Oregon DEQ Guideline for Alternative Wastewater Collection Systems

Water Quality Division
165 E Seventh Ave., Suite 100
Eugene, OR 97401
Phone: 541-686-7518
800-452-4011
Fax: 541-686-7551
Contact: Tim Caire
www.oregon.gov/DEQ

DEQ is a leader in restoring, maintaining and enhancing the quality of Oregon's air, land and water.

DEQ
State of Oregon
Department of
Environmental
Quality

DEQ can provide documents in an alternate format or in a language other than English upon request. Call DEQ at 800-452-4011 or email deqinfo@deq.state.or.us.

Oregon DEQ Guideline for Alternative Wastewater Collection Systems

Oregon DEQ Guideline for Alternative Wastewater Collection Systems

1. Applicability

As described in DEQ's Fact Sheet on Common Sewers[i], DEQ considers public sewage collection systems to be systems which serve two or more users located on two or more tax lots and which ultimately discharge to POTWs. This publication on alternative collection systems (ACS) is intended to be a guide for ACS which involve discharge to common sewers. In addition, ACS are usually hydraulically connected under pressure (or vacuum) therefore a user's connection can affect other connected users in the system. Accordingly, DEQ's review of these pressure systems begins with the septic tank (for STEP systems) or grinder pump (for grinder systems), whereas for STEG systems DEQ's review begins at the common collection main, and upstream private components are treated as laterals, and are regulated by Oregon Building Codes Division. DEQ expects the public entity to own ACS, and the public entity ultimately is responsible for their maintenance as described below (although DEQ will evaluate exceptions upon request). DEQ's basis for authority to require DEQ review and approval is OAR 340-052. This rule also requires construction inspection and post-construction certification of installation.

This guideline does not apply to systems which discharge to a drain field or other on-site disposal systems; such systems are regulated by DEQ in accordance with on-site sewage disposal rules, specifically OAR 340-071, 340-072, and 340-073.

This guideline is intended to supplement the guidance provided by the Water Environment Federation's publication "**Manual of Practice (MOP) FD-12, Alternative Sewer Systems, Second Edition.**"[ii] In case of conflict with MOP FD-12, DEQ requirements govern.

This guideline focuses on septic tank effluent pump (STEP) and grinder pump systems. There are a far greater number of these alternative collection systems in Oregon than there are vacuum or septic tank effluent gravity (STEG) systems. DEQ refers the reader to MOP FD-12 for information on vacuum and STEG systems beyond what is contained in this document.

Note: While following this DEQ guideline provides a path to compliance with applicable regulations, DEQ will consider approval of alternative approaches which are not recommended within this guideline. DEQ plan review engineers review and approve ACS submittals on a case-by-case basis.

2. Administrative: Ownership and maintenance

Technical activities fees are applicable for station reviews as set forth in OAR 340-045-0075 Table 70F. The fees can be found at the following link below, or by contacting the applicable regional plan review engineer. Alternatively, DEQ can invoice the utility. Fee payment covers DEQ review of both report and plans for a given project.

2.1 Ownership

The Owner is the public jurisdictional entity, and is defined herein as the municipality, sanitary district, private sewage utility, or sanitary authority which holds an NPDES discharge permit or WPCF permit (or is connected to a permit-holder), and thus is responsible for the operation of the system. The property being served is defined as the User (e.g., homeowner, apartment owner, school, etc.).

Legal title to tanks, pumps, or other components should preferably be in the Owner's name. The objective of vesting title in the Owner instead of the User is to avoid potential for disputes over equipment selection or repair methods or funding for repairs. DEQ will consider allowing the User to hold title to any system components on a case-by-case basis.

The Owner must inspect and accept the installation prior to its operation, and completely control all pumps, service lines, and other components of the system on private property. The administrative requirements listed below apply to STEP systems and grinder systems. Administrative requirements for STEG and vacuum systems are similar and should be discussed with DEQ.

1. The Owner must maintain ultimate responsibility and authority for design, equipment and materials selection, installation, and operation of the entire system including controls and other appurtenances on private property. The Owner may contract these services with qualified contractors. The User may hire a qualified contractor to install the system once the Owner and DEQ approve the design plans. However, the User cannot operate or maintain the system; the Owner is responsible for operation and maintenance once the Owner has accepted the installed system.
2. The Owner must possess a recorded general easement or deed restriction to enter the private property being served, and to access the system and its components.
3. No system may be operated without the direct field supervision of a certified operator, in accordance with OAR 340-049. An operations and maintenance manual must be submitted to DEQ for review and approval prior to startup in accordance with OAR 340-052. Refer to FD-12 (2nd ed.: pg. 241 for STEP systems, pg. 63 for grinder systems).
4. Owners must operate ACS facilities without any interruption, sewage spills on the ground, sewage backup into buildings, or other unhealthy conditions. Owners must establish operating procedures and maintain certified staff to assure:
    - Timely response to outages and trouble calls.
    - Adequate spare parts on hand including spare pumps, piping, electrical controls including panels and level controls, valves, and effluent screens, as applicable to the type and size of the ACS.
    - Annual inspection of each septic tank; and sludge removal every five years or as experience dictates.
5. The Owner's sewer use ordinance must contain special provisions regulating the ACS. Essential provisions include:
    - Exclusion of infiltration and inflow.
    - Prohibition of, and establishment of penalties for: modifications, repairs, or tampering by the User.
    - Control of materials and workmanship through adoption of technical specifications and construction standards.
    - Regulations and procedures for connection to an ACS of new Users, including signing of easements as a condition of service.
    - Regulations for adding new systems and extending existing systems to serve new areas, including submittal of plans to DEQ.

- Record-keeping for all installed STEP/STEG tanks by lot number, tank number, and address.

6. A Land Use Compatibility Statement (LUCS) is required, signed by the city or county planning department, in accordance with OAR 340-018.

2.2 Maintenance

DEQ allows these types of maintenance provider arrangements, listed in order of preference:

a. Owner directly maintains the system
b. Owner contracts with qualified service provider
c. Owner requires the User to contract with qualified service provider. DEQ recommends that the provider have certification from the manufacturer.

It is important to note that in all cases DEQ considers the Owner to ultimately be responsible for maintenance of the system.

3. Design considerations – Septic Tank Effluent Pump (STEP) system

A STEP system is a type of pressure sewer system which utilizes a septic tank and a pump. Typically, a single tank with two compartments is used so DEQ classifies them as septic dosing tanks. The upstream compartment captures most settleable solids which enter the tank. Settled solids must be removed from the tank periodically to avoid their taking up excessive volume within the tank and thus reducing its actual hydraulic detention time. Solids removal, along with partial oxidation of the sewage's soluble biochemical oxygen demand (BOD) content, provides a significant reduction in influent BOD by the STEP system, thus reducing loading to the publicly owned treatment works. The second compartment contains a filter and the pump which transfers effluent to a common pressure main.

3.1 General Design Requirements and Considerations

Tanks and auxiliary components must meet design requirements of OAR 340-073 and 340-071 as applicable to a STEP system.

Single tanks serving multiple lots under separate ownership will not normally be allowed. Systems serving facilities such as RV parks, mobile home parks, apartments, and unit developments are usually under the control of a single customer or responsible association. Such systems may be designed with shared tanks, subject to requirements of the Oregon Plumbing Specialty Code.

Use of existing septic tanks is discouraged however existing tanks may be allowed by DEQ on a case-by-case basis if results of DEQ-required testing and inspection are positive, otherwise existing tanks should be removed or decommissioned.

Existing building laterals must be replaced, inspected and tested per the Oregon Plumbing Specialty Code. Alternatively, a cleanout must be installed adjacent to the building and inspected and tested in accordance with code. All sewage from the building including kitchen, laundry, and bath wastes should be intercepted and conveyed to the STEP/STEG tank.

For additional information contact the DEQ plan review engineer serving the region of the project's location, or refer to OAR 340-071 and 073:

- DEQ regional plan review engineers: https://www.oregon.gov/deq/wq/wqpermits/Pages/plan-review.aspx

- Oregon Administrative Rules 340-071 and 073: https://www.oregon.gov/deq/Residential/Pages/Onsite-Rules.aspx

3.2 Pumps

Effluent pumps should be submersible turbine pumps and should generally comply with the provisions of OAR 340-073-0055, sized as appropriate for head/capacity conditions of the design. Installed pumps must be wet-tested including operation against shutoff head. Conventional centrifugal sewage pumps are usually less satisfactory for STEP system service because of their flat characteristic curve, but may be considered case-by-case for low-head installations. Grinder pumps are unacceptable for STEP application.

3.3 Pump control panels and alarms

Pump control panels must be energized through a dedicated breaker and must be rated minimum NEMA-4X with a locked door. Control panels must be exterior mounted and should be visible to Owner's service personnel from public right of way. Electrical conduits must be sealed gas-tight at the tank and the panel. Control panels must be equipped with elapsed time meters and may also be equipped with event counters. Operational controls must be HAND/OFF/AUTO. Dual pumping units must have operator-cancellable automatic alternators. Note: Power is normally furnished by the User.

Installations must contain a high-water alarm switch, activating a user-cancellable buzzer and an alarm light. Access to the light reset button must be restricted to Owner's service personnel. Trip of pump breaker must not disable an alarm.

3.4 Effluent piping

Pressurized service lines from a STEP tank to the common pressure main must be minimum 1" diameter. A shutoff valve (gate, plug, or ball) must be installed in a tamperproof valve vault at the property line. Unless otherwise approved, a swing check valve must be installed in the same vault, and an additional swing check valve should be installed at the tank outlet. Valves must be full-port type and constructed of non-corrodible materials such as plastic and stainless steel.

Common pressure sewers must be minimum 2" diameter PVC or polyethylene pressure pipe, installed with toning wire or detectable tracer tape. Pipe sizing and layout must generally conform to recommended practices in MOP FD-12; MOP FD-12 should also be referenced with regard to these design features: isolation valves, flushing connections, vacuum release valves, air release valves, and pig launching stations.

3.5 Small-Diameter Gravity Sewers (STEG)

Pipe sizing and layout, valves and other appurtenances including cleanouts should generally conform to recommended practices in MOP FD-12. Gravity-flow service lines from STEG tanks to small-diameter common gravity mains are typically 4” diameter but must be minimum 2" diameter. Each service line must be vented at the upper end, and venting must be continuous through the tank and building stack. Common gravity mains must be minimum 4" diameter, installed with tracer tape or toning wire, and should be designed to flow half full, based on 1 gpm per dwelling. Minimal velocities are acceptable, however low-velocity and flooded sections may require sulfide controls. Cleanouts must be sealed with a screwed cap or plug secured under a tamperproof boltdown cover. Cleanout spacing should be approximately 300 feet.

3.6 Control of Hydrogen Sulfide

The normal hydrogen sulfide content of gravity sewage in the Pacific Northwest is approximately zero. The hydrogen sulfide content of effluent from a septic tank withdrawal zone usually is generally negligible, although its dissolved oxygen concentration is lower than that in gravity mains, thus sulfate in the effluent readily reduces to sulfide during periods of detention in the STEP pressure sewers and service piping. These systems reduce all available sulfate over time, resulting in hydrogen sulfide concentrations well exceeding 10 milligrams per liter (mg/l). Because of corrosion, odor, and safety concerns, STEP discharges into unarmored gravity sewers must not exceed 0.1 mg/l hydrogen sulfide content.

The engineer's design submittal must contain an evaluation of hydrogen sulfide production, and proposed control measures to protect the gravity sewer system against corrosion. Air injection or chemical treatment may be necessary. DEQ will evaluate proposed methods for handling hydrogen sulfide on a case-by-case basis. Testing may be required; general information on hydrogen sulfide testing is available in DEQ's guideline on pump station design (https://www.oregon.gov/deq/FilterRulemakingDocs/div52-designwwps.pdf)

4. Design considerations – grinder pump systems

Grinder pump systems are pressure sewer systems which pump untreated sewage from the user to the POTW. Solids are not removed, nor is the sewage partially treated as it is with systems which utilize septic tanks. Sewage is coarsely-ground by the pump to prevent blockage in the pump or pipeline. Overall, sewage flows from a conventional drain, waste and vent (DWV) pipe within a building to a grinder pump tank or basin (usually outdoors), which contains a simplex (or duplex) pump. Pump discharge is carried by individual service lines to a common pressure main. Grinder pumps are submersible and their design can feature a semi positive-displacement impeller or a centrifugal impeller with a cutter assembly. These two types are different and so the designer can base selection of pump type on specific project requirements regarding range of total dynamic head (TDH) and flow capacities.

Pipe sizing and layout, valves and other appurtenances should generally conform to recommended practices in MOP FD-12. Service lines from grinder pumps to common pressure mains must provide a scouring velocity on at least a daily basis. A typical minimum diameter is 1-¼". Refer to MOP FD-12 for guidelines on sizing of common mains. As with other alternative collection systems, small-diameter pressure piping is installed at shallow depth from the pump to the collector main.

4.1 Pump Control Panels and Alarms

As with STEP units, a grinder pump system will contain a control panel and a level control system (usually floats) with programming and hardware to carry out various control and alarm functions; information above on STEP systems is applicable to grinder systems.

4.2 Control of Hydrogen Sulfide

Grinder piping systems are subject to the same hydrogen sulfide formation potential as pump station force mains; refer to DEQ guideline on pump station design (Section 3.6).

5. Miscellaneous considerations

5.1 Vacuum Systems

Unlike STEP and grinder systems which typically require a pump at each private residence, vacuum systems typically utilize a single vacuum pump (with standby unit) and controls which serve the entire vacuum collection system.

Refer to MOP-12 for design considerations for vacuum systems. DEQ reviews and approves vacuum collection system designs on a case-by-case basis.

6. Design submittals and construction requirements

Plans and specifications must be submitted to DEQ for approval in accordance with OAR 340-052. Also, additions and extensions to existing systems are subject to DEQ review and approval.

Submittals must include:

a. Engineer's design data including hydraulics (model summary table or equivalent), and sizing of tanks, pumps, and pipes. In general, system design must conform to information herein, with recommendations published in MOP FD-12, and with applicable Oregon Administrative Rules.

b. Technical standards and specifications for systems to be installed, including acceptance testing.

c. Explanation of effect of proposed pumping rate on maintenance requirements for pump screens (to prevent rapid clogging).

d. Copy of current sewer ordinance allowing use of the proposed systems.

e. Copy of access easement form to be signed by User.

f. Engineer's evaluation of hydrogen sulfide production and preliminary design of control measures to protect system against corrosion.

g. List of spares and repair materials to be supplied to the Owner to assure reliable operation of the system.

h. An itemized list of quantities involved in the project.

i. The name and address of the owner, developer, and engineer must be shown on the plans. Easements must also be shown. Blanket easements may be indicated by note.

---

[i] Oregon DEQ Regulatory Requirements for Common Sewer System Owners https://www.oregon.gov/deq/FilterDocs/CommonSewerSystems.pdf

[ii] Water Environment Federation. 1986. *Alternative Sewer Systems, Manual of Practice FD-12*.