

Home Treatment Units
(for individual drinking water services intended to
remove primary or health related (organic) contaminants)

F.06

Subject: Home Treatment Units for Individual Homes on Public Water Systems

Purpose: This guideline is intended to provide direction to DSHS staff, local health department staff, and other interested parties regarding the use of home treatment units for individual drinking water services for removal of primary or health related contaminants such as synthetic organic chemicals.

GUIDELINE

Background:

1. The general position of the Department is not to approve home treatment units for use on public water systems. Also, their use on private residences is not endorsed by the Department.
2. Home treatment unit applications shall include whole house or point-of-use devices described as faucet add-on units, by-pass units, and batch treatment units.
3. Home treatment unit designs shall include granular activated carbon, pressed carbon filters, spool filters, membrane filters, precoat filters, and reverse osmosis units.
4. The basis for the Department position is:
 - a. The difficulty and cost associated with pre-design studies required to size and select home treatment units.
 - b. The lack of laboratories certified to test for the presence of Giardia, organic contaminants, and other health related contaminants of concern.
 - c. The difficulty encountered by the average homeowner in providing maintenance, repair, replacement, and monitoring of home treatment units.
 - d. Concern regarding the potential for degraded bacteriological water quality due to microbiological growth in the treatment unit.
 - e. A false sense of security on the part of the homeowner.
5. The only exception to this policy shall be situations where an engineering report prepared in accordance with WAC 248-54 and approved by the Department recommends home treatment units for individual drinking water services which are on a public water system. The Department will have the ultimate responsibility for design and specification review.

Engineering Report Review Criteria:

1. The home treatment units shall be selected and sized on a rational design basis to treat all water used in the home. Point-of-use installations of home treatment units may be considered for use if it can be demonstrated to the Department's satisfaction that the treatment unit is intended to remove only aesthetic contaminants.
2. Thorough testing of the raw water quality to define the contaminant loading shall be conducted by the purveyor prior to the selection of a home treatment unit. Desired treated water quality shall be specified by the Department. Disinfection of treated water shall be required.
3. The home treatment unit selected shall have been tested and certified by the National Sanitation Foundation (NSF) in conformance with NSF Standard Number 53 - Drinking Water Treatment Units - Health Effects.
4. The economic analysis comparing water treatment alternatives shall include costs associated with the purchase and installation of the units as well as the maintenance, repair, replacement, and monitoring of home treatment unit performance.
5. The individual homeowner shall not be responsible for the operation and maintenance of the home treatment unit. The water purveyor shall be responsible for maintenance, repair, replacement, and monitoring schedules shall be specified.
6. The purveyor shall submit periodic (to be prescribed) reports to the Department documenting the performance of the home treatment units.

Approved by: Bill Leach Date: 4/23/85

GRANULAR ACTIVATED CARBON WHOLE HOUSE TREATMENT

UNITS FOR ETHYLENE DIBROMIDE REMOVAL

SUBJECT: Recommendations for granular activated carbon (GAC) whole house treatment units for individual homes on public water systems for ethylene dibromide (EDB) removal.

PURPOSE: To provide technical information to DSHS staff and other interested parties regarding the design, maintenance and monitoring of granular activated carbon home treatment units for removal of EDB from drinking water.

DSHS POSITION: Point of use treatment units designed to remove EDB from water used only for cooking and drinking purposes are not recommended by DSHS for individual homes on public water systems.

However, DSHS can accept, in some instances, whole house GAC treatment units for removal of EDB from drinking water for individual homes on public water systems. This position applies only to situations where an engineering report prepared in accordance with WAC 248-54 and approved by DSHS recommends home treatment units for individual drinking water services on a public water system.

BACKGROUND: The Water Supply and Waste Section has been in contact with several states where drinking water supplies contain EDB. These states are Florida, Connecticut, Massachusetts and California.

In these states, bottled water is being recommended as a short term solution to EDB contamination. Long term corrective solutions include connections to alternate community water supplies, development of new water sources or treatment.

Comparative studies of treatment options (GAC, PAC, air stripping, etc.) have shown that granular activated carbon poses the most economical and effective process to remove EDB from drinking water.

Whole house GAC units are being recommended by state health agencies in Florida, Connecticut and Massachusetts for individual home treatment instead of point-of-use devices. Whole house units are sized to treat water for all household uses. Whole house treatment is primarily recommended due to concerns about health effects from absorption or inhalation of EDB during bathing and/or showering.

Two states, Florida and Connecticut, have developed specifications for whole house GAC treatment units to remove EDB from drinking water. Field and laboratory studies were conducted to develop the specifications. The EDB removal efficiency (to .02 ppb) of representative treatment units has been verified by the Florida Department of Environmental Regulation.

COSTS: Costs per home treatment system in Florida were bid at approximately \$1300; this fee included installation and maintenance (one media replacement).

In Washington, the cost per home treatment unit including installation and one media replacement is estimated to be \$1500 - 2000. Media replacement costs are estimated to be approximately \$200 - 300 per exchange. Disposable filter cartridge and u.v. bulb replacement would be included (at no additional cost) as part of the media replacement service.

Monitoring costs were not included in the previous considerations and would be an added expense. The James M. Montgomery Laboratory in Pasadena, California is the only laboratory on the West Coast known to be certified by EPA for EDB analysis. Montgomery Laboratory charges \$250 per EDB sample analyzed by gas chromatography/mass spectrometry (GS/MS); for analysis by GC only, the charge is \$75/sample. An additional fee of \$100 (per sample) is charged for "dirty" samples (i.e., samples which require extensive preparation prior to EDB analysis). Montgomery Laboratory reduces the above charges by 5% when more than 10 samples are submitted at one time.

DESIGN SPECIFICATIONS

The following specifications are based upon information obtained from Florida and Connecticut. These specifications include recommended media volume, system layout, disinfection methods and maintenance and monitoring schedules.

I. Water Quality

Finished water quality shall conform to the minimum water quality standards established in WAC 248-54-175.

In addition, finished water quality shall not exceed the health action level of 0.02 ppb established for EDB in drinking water in Washington.

II. Adsorption System

A. Media Volume

A filter system containing two cubic feet of GAC media is the minimum recommendation per individual household.

B. Flow Rates

Maximum and average flow rates shall ensure adequate GAC media contact time to meet water quality requirements specified in I. An empty bed contact time of five minutes is recommended, but satisfactory performance has been noted at contact times of one minute for short durations of flow.

C. GAC Media

GAC media shall meet the American Water Works Association (AWWA) Standard for granular activated carbon AWWA B604-74 with the exception of Adsorptive Capacity. The standard includes but is not limited to:

1. Impurities - shall not be present in quantities capable of causing adverse health effects in consumer of treated water.
2. Moisture - shall not exceed eight per cent by weight of listed container contents.
3. Apparent Density - shall not be less than 0.36 g/ml.
4. Particle Size Distribution - should range between U.S. Standard sieve sizes No. 8 and No. 50.
5. Abrasion Resistance - retention of average particle size of granular activated carbon shall not be less than 70% as determined by either the stirring abrasion test or the Ro-Tap abrasion test.
6. Adsorptive Capacity - the Iodine Number shall not be less than 900 or the GAC of equal adsorptive capacity. The iodine number requirement is based upon information obtained from the Florida Department of Environmental Regulation.

The AWWA Standard should be consulted for more detailed information.

D. Filter and Other System Components, Materials

All GAC filter and other system components and materials shall meet applicable AWWA, American Public Works Association, or National Sanitation Foundation Standards.

E. Basic System Components

The system shall consist of the following components:

1. Water Meter - The water meter should be of the flow totalizing type to measure flow in terms of gallon per minute and total gallons of flow.
2. Prefilter - A five micron (maximum) prefilter shall be installed to reduce particulate matter reaching the GAC filter. Disposable cartridge filters or washable reusable media type filters are acceptable.

Installation of additional equipment prior to the five micron filter will be required if treatment for iron, manganese, or other constituent is determined to be necessary.

3. GAC filter - The GAC filter system shall provide a minimum of two cubic feet of filter media. A 5:1 length to diameter ratio of the GAC unit is recommended. Representative dimensions for 1 ft³ and 2 ft³ GAC media are listed below:

<u>Volume of Filter Media (cubic feet)</u>	<u>Filter Diameter (inches)</u>	<u>Filter Height (inches)</u>
1 (per each filter)	8	40
2	10	50

For other media volumes, diameters and heights may be determined by using the following formulas:

$$D = \frac{4V}{5\pi} \quad \text{and} \quad H = 5D \quad \text{where} \quad D = \text{diameter in feet,} \\ \text{and} \quad H = \text{height in feet.}$$

4. Pressure Gauges - Pressure gauges shall be installed before and after the prefilter and after the GAC filter for identification of prefilter or GAC filter clogging.
5. Sampling taps - Sampling taps to evaluate water quality shall be provided before and after the GAC filter.
6. Valves - Gate valves shall be installed before and after the prefilter and after the disinfection unit to allow isolation of system components for maintenance, repair, or replacement.

Installation of a flow regulating valve may be required on some systems (wells with high pumping rates) to ensure adequate GAC media contact time.

7. Disinfection - Continuous disinfection following GAC filtration shall be provided either by chlorination or ultraviolet sterilization.

F. System Component Layout

Possible granular activated carbon adsorption system schematics are shown in Figure 1. A bypass may be established whereby water is diverted around the GAC adsorption system. The bypass shall be plumbed such that untreated water is provided only to outside taps (for watering lawns, etc.).

G. Plans and Specifications

The water purveyor shall in accordance with WAC 248-54-095 submit to the Department for review and approval complete plans and

specifications fully describing the proposed home treatment adsorption system prior to installation of any portion of said system.

III. Monitoring

Monitoring of home treatment unit performance shall be provided by the purveyor. Sample collection, transportation and analysis shall be in accordance with EPA/State approved methods. All samples shall be analyzed at EPA/State certified laboratories.

Proposed EDB monitoring schedules shall be submitted to the Department for review and approval with the plans and specifications.

The minimum recommended frequency of monitoring treated water for EDB per individual household is: one sample within 24 hours following installation (or media replacement) and one sample for every 15,000 gallons treated thereafter. For a family of 4 with average water usage rates (45 gpcd), samples would be taken approximately every 3 months. When sufficient data has been gathered to determine long term EDB removal efficiency, EDB monitoring frequency may be reduced.

Bacteriological monitoring of treated and untreated water for total coliform shall be conducted on a monthly basis.

Additional monitoring may be required by the Department.

IV. Operation, Maintenance, Reporting

Operation and maintenance of the home treatment units will be the responsibility of the purveyor. All operation and maintenance shall be in accordance with the treatment unit manufacturer's/vendor's recommended schedules and procedures.

Operation and maintenance schedules shall be submitted for Departmental approval with plans and specifications. Monthly operations reports will be prepared and submitted to the Department in a format mutually agreed upon by the purveyor and the Department.

V. GAC Media Replacement

Replacement of GAC media shall be required such that the water quality requirements of section I will be met at all times of system operation.

Frequency of media replacement will be site specific, because influent concentrations of EDB and total water usage will vary between individual households. Periodic monitoring of treated water for EDB along with records on volume of water treated should provide sufficient information to indicate when the media needs to be replaced. Replacement of filter media on a minimum of six month intervals after installation is required.

If frequent monitoring is unattainable or cost prohibitive, more frequent media replacement will be required. In these cases, a more conservative replacement schedule, such as every 3-4 months, should be implemented.

VI. Disposal of Spent Carbon

Disposal of spent carbon shall be the responsibility of the purveyor. Disposal shall be in accordance with WAC Chapters 173-301 and 173-303. Regeneration of GAC is encouraged only where engineering analysis has indicated regeneration to be an economical and feasible alternative to replacement.

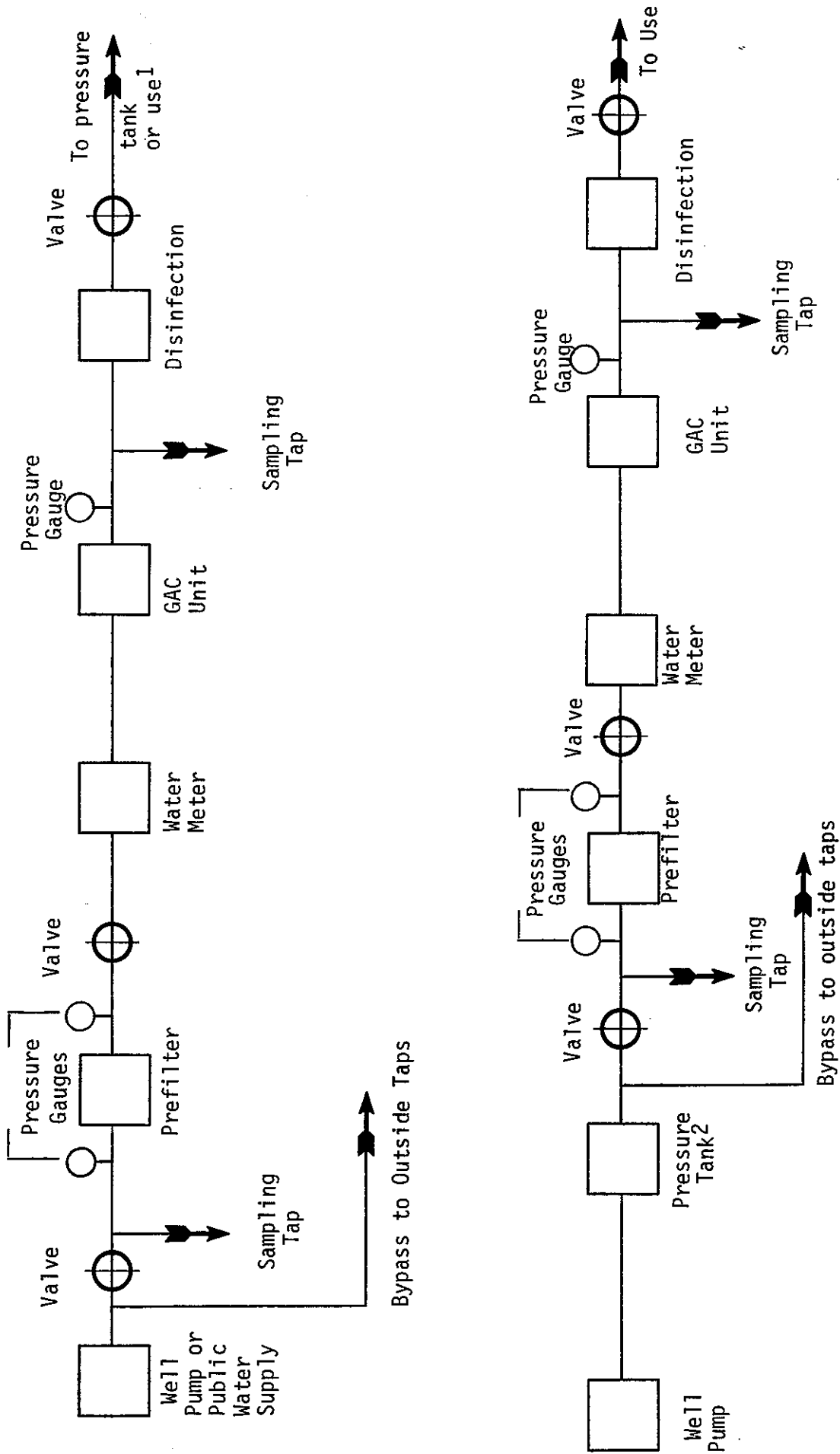
VII. References

A file of references used to prepare this guideline is available in the Technical Service's office in Olympia.

Approved By: *Bill Leahy*

Date: 6/7/85

FIGURE 1 : Granular Activated Carbon Adsorption System



FOOTNOTES: 1. May need to repump to pressure tank.

2. Maximum and minimum operating pressures of pressure tank should be taken into consideration when selecting downstream treatment equipment.