita-day for new systems in undeveloped areas unless other information is available.
- **Pumps**: At least 2 pumps are required, and 3 are required when the design flow exceeds 1 MGD. Both pumps should have the same capacity if only 2 pumps are used. This capacity must exceed the design flow for each pump. If 3 or more pumps are used, the capacities may vary, but capacity pumping must be possible with one pump out of service.
- **Racks and Bar Screens**: All racks and screens shall have openings less than 1.75″ wide. The smallest opening for manually-cleaned screens is 1.0″. The smallest opening for automatically-cleaned screens is 0.625″. Flow velocity should be 1.25 to 3.0 fps.
- **Grinders and Shredders**: Grinder/shredders are required if there is no primary sedimentation or fine screens. Gravel traps or grit-removal equipment should precede comminutors.
- **Grit Chambers**: Grit chambers are required when combined storm and sanitary sewers are used. A minimum of two grit chambers in parallel should be used, with a provision for bypassing. The optimum velocity is 1.0 fps throughout. The detention time is dependent on particle sizes to be removed.
- **Plain Sedimentation Tanks**: Multiple units are desirable and must be provided if the flow exceeds 100,000 gpd. For primary settling, the depth should be 7.0′ or greater. The maximum peak overflow rate is 1500 gpd/ft^2.[22] 15,000 gpd/ft is the maximum weir loading. If the flow rate is less than 1.0 MGD, the weir loading should be reduced to 10,000 gpd/ft.
- **Trickle Filters**: Rock media should have a depth of 5′ to 10′. Manufactured media should have a depth of 10′ to 30′. The rock media should be 1″ to $4\frac{1}{2}$″ in size, with no fines. Freeboard of 4′ or more is required. The drain should slope at 1% or more.
- **Activated Sludge Processes**: For sedimentation basins, the following hydraulic loading maximums are specified: 1200 gpd/ft^2 for conventional, step, and contact units; 1000 gpd/ft^2 for extended aeration units; 800 gpd/ft^2 for separate nitrification units. The maximum BOD loading shall be: 40 lbm/day-1000 ft^3 for conventional, step, and complete mix units: 50 lbm/day-1000 ft^3 for contact stabilization units; 15 lbm/day-1000 ft^3 for extended aeration units.

  Aeration tank depths should be between 10′ and 30′. At least two aeration tanks should be used. The dissolved oxygen content should not be allowed to drop below 2.0 mg/l at any time. The aeration rate should be 1500 ft^3 oxygen per pound of BOD_s. For extended aeration, the rate should be 2000 ft^3 oxygen per pound of BOD_s.
- **Final Clarifiers**: Maximum surface settling rate is 800 gpd/ft^2 for separate nitrification stages, 1000 gpd/ft^2 for extended aeration, and 1200 gpd/ft^2 for all other cases, including fixed film biological processes.
- **Lagoons**: Maximum BOD application is 15 to 35 lbm BOD_s per acre-day for both controlled-discharge and flow-through stabilization ponds.
- **Chlorination**: Requires a 15 minute contact period at peak flow.
- **Anaerobic Digesters**: For completely mixed digesters, up to 80 lbm of volatile solids per day per 1000 ft^3 of digester. For moderately mixed digesters, the limit is 40 lbm/day-1000 ft^3. Multiple units. Minimum 20 feet sidewater depth.
- **Sludge Drying Beds**: Requires 2 ft^2/capita-day, if drying beds are the primary dewatering method, and 1 ft^2/capita-day if beds are a back-up dewatering method.

[22] The basin size shall also be calculated based on the average design flow rate and a maximum overflow rate of 1000 gpd/ft^2. The larger of the two sizes shall be used.