



Additional Design Requirements for Decentralized Wastewater Systems

Utility Approval

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Date

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By



SEC, Inc.
850 Middle Tennessee
Blvd.
Murfreesboro, TN 37129
SEC No. 25814



Foreword

The City of Spring Hill is committed to protecting public health, preserving environmental quality, and supporting sustainable growth within the community. In furtherance of these objectives, the City has adopted the *Standard Technical Specifications for Decentralized Wastewater Systems*, as approved by the Tennessee Department of Environment & Conservation (TDEC). These Specifications were developed in accordance with Chapter 17 of TDEC's *Design Criteria for Sewage Works*.

These Design Requirements for Decentralized Wastewater Systems shall be used in conjunction with the City's Standard Technical Specifications. Together, these establish the governing framework for the planning, design, permitting, and construction of decentralized wastewater systems within the City's jurisdiction.

The purpose of these Design Requirements is to ensure uniformity in system design, maintenance practices, and the interchangeability of replacement components. Standardization enhances reliability, supports efficient long-term operation and maintenance, and safeguards public infrastructure investments and environmental resources.

All decentralized wastewater systems designed, permitted, and constructed within the City's jurisdiction shall conform to these Design Requirements, the associated Standard Technical Specifications, and TDEC's *Design Criteria for Sewage Works*. In the event of a conflict between these Design Requirements and any other applicable federal, state, or local regulation, ordinance, or standard, the more stringent requirement shall govern. Compliance with these documents ensures adherence to applicable regulatory requirements and promotes long-term system performance and operational integrity.

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PART 1 GENERAL

1.1 SUMMARY

- A. The CITY OF SPRING HILL (CITY) has adopted the following system criteria for effluent collection, effluent treatment, and effluent dispersal. State authorities having jurisdiction may have more stringent criteria. In either case, the more stringent criteria shall be adhered to.
- B. The Developer shall submit to the CITY a topographic map showing the complete layout of the subdivision, the proposed location of the treatment facility and the drip fields (based on a general NRCS soils map), and all easements. Once it is determined by the CITY, and approved in writing, that service can be provided, a detailed soils map shall be created and submitted for the areas considered for the drip field. Once approved by the CITY in writing, a detailed set of construction plans shall be submitted to the CITY for review and approval.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions
- B. Specification sections:
 - 1. 13 15 16 CONTROL BUILDING
 - 2. 22 13 13 EFFLUENT COLLECTION SYSTEM
 - 3. 22 13 43 EFFLUENT PUMPS
 - 4. 22 13 53 EFFLUENT TANKS
 - 5. 22 14 23 GREASE INTERCEPTORS
 - 6. 32 84 13 EFFLUENT DRIP DISPERSAL
 - 7. 46 61 00 WASTEWATER PRETREATMENT – SETTLING TANKS

1.3 EFFLUENT COLLECTION

- A. Effluent collection line sizes shall be 8" minimum gravity lines.
 - 1. Effluent collection system shall be designed and constructed to comply with Section 22 13 13 EFFLUENT COLLECTION SYSTEM.

1.4 EFFLUENT TREATMENT

- A. Pre-Treatment
 - 1. Where effluent contains solids, fats, oils, or grease (FOG), pre-treatment must be provided as follows:
 - a. For effluent with solids present, removal must be provided
 - b. For effluent with fats, oils, or grease (FOG) present of animal, vegetable, or mineral origin, pretreatment must be provided according to Section 22 14 23 GREASE INTERCEPTORS.

1.5 STORAGE

- A. Required Influent Storage: Storage shall be equal to or greater than the daily design flow.
 - 1. The required storage volume will be attained by the use of tanks, including the total volume in the recirculation and final disposal tanks.
 - 2. Recirculation tank: Size to be determined by the number of pumps and the total storage volume required. Minimum size: 2000 gallons. Minimum number of pumps shall be 2.
 - 3. Final disposal tank: Size to be determined by the number of pumps and the total storage volume required. Minimum size: 2000 gallons. Minimum number of pumps shall be 2.

1.6 CONTROL BUILDING

- A. The Control Building shall house the ultraviolet equipment, disk filters and piping, control panels and related furnishings. Building size shall be as needed with 12' x 12' minimum inside dimensions unless approved otherwise by the CITY.
- B. The control building shall be secured in a fenced area.
- C. The Control Building and shall comply with Section 13 15 16 CONTROL BUILDING.
- D. Ultraviolet Disinfection:
 - 1. Ultraviolet disinfection shall be used, unless otherwise approved, to disinfect the treated effluent prior to entering the disk filtration.
 - 2. Disinfection system shall have a minimum of two (2) lamps.
- E. Disk Filtering:
 - 1. Dual disk filters are to be used to provide filtration to the drip lines.
 - 2. Disk filter assembly is to allow back flushing the system, with return to the recirculation tank.
 - 3. Disk filters are to be sized for the design flows.
- F. Control Panels shall be provided as specified in Section 13 15 16 CONTROL BUILDING, Subsection 2.27.

1.7 ADDITIONAL REQUIREMENTS FOR LAND APPLICATION USING DRIP DISPERSAL

- A. Drip tube spacing: Horizontally spaced on 2-foot or 5-foot centers.
- B. Loading Rate (Land Application Rate): As determined by the soil scientist.
 - 1. Well Drained Soils: Maximum of 0.20 gallons/day/square foot.
 - 2. Moderately Well Drained Soils: Maximum of 0.10 gallons/day/square foot.
- C. Required Reserve area:

1. 25% reserve soils for sites connected to CITY gravity sewer (with the reserve drip zones constructed with primary zones).
 2. 50% reserve soils for sites not connected to CITY gravity sewer onsite.
 3. 100% reserve soils for sites with design flow less than 1,500 gpd (gallons per day).
- D. Typical Influent Characteristics per Collection Type:
1. Gravity sewer with or without lift stations (all solids make it to the plant):
 BOD5 = 250 mg/l
 TSS = 250 mg/l
 TKN = 50 mg/l
 pH = 6-8
 2. Grinder pumps (macerated waste):
 BOD5 = 350 mg/l
 TSS = 350 mg/l
 TKN = 50 mg/l
 pH = 6-8
- E. Effluent Requirements:
- | <u>Characteristics</u> | <u>Required Effluent</u> |
|------------------------|--------------------------|
| BOD5 | ≤ 45 mg/L |
| TSS | ≤ 40 mg/L |
| TKN I | = 50 mg/l |
| Total Nitrogen, | ≤ 10-15 mg/L |
| Escherichia coli | = 94 colonies / 100 µL |
- F. Design flow shall be based on the size of the area served as follows:
1. 300 gpd per lot for subdivisions with less than 100 lots
 2. 250 gpd per lot for subdivisions with 100 lots or greater.

1.8 SOIL MAPPING

- A. Soil maps are to be produced by a state certified soil scientist.
- B. Soil scientist shall map the soils per TDEC Water Pollution Control high intensity soils maps at 100-foot grid with a minimum of 2 pits per acre in polygons of qualifying soils.
- C. Minimum depth of 20 inches to restrictive layer, per TDEC Chapter 17 Design Guidelines for Wastewater Dispersal Using Drip Irrigation

1.9 EFFLUENT DRIP DISPERSAL

- A. General

GENERAL SYSTEM REQUIREMENTS

1. Drip lines are to have a drip rate of 0.61 gallons per hour with drip emitters spaced at 2-feet on center.
 2. Drip lines are to originate with the supply line and end with the return line.
 3. Maximum run length of a drip line shall be 400 feet.
 4. Drip line spacing: to be as shown on the approved drawings.
 5. Treatment Systems with design flow less than 1,500 gpd are required to have drip lines installed at 2-foot centers with 100% reserve soils.
 6. Drip lines are to be placed 7 to 9-inches below the ground surface.
 7. Drip lines are to run parallel to the contours and be reasonably constant in elevation.
 8. Maximum length of drip lines per zone: to be determined by pressures at solenoids – (typ. 4,000 to 8,000 lbf per zone).
 9. High pressure drip zones may be required to install a pressure reducing solenoid valve.
 10. Each zone shall be approximately the same size.
 11. A tight line is required through unusable soils.
 12. Typical maximum number of distal ends: 16 to 18
 13. A solenoid valve shall be used to open and close each zone and placed at the lowest elevation.
 14. A flush valve is required at the highest elevation of the zone.
 15. There must be an even number of zones.
- B. Effluent drip dispersal design and construction shall comply with Section 32 84 13 EFFLUENT DRIP DISPERSAL.
- C. Upon completion of construction, the developer shall provide a certified as-built survey of the treatment facility, all appurtenances, and drip dispersal zones to the CITY. The as-built survey shall be in conformance with the approved construction plans.

1.9 SETBACKS

A.	Land Application	<u>Setback, Ft.</u>
1.	Property Line	10
2.	Potable Well, Spring	100
3.	Public Water Utility & Storm Mains	10
4.	Stream, Sinkhole, Drainage Way	25
B.	Treatment Facility	<u>Setback, Ft.</u>
1.	Property Line	100
2.	Sinkhole, Stormwater Detention	100

END OF SECTION 01 33 16

RECIRCULATING MEDIA FILTERS (BIOCLERE TREATMENT SYSTEMS)

PART 1 – GENERAL

1.1 SCOPE

- A. The work of this section includes furnishing all labor, materials, tools, and equipment necessary to furnish and install an AQUAPOINT factory built, Bioclere fixed film aerobic process type treatment system with all necessary equipment and appurtenances for efficient operation as specified herein and as shown on the drawings.
- B. The manufacturer of the Bioclere process system shall be AQUAPOINT of New Bedford, MA.

1.2 DESIGN CRITERIA

- A. The materials and equipment covered by this specification are intended to be standard materials and equipment of proven ability as manufactured by reputable concerns. Equipment shall be designed and constructed in accordance with the best practice of the industry and shall be installed in accordance with the manufacturer's recommendations and the Contract Documents.
- B. The Bioclere system shall be designed to operate under the design criteria detailed in SECTION 2.1(A).

1.3 PRODUCT HANDLING

- A. All materials and equipment shall be shipped, stored, handled, and installed in such a manner as not to degrade quality, serviceability, or appearance. The Bioclere unit(s) shall be stored outdoors in a secured location according to the manufacturer's recommendations. Loose-shipped items shall be stored in a clean, dry location free from precipitation and excess moisture.

1.4 SUBMITTALS

- A. Three complete sets of shop drawings and/or site-specific Technical Manuals shall be submitted for all items to be furnished by AQUAPOINT. Submittals shall include all equipment and components, catalogue cuts, wiring diagrams, control schematics, and all pertinent installation, operation, and maintenance procedures to maintain efficient operation.

PART 2 – MATERIALS

2.1 BIOCLERE TREATMENT SYSTEM

- A. General

RECIRCULATING MEDIA FILTERS (BIOCLERE TREATMENT SYSTEMS)

1. Bioclere treatment system shall be a Series 16, 24, 30 or 36 as required to meet the project requirements.
2. The Bioclere treatment system shall include a trickling filter situated over a final settling tank. The Bioclere treatment system shall be delivered complete from the supplier and shall include: random packed PVC manufactured media, ventilation fan, dosing pump(s), sludge return pump, internal piping, wiring, and controls for a complete operational treatment system.
3. The trickling filter portion of the tank shall have fiberglass inner and outer skins with the cavity between filled with polyvinyl chloride foam insulation. The remainder of the unit shall be constructed of FRP or plastic as recommended by the equipment manufacturer.
4. All internal piping shall be Schedule 40 PVC plastic pipe. The Bioclere unit shall withstand normal pressures from the interior hydrostatic load and from the soil.
5. Flange factory sealed for water tightness.
6. The effluent design criteria are as follows:

BOD5	≤ 45 mg/L
TSS	≤ 40 mg/L
TKN	= 50 mg/l
Total Nitrogen	≤ 10-15 mg/L
Escherichia coli	= 94 colonies / 100 µL

B Pre-Cast Mounting Pad

1. The Contractor shall be responsible for providing a precast mounting pad upon which to set each Bioclere vessel. The mounting pad shall be as shown on the drawings.

C. Filter Media

1. The PVC randomly packed filter media with void ratio >95%, shall be UV resistant, resistant to a wide range of aqueous solutions, acids, alkalis, oxidizing agents, oils, fats, and alcohols.

D. Settling Tank

1. The settling tank shall be cone shaped and have 60-degree sloped sides to prevent the accumulation of biological and inorganic suspended solids and shall contain the necessary internal baffling to prohibit short-circuiting of the wastewater.

E. Ventilation Fan

1. CSA and UL approved 115v/1ph/60hz, ball bearing fan.
2. Minimum airflow rate shall be 58 cfm to 240 cfm.

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3. Housing & blade detail: aluminum housing & polycarbonate blade.

F. Pumps: The CSA and UL approved dosing pumps and recycle pumps shall be stainless steel submersible pumps. All pumps shall have an internal high temperature shut off switch. Each pump shall be rated for intermittent or continuous duty when fully submerged between 0°C-55°C. The alternating dosing pumps shall be controlled such that when one pump fails, the remaining pump will complete both dosing cycles. A dry contact shall be installed in each control panel so that a common Bioclere alarm may be wired to a convenient location.

Pumps for each Bioclere Series shall be in number and type as follows:

1. Series 16: one dosing pump + one recycle pump
2. Series 24 – 36: two alternating dosing pumps + one recycle pump
3. Voltage:
 - a. Series 16 – 30: 115v/1ph/60hz,
 - b. Series 36: 200–230v/1ph/60hz.
4. Capacity:
 - a. Series 16: 20 gpm at 21 feet of head
 - b. Series 24 – 30: 45 gpm at 21 feet of head
 - c. Series 36: 65 gpm at 21 feet of head
5. Alternating dosing control feature shall be specified in Series 24, 30, and 36, but not in Series 16. The alternating dosing pumps shall be controlled such that when one pump fails, the remaining pump will complete both dosing cycles.

G. Float Switches

1. CSA & UL approved low level, 115v/1ph/60hz, mechanically activated wide-angle switch. Float switch shall be installed to prevent the recycle pump from operating when water levels are abnormally low in the Bioclere (i.e. during primary tank pumping).

H. Power Supply

1. Dedicated power per unit for each shall be as follows:
 - a. Series 16: 20 amp, 115v/1ph/60hz
 - b. Series 24: 30 amp, 115v/1ph/60hz
 - c. Series 30: 40 amp, 115v/1ph/60hz
 - d. Series 36: 30 amp, 208–230v/1ph/60hz

I. Control Panel

RECIRCULATING MEDIA FILTERS (BIOCLERE TREATMENT SYSTEMS)

1. The UL approved control panel shall be furnished with an audio and visual alarm for pump failure & tripped circuit breaker conditions, an exterior alarm silence button, and an on/off/test power/alarm toggle switch.
2. Within the NEMA 4X enclosed fiberglass panel pump, the following shall be provided: timers, relays, terminal strip, on/off/test switches, run lights, dosing pump alternator, circuit breakers, and current sensors.
3. Contact type: dry contact shall be installed in each control panel so that a common Bioclere alarm may be wired to a convenient location.
4. The alarm shall sound and the light shall flash continuously until the alarm is reset on shut off.

J. Wiring

1. The electrical contractor shall complete the wiring between the Bioclere control panel and the terminal strip, with the Bioclere fan module meeting all local, state, and federal codes.
2. All fittings, connections, etc... shall be of weatherproof and watertight construction. Ground terminals are provided in both the main panel and the junction box for each unit. Each ground terminal shall be wired to an earth ground.
3. Care shall be taken to match the wires between the control panel and the terminal strip within the Bioclere fan module located on each unit.

K. Warranty

1. All equipment shall be warranted against defects in materials and workmanship for a period of one year from installation date.

L. Spare Parts

1. A recommended list of spare parts shall be detailed in the site-specific Technical Manual that details the Installation, Operation & Maintenance procedures.

M. Services Provided

1. AQUAPOINT or an approved manufacturer's representative shall provide the following services for each project:
 - a. The general contractor shall install the Bioclere unit(s) and all related components.
 - b. Provide onsite technical assistance for the handling and positioning of the Bioclere unit(s) the day of installation.

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- c. Return to the site for testing and/or commissioning of the Bioclere unit(s) upon substantial completion of site work by the general contractor (backfill, piping, electrical, grading, etc.).
- d. AQUAPOINT shall install the randomly packed PVC media and pumps into the treatment unit(s).
- e. AQUAPOINT shall be available to train the operator(s) and instruct the CITY OF SPRING HILL (CITY) on Bioclere operation the day of testing/commissioning.
- f. Remain accessible to the CITY and/or operator for phone consultation.
- e. Be available on a contract basis for additional site visits or consultation.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. All materials and equipment shall be installed in a neat, workmanlike manner.
- B. Installation of the Bioclere treatment system and ancillary equipment supplied by AQUAPOINT shall be in accordance with written instructions provided by the manufacturer or approved representative.
- C. The Bioclere and all applicable treatment units supplied by the manufacturer shall be installed with sufficient ballast to offset buoyant forces due to induced or high groundwater conditions.

3.2 CLEAN UP

- A. Prior to start-up and field-testing, all foreign matter shall be removed from the grease trap(s), pump station(s) and Bioclere unit(s).

3.3 FIELD TESTING

- A. The Bioclere treatment system shall be field-tested using clean, fresh water prior to acceptance. The system shall be operated to test the efficiency of all components. All systems, controls, and sequences shall be operated and demonstrated as operating as approved. The contractor shall perform all tests and shall be responsible for all necessary temporary connections, testing equipment and utilities and shall provide and dispose (if necessary) of all water used. A factory trained representative shall be present for the testing.

RECIRCULATING MEDIA FILTERS (BIOCLERE TREATMENT SYSTEMS)

3.4 PROHIBITIONS

- A. Organic solvents, fuel oils, paints and thinners, photographic fluids, floor waxes and strippers, solutions containing copper compounds, cleaning agents containing quaternary ammonium chlorides and products containing compounds that are documented to inhibit biological growth should not be discharged to the sewage treatment system.

END OF SECTION 46 07 53

PART 1 – GENERAL

1.1 SUMMARY

- A. Provide settling tank(s) and appurtenances for solids removal prior to downstream wastewater treatment.
- B. Includes:
 - 1. Settling tank (steel, concrete, or package unit).
 - 2. Influent distribution, baffles, and weirs.
 - 3. Sludge collection and withdrawal equipment.

1.2 SUBMITTALS

- A. Product Data: Tank dimensions, drive unit data, sludge withdrawal equipment.
- B. Shop Drawings: Equipment layout, connections, and supports.
- C. O&M Manuals: Operating instructions and maintenance schedule.

1.3 DESIGN REQUIREMENTS

A. The effluent design criteria are as follows:	
<u>Characteristics</u>	<u>Required Effluent</u>
BOD5	= ≤ 45 mg/L
TSS	= ≤ 40 mg/L
TKN	= 50 mg/l
Total Nitrogen	≤ 10-15 mg/L
Escherichia coli	= 94 colonies / 100 µL

PART 2 – PRODUCTS

2.1 SETTLING TANK

- A. Type:
 - 1. Rectangular tank; or
 - 2. Prefabricated package unit.
- B. Components:
 - 1. Inlet energy dissipating baffle.
 - 2. Effluent v-notch weir (stainless steel or FRP).

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install equipment per manufacturer instructions.
- B. Verify tank dimensions, slopes, and anchor bolt placement.
- C. Adjust weirs and baffles for level operation.

3.2 TESTING AND STARTUP

- A. Perform water fill test to verify even flow distribution and weir flow.
- B. Provide operator training.

3.3 CLEANING

- A. Remove debris and temporary bracing.
- B. Protect mechanical equipment until placed in full operation.

END OF SECTION 46 61 00