State of North Carolina
Department of Environment and Natural Resources

Division of Water Quality
MINIMUM DESIGN CRITERIA FOR
NPDES WASTEWATER TREATMENT FACILITIES

The minimum design criteria contained in this document:

- Are intended to provide technical criteria and clarifications to ensure consistency of very specific design standards for NPDES wastewater treatment facilities that are required to apply for an Authorization to Construct from the Division of Water Quality;
- Present baseline, fundamental design requirements; exceeding the minimum design criteria is strongly encouraged when and where deemed necessary by the applicant and/or the North Carolina-licensed Professional Engineer certifying the design;
- Cannot provide guidance for every potential set of project conditions; therefore, in some situations, complete adherence to the minimum design criteria may not be possible or may not represent the best engineering design; in these situations, unique design criteria and detailed explanations of the design requirements shall be provided to the Division for evaluation as part of the required Engineering Calculations.

---

1. Facility Design Criteria

A. Facility design criteria are contained in the following Sections of the North Carolina Administrative Code (NCAC); all designs must comply with the NCAC requirements:
   - 15A NCAC 02H .0124
   - 15A NCAC 02T .0100
   - 15A NCAC 02T .0800 which references other Sections within Subchapter 02T

B. In addition to the criteria and requirements contained in the Rules cited above, the Division acknowledges that design guidelines contained in the following references are frequently utilized; the Division will consider the applicability of guidelines provided in these references when identified with proper citation and justification as part of the required Engineering Calculations:
   - Recommended Standards for Wastewater Facilities – Published by the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (often referred to as "The 10 States Standards")
   - Wastewater Engineering Treatment and Reuse, Metcalf and Eddy – Published by McGraw Hill
   - Water Environment Federation Manuals of Practice

2. Definitions

A. Aerobic conditions – bulk dissolved oxygen concentration equal to or greater than 1 mg/L.

B. Essential treatment unit – per 15A NCAC 02T .0103(16), any unit associated with the wastewater treatment process whose loss would likely render the facility incapable of meeting the required performance criteria, including aeration units or other main treatment units, clarification equipment, filters, disinfection equipment, pumps and blowers.

C. Firm capacity – capacity of a system (air, pumping, etc.) with the largest single component out of service.

3. Reliability – Multiple Units for Treatment Facilities *Greater than 20,000 Gallons per Day*

A. The design must be prepared in accordance with 15A NCAC 02H .0124 which requires multiple (dual at a minimum) components such as pumps, chemical feed systems, aeration equipment and disinfection equipment.

B. The following unit processes require multiple components, sized to hydraulically pass the peak hourly flow with one component out of service:

i. Preliminary/Primary Treatment:
- Bar screens
  - If a mechanical bar screen is utilized, a manual bar screen may serve as the dual component only if an automatic bypass of the mechanical bar screen is provided
- Primary clarifiers

ii. Secondary/Tertiary Treatment:
- Biological treatment units
- Secondary clarifiers
- Tertiary filters

C. Disinfection requirements are as follows:

i. If chlorine is used for disinfection, multiple feed pumps are required for chlorine disinfection and dechlorination, each sized to treat the peak hourly flow.

ii. If ultraviolet (UV) light disinfection is used, the system must be designed to provide adequate disinfection at the peak hourly flow with one bank out of service as follows:

Permitted Flow (gpd)	Design Criteria	Additional Requirements
5,000,000 and greater	Minimum of 2 banks	Audible & visible alarms to notify operators and control room of lamp/unit failures
		Automatic controls to switch to backup units in case of failure
		Spare lamps kept on-site
> 20,000 to < 5,000,000	Minimum of 2 banks	Ability to notify ORC of lamp/unit failures; telemetry and audible & visible alarms
		Automatic controls to switch to backup units in case of failure
		Spare lamps kept on-site

4. Reliability – Units for Treatment Facilities *Less than or Equal to 20,000 Gallons per Day*

A. The design must include multiple (dual at a minimum) pumps and blowers.

B. For ultraviolet light disinfection systems, one bank is allowed and must be designed to provide adequate disinfection of the wastewater at the peak hourly flow. The system must have the ability to notify the ORC of lamp/unit failures, telemetry and audible and visible alarms, and spare lamps must be kept on-site.

5. Reliability – Power

A. Per 15A NCAC 02H. 0124(2)(a), power reliability shall be provided by either dual power or standby power as follows:

i. For Standby Power: Per 15A NCAC 02T .0505(l), power reliability shall be provided consisting of automatically activated standby power supply onsite capable of powering all essential treatment units under design conditions.

ii. For Dual Power: Dual power is defined as two (2) separate and independent sources of incoming power.

6. **Pump Requirements**

Pumps shall be capable of handling the peak hourly flow with the largest pump out of service (firm capacity).

7. **Air and Blower Requirements**

A. All air requirements shall be calculated based on the plant design maximum month load.

B. For the liquid treatment train biological reactors, the firm capacity of the blowers must provide the air flow required to maintain solids suspension and aerobic conditions in the mixed liquor; dedicated blowers shall be provided where practicable.

8. Chlorine Disinfection Detention Time

All disinfection systems utilizing chlorine shall be sized to provide a minimum of 15 minutes hydraulic detention time under the peak hourly flow.

9. Dechlorination

All disinfection systems utilizing dechlorination shall be designed in accordance with the Recommended Standards for Wastewater Facilities – Published by the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers ("The 10 States Standards").

10. Freeboard

All concrete and steel treatment units shall provide at least 12-inches of freeboard under the peak hourly flow with one treatment train removed from service. Additional freeboard shall be provided as necessary to prevent splashing outside of the treatment unit.