

Oregon Health Authority, Drinking Water Services

Plan Review requirements for new disinfectant systems at existing public water systems.

The requirements apply to new **disinfectant systems** for existing Community, Non-Transient Non-Community, Transient Non-Community, and Oregon Very Small water systems, which are defined on page 7. Two sets of information are provided below, 'short' and 'long' instructions. The short instructions are abbreviated. If you are unfamiliar with the plan review process, it is strongly recommended you read the long instructions.

For assistance, call (971) 673-0405 or fax (971) 673-0694.

SHORT INSTRUCTIONS:

The following shall be submitted and approved by OHA **prior to construction** of a new **disinfectant system** or major additions or modifications to **existing disinfectant** systems:

1. Plans prepared by an Oregon Professional Engineer.
2. CT calculations (if necessary; required for all systems using a surface water source, and groundwater systems with a source having fecal contamination [e.g., *E. coli* confirmed]).
3. The appropriate plan review fee <http://healthoregon.org/pwsplanreview>.

Specific Requirements

A. *Prior to construction*, submit at a minimum:

1. A site plan showing the project location in relation to source, any existing treatment, proposed treatment, storage, and first customer served by the disinfectant system;
2. Narrative describing purpose of disinfectant and type of disinfectant;
3. Proof of proposed disinfectant's NSF Standard 60 certification;
4. Construction specifications indicating wetted materials have NSF Standard 61 certification;
5. CT calculations (if necessary depending on the purpose of disinfectant);
6. Disinfection Benchmark Profiling (if necessary depending on the type of disinfectant change); and
7. Plan Review fee.

B. *After construction*, submit the following:

1. Structural detail if different from the submitted plans (aka as-built detail); and
2. Documentation that all conditions outlined in the Conditional Approval letter were met.

END SHORT INSTRUCTIONS

LONG INSTRUCTIONS:

The responsibilities associated with this process include:

- A. Water system actions [Prior to Construction](#)
- B. Drinking Water Services response for [Plan Review](#)
- C. Water system actions [After Construction](#)
- D. Drinking Water Services grants [Final Approval](#)

These are addressed in detail as follows. Additional detail may exist in the Oregon Administrative Rules.

A. [PRIOR TO CONSTRUCTION](#)

A water system submits the following, with some exceptions, prior to construction:

- a) A site plan showing the project location in relation to source, any existing treatment, proposed treatment, storage, and first customer served by the disinfectant system;
- b) Narrative describing purpose of disinfectant and type of disinfectant;
- c) Proof of proposed disinfectant's NSF Standard 60 certification;
- d) Construction specifications, including proof wetted materials have NSF Standard 61 certification;
- e) CT calculations (if necessary depending on the purpose of disinfectant);
- f) Disinfection Benchmark Profiling (if necessary depending on the type of disinfectant change); and
- g) Plan Review fee.

Submittal detail is provided in this section. The submittal materials are sent to:

ATTN: PLAN REVIEW
OHA DRINKING WATER SERVICES
800 NE OREGON ST., STE 640
PORTLAND, OR 97232-2162

(Materials may be sent directly to the relevant regional engineer, though the fee payment should be sent to the address above. Sending the fee to a regional engineer may slow processing time.)

a) *SITE PLAN – Required in all cases*

- A site plan showing where the proposed disinfectant system will be located in relation to the following:
 - 1. Source (well, spring, etc.)
 - 2. Existing treatment (e.g., ion exchange, filtration, etc.)
 - 3. Any storage before the first customer (e.g., clearwell, reservoir tank, transmission line, pressure tank)
 - 4. First customer served by the disinfectant system (show size and length of distribution pipe run to that point, if available).
- ***The site plan does not need to be to scale.*** However it shall include the following additional information:
 - 1. Water system ID number;
 - 2. Water system name;
 - 3. Name, phone number, signature of the person who completed the site plan, and, if prepared by an

Oregon registered professional, their stamp; and

4. Name, phone number, and mailing address of the person/company who completed the site plan.

b) NARRATIVE OF DISINFECTANT SYSTEM– Required in all cases

A general narrative of the disinfectant system needs to be submitted with the following information:

1. Source of supply (groundwater or surface water [rainwater is considered surface water]);
2. Reason for disinfectant addition (e.g., disinfection for source water, residual maintenance, oxidation);
3. Type of disinfectant (e.g., liquid sodium hypochlorite, gas chlorination, ozone, mixed oxidants, chlorine dioxide, etc.) and feed system (e.g., electric feed pump, meter drive, erosion chlorinator, etc.).

c) NSF STANDARD 60 CERTIFICATION OR EQUIVALENT

Proof that chemicals added to the water are safe for human consumption. Proof of certification should be available through your vendor(s). Alternately it is available through National Sanitation Foundation (NSF) Standard 60 certification, or an equivalent certification from another testing organization such as Water Quality Association (WQA), Underwriters Laboratories (UL), etc. NSF Standard 60 certification for chemicals may be verified at the following websites: <http://www.nsf.org/Certified/PwsChemicals/>, [http://www.wqa.org/Find-Products#/#/](http://www.wqa.org/Find-Products#/). This also applies to chemicals used as precursors, such as the salt used with on-site mixed oxidant generation.

d) CONSTRUCTION SPECIFICATIONS

- Proposed disinfectant specifications shall include:
 1. Location of all sample taps in relation to the disinfectant system. (Note: for residual maintenance disinfectants in groundwater systems, a treated sample tap after any storage volume that provides contact time is strongly recommended in the event that future treatment or inactivation is necessary for fecal-contaminated sources.)
 2. Specifications of the disinfectant feed equipment. Specifications should be detailed and clear enough to readily discern the disinfectant is added in proportion to the flow of water from the source or treatment plant. Tank capacities or dimensions and pump flow rates should be provided. The means to measure disinfectant residual shall be described. There shall be provision to alert the water supplier prior to the disinfectant supply being exhausted.
 3. Components in contact with the raw or treated water (e.g., piping, fittings, storage tanks) need to be NSF Standard 61 certified or equivalent (stainless steel is considered inherently equivalent). Proof of certification should be available through your vendor(s). Alternatively, NSF Standard 61 certification for components may be verified at the following websites: <http://www.nsf.org/Certified/PwsComponents/>, <http://www.wqa.org/Find-Products#/#/>.
 4. Location of flow meters, if applicable, in relation to any storage reservoirs.
- For gas chlorinators, the specifications shall also include storage safety features:
 1. Storage area separated from other operating areas, storage above ground, doors that open outward, chained or properly secured cylinders; and
 2. Storage properly ventilated, air intake higher than exhaust vent, light/ventilation switches outside the room, corrosion resistant switches, and availability of personal protective equipment (e.g., gas mask, SCBA).

e) CT CALCULATIONS (ACTUAL CT = ‘DISINFECTANT CONCENTRATION’ × ‘CONTACT TIME’)

REQUIRED OF ALL SURFACE WATER SYSTEMS

REQUIRED OF GROUNDWATER SYSTEMS (WELLS OR SPRINGS) ADDING A DISINFECTANT TO ACHIEVE SUFFICIENT ACTUAL CT BECAUSE OF FECAL CONTAMINATION (CONFIRMED *E. coli*)

ENCOURAGED FOR ALL SYSTEMS USING A DISINFECTANT

Requirements for Surface Water Systems: Surface water systems shall demonstrate a total of 3.0-log inactivation of *Giardia* cysts is achieved by treatment. The disinfection shall be sufficient to ensure any balance of *Giardia* inactivation not provided by settling, filtration, etc. is met to achieve a total of 3.0-log *Giardia* inactivation by the combined treatments. For example, if filtration is credited with 2.0-log *Giardia* inactivation, then disinfection shall achieve a CT of 1.0-log inactivation of *Giardia*, where CT is ‘chlorine concentration at or before the first user’ multiplied by ‘contact time between chlorine injection and the first user.’

‘Actual CT’ shall be equal to, or greater than, the required CT. ‘Required CT’ is calculated with a regression equation or via look-up tables based on disinfectant concentration, pH, and temperature. As described below, the plan review submittal shall include information on contact time. Contact time depends on maximum system hourly demand flow, minimum operating storage volume (lowest volume the clearwell is allowed to reach), and a ‘baffling factor’ (accounts for mixing efficiency):

- Maximum system flow:
 1. Provide the peak hourly demand flow for the system (typically early morning on the hottest day of the year, which is often in August). ‘Peak hourly’ is the highest flow rate of the year over a one-hour interval, expressed in gallons per minute (gpm).
 2. Explain how the peak hourly demand flow is determined. Determination can be via an instantaneous or totalizing flow meter at the effluent of a storage reservoir, via a well’s pump flow rate for systems without storage reservoirs, or via approximation. Approximation may consist of one or more of the following generically described approaches:
 - a. Data from a totalizing flow meter that spans longer time than the peak hour (e.g., from a daily meter reading) and multiplying that result by a peaking factor (typically 3x to 5x);
 - b. A clearwell effluent flow restrictor (must know dimensions of flow restrictor);
 - c. The maximum pump capacity from the clearwell (as long as there is no reservoir before the first user);
 - d. The change in volume within a storage reservoir over the peak hour. Note: This requires accurate level transducer readings, the volume per foot of reservoir (or area of the tank), and any flow into the reservoir during the peak hour.
 - e. Bernoulli Equation calculations factoring in pipe flow velocities, area of pipe, static pressures, and vertical elevation profiles. Note that this method does not factor in frictional losses due to pipe flow.
 - f. Estimating peak flows using populations, connections, or number of fixture counts (may not be acceptable for systems using a surface water source).

Note that the maximum system flow may be provided in a contact time tracer study report, as described below.

- Minimum operating storage volume:

This is the smallest volume of water between where disinfectant is added and the first user that could occur during system operation. Tanks providing contact time (aka 'clearwells') typically have a low level float switch that activates the pumping and treatment system to refill the tank. The smallest volume is that volume where the float switch is activated. Pipeline volumes after disinfectant and prior to the first user may be included in this minimum volume. For instance, if the 1,000 gallon clearwell was operated as low as half its volume and the pipe volume was 50 gallons, the minimum operating storage volume would be $(1000 \times 0.5) + 50$, or 550 gallons.

- 'Baffling Factor':

'Effective contact time' is obtained with a 'baffling factor' (BF). The BF accounts for some containers having less than perfect mixing. For example, if a storage tank is 1,000 gallons shaped as a 6 foot diameter cylinder with water coming in at top center and flowing out from the side down near the floor while the maximum system flow is 10 gpm, there will be less than perfect mixing. Thus, the contact time in that tank won't be simply 1,000 gallons / 10 gallons per minute, or 100 minutes. The 'effective contact time' will be 1,000 gal * 'baffling factor' / 10 gpm. Baffling factors are obtained by conducting a tracer study (please contact the DWP for information on conducting a tracer study). For some systems, the baffling factor may be estimated based on the shape of the storage volume. Pipes (very long relative to diameter) are assumed to have a perfect baffling factor of 1. *Estimated baffling factors for storage reservoirs are not acceptable methods for estimating contact time for systems using a surface water source.*

Thus, 'effective contact time' equals the total effective contact volume (minimum volume × baffling factor) divided by the peak hourly demand flow. For storage reservoirs (clearwells) please submit a Tracer Study Report, as tracer studies are used to empirically verify contact time for surface water systems with these contact chambers. Please see the 'Tracer Study Reporting Form' located under www.healthoregon.org/dwp, then the 'Water System Operations' link on the left menu of DWP's Home Page, select 'Surface Water Treatment,' and then under the section 'Forms, Tools, & Resources' use the 'Forms & Tools' link. A tracer study workplan shall be submitted to the DWP for review, prior to conducting a study. 'Preparing a Tracer Study Plan' is just above the 'Tracer Study Reporting Form' referenced above. The document outlines the required elements to submit and items for consideration in completing a tracer study workplan.

Requirements for Groundwater Systems with confirmed *E. coli* (fecal) contaminated sources: Groundwater systems with fecal contaminated sources shall demonstrate a total of 4.0-log inactivation of viruses through disinfection. CT shall be at least as great as the required CT for 4.0-log inactivation of viruses as determined by disinfectant concentration, temperature, and pH. The submittal shall include information related to maximum system demand flow, minimum operating storage volume, and baffling factor as outlined above for surface water systems. The primary difference is the 'required CT' values differ between viruses and *Giardia*.

A 'Disinfection Verification Form for Groundwater Systems' is available that may help groundwater systems with CT. It is available at www.healthoregon.org/dwp, left menu pick 'Rules & Implementation Guidance,' flyout 'Groundwater Rule,' left menu pick 'Groundwater Rule Monitoring Requirements,' then 'GWR Compliance Monitoring' quicklink (or scroll to the bottom), and select 'Disinfection Verification Form for Groundwater Systems.' The direct link is:

<http://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/Rules/GWR/Documents/gwdisinfection.pdf>.

Note that volumes in pressure tanks do not count toward CT.

Note that the DWS may require groundwater systems conduct a tracer study. An example is when an estimate of contact time yields a CT close to the required CT for 4-log viral inactivation.

f) DISINFECTION BENCHMARK PROFILING

Any C, NTNC, or TNC treating surface water or ground water under the direct influence of surface water making a significant change to its disinfection treatment is required to develop a disinfection benchmark profile and calculate a disinfection benchmark. This information must be provided to DWS prior to making the change. The profile is to be based on either daily or weekly log pathogen inactivation rate calculations (i.e. CT determinations) for a period of 12 months. These calculations will be used to calculate a disinfection benchmark, describe the proposed changes in the disinfection process, and analyze the effect of the proposed change on the current levels of disinfection. Contact DWS for specific guidance on making the calculations and compiling the necessary information. Significant changes to the disinfection treatment process include:

1. Changes to the point of disinfectant application;
2. Changes to the disinfectants used in the treatment process;
3. Changes to the disinfection process; or
4. Any other modifications identified by DWS.

g) PLAN REVIEW FEE – Required in all cases

A plan review fee is required for all submittals and must be received before DWS starts the review. For a current fee schedule, check <http://healthoregon.org/pwsplanreview>.

The fee check should be made *payable to*: **OHA Drinking Water** (checks only, no cash or credit cards)

B. PLAN REVIEW

The Oregon Health Authority – Drinking Water Services (DWS) will do the following:

- a) Assign a **plan review number** (e.g., PR 1000-2011, or 2011-1000);
- b) Review all submitted information;
- c) If the disinfectant is being installed for a groundwater source, a well evaluation may be performed by a DWS hydrogeologist;
- d) Based on the submitted information, the Program will **send a letter** to the water system indicating if the disinfectant addition is approved for construction or asking for additional information. **Construction cannot begin until the water system has obtained a letter from DWS with ‘approval’ in the reference lines.** There are three types of approvals: conditional, preliminary, and final. The letter includes, at minimum, the following information:
 - The water system ID and name;
 - The plan review number and the name of the project (e.g., chlorination); and
 - Contact information of the reviewing State engineer.

An ‘approval’ is effective as of the date of an approval letter, if granted. More than one conditional approval is possible, in which case the conditions of the most recent conditional approval take precedence.

C. AFTER CONSTRUCTION

After the disinfectant system and related facilities are constructed, the water system submits the following to the reviewing State DWS engineer:

1. Structure detail if different from the submitted plans (aka 'as-built' detail), including:
 - Location of disinfectant addition;
 - Type of disinfectant; and
 - Feed system.
2. Written documentation that any conditions outlined in the Conditional Approval letter have been complied with.

Be sure to add the following identifying information on submitted materials:

- a) Water system ID number (for example 'OR4199999');
- b) Water system name;
- c) Plan review number; and
- d) Name, phone number, and mailing address of the person who can be contacted regarding this information.

As with pre-construction, mail to:

ATTN: PLAN REVIEW
OHA – DRINKING WATER SERVICES
800 NE OREGON ST., STE 640
PORTLAND, OR 97232-2162

Water systems may mail or email the materials directly to the appropriate DWS regional engineer. For assistance, you are welcome to call (971) 673-0405, or fax (971) 673-0694.

D. FINAL APPROVAL

The Oregon Health Authority – Drinking Water Services will:

- a) Review all submitted information;
- b) Based on the submitted information, DWS may **send a letter** to the water system **indicating if the disinfectant system has been granted final approval**. A water system's receipt of *final approval* concludes the plan review process for that project. If final approval cannot be granted, the letter will indicate what steps could be taken to achieve final approval.
- c) Note that groundwater systems installing a disinfectant will need to begin taking a minimum of one annual assessment sample, a raw water coliform sample prior to disinfectant addition.

END OF LONG INSTRUCTIONS

Definitions:

"Community (C) Water System" means a public water system that has 15 or more service connections used by year-round residents, or that regularly serves 25 or more year-round residents.

"Non-Transient Non-Community (NTNC) Water System" means a public water system that is not a Community Water System and that regularly serves at least 25 of the same persons over 6 months per year.

"Transient Non-Community (TNC) Water System" means a public water system that serves a transient population of 25 or more persons.

"Oregon Very Small (OVS) Water System" (formerly named "Non-Public (NP)" or "State Regulated Water System") means a public water system that serves 4 to 14 service connections or serves 10 to 24 people. Monitoring requirements for these systems are very similar to those for Transient Non-Community water systems, with the possibility of less frequent sampling for some analytes or situations.