STATE OF CONNECTICUT DEPARTMENT OF PUBLIC HEALTH
DRINKING WATER SECTION

PRESSURE FILTER DESIGN AND INSTALLATION GUIDELINES

Effective Date: June 2, 2011

Authority: Section 19-13-B102(d)(2) of the Regulations of Connecticut State Agencies (RCSA) requires approval from the Department of Public Health (DPH) of treatment works prior to construction. The following guidance is provided in the interest of facilitating the approval process. Discretion in the application of these guidelines is allowable except as required by regulation.

Definitions

Pressure filters: In these guidelines shall refer to cylindrical pressure vessels containing process media used for organic & inorganic chemicals removal, radiological removal, iron and manganese control, water softening, pH adjustment, etc. These guidelines cover only general concepts of pressure filters and associated components. Other guidelines are available on the DPH website http://www.ct.gov/dph/publicdrinkingwater for use as a reference in the design of pressure filters when other specific considerations or appurtenances are necessary.

Water Quality Review and Characterization

(1) Prior to starting the design of pressure filters, the raw water quality should be reviewed so that appropriate process media and pre-treatment process(es) can be properly selected. If there is no sufficient raw water quality data, adequate water samples from all sources of supply should be collected and analyzed by a State certified laboratory. The water analyses are dependent on the parameters/contaminants (i.e. arsenic, uranium, volatile organic chemicals, iron & manganese, hardness, nitrate, nitrite, pH, etc.) that need to be removed/adjusted or that may have an impact on the operation of the filtration/adsorption process being considered. In some cases, water quality characterization is necessary to determine the pre-dominant species of contaminants (i.e. arsenic III, arsenic V, dissolved iron, etc.) in the raw water. The results of the water quality characterization will be used to determine the proper type of process media to be considered and dictate whether a pre-treatment process(es) (i.e. oxidation, pH adjustment, etc.) should be incorporated in the filter design to ensure that the treated water quality meets the applicable drinking water standards or achieves the desired treatment goals.

Location

(1) Section 19-13-B102(d)(1) of the RCSA requires treatment facilities to be located above the 100-year flood elevation. When feasible, the foundation for the proposed treatment facilities should be located at least three feet above the 100-year flood elevation. In addition, it is recommended that the finished floor elevation of the treatment facility be located at least six inches above the final established grade around the facility.

(2) Construction of treatment facilities below the surface of the ground should be avoided whenever possible. If no other option is feasible, appropriate gravity drain to daylight should be provided or provision of sump pump(s) and/or other means should be considered to keep the treatment area dry.

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Sizing of Pressure Filters

(1) Section 19-13-B102(p) of the RCSA requires treatment facilities to have sufficient capacity to provide flows in excess of the maximum flows experienced in the community public water system or service area to be served by the treatment facility.

(2) For a proposed pressure filter treatment facility at a minimum two pressure filters should be installed in parallel with each pressure filter sized based on the system's maximum anticipated daily water demand. For redundancy purposes, at least two parallel trains with two pressure filters in each train, installed in series, should be provided. Each train should be adequately sized to handle the maximum anticipated water demand so that one of the filter trains can be taken out of service for repair and maintenance without service interruption. Provisions to control the flow into or from each filter and to divide flows equally between each active filter should be provided. If multiple filters will be installed, installation should be done in such a way that they can be independently operated and backwashed.

(3) For an existing treatment facility, the pressure filters should be sized based on the approved production capacity of source(s) of supply. If the production capacity of the source(s) of supply is not known, available records (i.e. well yield test log, meter readings, pump data, etc.) should be reviewed. If there are no available records, the production capacity of source(s) of supply should be verified in the field. Sizing the filters using assumed flow rate data is not good practice as this may result in installing either undersized or oversized filters. If the source(s) of supply are not sufficient to meet the average and maximum demands of the water system and no other source(s) of supply are available, the treatment design should be consistent with the system's plans to increase supply capacity as applicable.

Design and Installation Considerations

(1) Pressure filters should be designed and constructed in accordance to the manufacturer's specifications to maintain the sanitary quality of treated water, ensure safety, reliability, and ease of operation and maintenance. Pressure filters should be installed in a secured and sanitary area to protect them from vandalism and potential contamination due to rain, excessive dust, vermin, etc.

(2) Pressure filters should be designed to allow the water to flow through a filter column at a uniform rate to prevent premature breakthrough.

(3) Whenever possible, the filter piping should be arranged as simple as possible to provide for proper filtration, backwashing, and filtering to waste. Adequate space should be provided around each filter to allow for proper operation and maintenance.

(4) Adequate space should be provided for the installation of additional filters and associated appurtenances for future expansion.

(5) Whenever feasible, the pressure filters should be installed upstream of any pressure or atmospheric storage tanks to allow the water to be treated first before storage. If installation of pressure filters upstream of storage tanks is not possible due to operational issues, adequate water storage for treated water should be provided so that clean water is available for use to backwash the process media without water interruption to the distribution system.

(6) Well pumps should be properly sized to accommodate the expected headloss in the pressure filter.

(7) Plumbing components of the facility should conform to the state plumbing code where applicable.

(8) Adequate freeboard should be provided above the process media to allow for expansion during backwash.

(9) The pressure filters should be installed by qualified personnel with experience in drinking water industry and have valid license from the Department of Consumer Protection (DCP) for the scope of work they are permitted to render.

Appurtenances

(1) The individual inlet and outlet pipes of the filters should be provided with isolation valves to minimize service interruption when the filter is removed from service for repair or maintenance.

(2) Smooth nosed (threadless) sample taps should be installed to allow for collection of water quality samples representative of untreated and treated water (before and after each pressure filter). All sample taps should be installed pointed downward at least 12 inches above finished grade and clear from any obstructions.

(3) A filter should be provided with a control mechanism to allow automatic/manual backwash and/or chemical regeneration of process media.

(4) Pressure gauges should be installed on the inlet and outlet pipes of the pressure filter to monitor headloss.

(5) A flow meter is recommended for each filter vessel to monitor the volume of water being treated.

(6) When a brine tank is used for media regeneration, the tank should be kept in good sanitary condition, all connections sealed watertight and provided with a tight-fitting and secure cover.

(7) Each filter should be provided with an adequate means of access to allow for an inspection and maintenance of the interior area, and add or replace the process media.

(8) There should be means for periodic treatment of filter material for control of bacterial growth and other bio-film buildup.

(9) A manual or automatic air release valve should be located on the highest point of the pressure filter or pipeline.

(10) Flow meters should be provided on backwash water lines to monitor the water used for backwashing.

(11) Media retention screens or equivalent should be provided.

(12) The snifter valve(s) for an air eductor should be suitably protected and screened.

(13) A filter-to-waste line should be provided.

(14) Pipes should be properly labeled, color coded, and have flow directional arrows.

Chemical Regeneration

(1) The chemical regeneration components (i.e. chemical day tank, metering pump, etc.) for process media should be properly sized and adequate safety measures should be implemented to protect the system from chemical overfeed. All chemical storage tanks should be properly labeled identifying the type of chemical stored and a secondary containment with 110% holding capacity should be provided.

(2) Pursuant to the RCSA Section 19-13-B80, all drinking water treatment chemicals must be approved by the Department including regenerating chemicals used in pressure filtration systems. The Department accepts the use of drinking water treatment chemicals which are certified to NSF Standard 60. NSF Standard 60 is a national industry standard pertaining to the certification of drinking water treatment chemicals. There are third party accredited testing laboratories including, but not limited to, NSF (www.nsf.org), UL (www.ul.com), and WQA (ww.wqa.org) which certify drinking water treatment chemicals to NSF Standard 60.

(3) Other design considerations for chemical regeneration and associated feed equipment should be consistent with the “Liquid Chemical Feed System Design and Construction Guidelines” available on the Department’s website at http://www.ct.gov/dph/publicdrinkingwater.

Filter Backwash Wastewater and Spent Media Disposal

(1) The drywell or leaching field and its associated appurtenances (i.e. pipes carrying wastewater, manhole, etc.) for backwash wastewater must be located outside of the protective sanitary radius of the nearest production well pursuant to Section 19-13-B51(d) of the RCSA and be at least 25 feet away from an in-ground finished water storage tank pursuant to Section 19-13-B102(f)(5)(B) of the RCSA.

(2) The Department of Environmental Protection (DEP) and the Local Health Department (LHD) should be contacted regarding the regulatory requirements for on-site backwash wastewater disposal systems. All necessary permits/approvals from DEP, LHD, and other agency(ies) should be obtained prior to starting the installation of the filters.

(3) The spent process media should be properly disposed of in accordance with applicable regulations.

Materials

(1) Pressure filter materials and products should not cause the water delivered to the customers to become impure, unhealthy, and non-potable, produce aesthetic problems such as taste and odors, or promote bacterial growth after being placed into active service. Materials in direct contact with potable water such as but not limited to: vessels and interior surface coatings, media, adhesives, lubricants, etc. should be certified to applicable NSF/ANSI Standards. Media should conform to AWWA Standards, if available.

(2) Calcite media for pH adjustment and other media used in the pressure filters that dissolve in the water must be approved by the Department pursuant to the RCSA Section 19-13-B80. The Department accepts the use of drinking water treatment chemicals which are certified to NSF Standard 60. NSF Standard 60 is a national industry standard pertaining to the certification of drinking water treatment chemicals. There are third party accredited testing laboratories including, but not limited to, NSF (www.nsf.org), UL (www.ul.com), and WQA (ww.wqa.org) which certify drinking water treatment chemicals to NSF Standard 60.

Cross Connection Control

(1) Appropriate cross connection control measures (i.e. air gap, RPD, etc.) shall be provided as necessary in accordance with Section 19-13-B38a of the RCSA on the pipeline carrying backwash wastewater to disposal site, make-up water supply line to a chemical regeneration tank, filter-to-waste lines, etc. to protect the system from potential cross-contamination.

(2) There shall not be any piping bypass around a pressure filter between untreated and treated water if the untreated water does not meet drinking water standards (i.e. MCL violation) in accordance with Sections 19-13-B37 and 19-13-B38a of the RCSA.

Disinfection

(1) After installation is completed, pressure filters and associated appurtenances must be effectively disinfected in accordance with Section 19-13-B47 of the RCSA and the manufacturer's requirements. Caution should be exercised when disinfecting the process media to prevent it from being damaged. The media manufacturer/supplier should be consulted for proper disinfection. At a minimum, the inside of the empty pressure filters should be thoroughly cleaned and washed with a bleach and water solution. For water softeners, the units should be placed into "bypass" mode and

bleach should be added to the brine tank. The water softeners should then immediately be run through a regeneration cycle. For larger pressure filters, disinfection may be done in accordance with the most current version of AWWA Standard C653 *Disinfection of Water Treatment Plants*. Special care should be taken not to run chlorinated water through granular activated carbon (GAC) filter media.

Water Quality Testing

(1) After disinfection and flushing but prior to placing the pressure filter(s) into active service, water quality samples must be collected from the discharge line of the pressure filters for total coliform bacteria analysis and/or other water parameters analyses as specified in the term of the DPH's project approval. The water quality test results must be in conformance with Section 19-13-B102(e) of the RCSA prior to placing the pressure filters into active service.

(2) Upon placing the pressure filters into active service, water samples should be collected from each filter discharge pipe for laboratory analyses to determine the treatment effectiveness. The test results would be used to make adjustments of the treatment process(es) operation to ensure that the treated water quality meets the applicable drinking water standards or achieves desired treatment goals.

Schematic of Pressure Filters

Schematics of various typical pressure filters installations have been provided on the following pages for reference purposes. The schematics show the basic components and appurtenances for pressure filter design and installation. Schematics may need to depict other system components depending on the installation, system operations and water quality conditions and how they might relate to the design and construction of the pressure filtration system.

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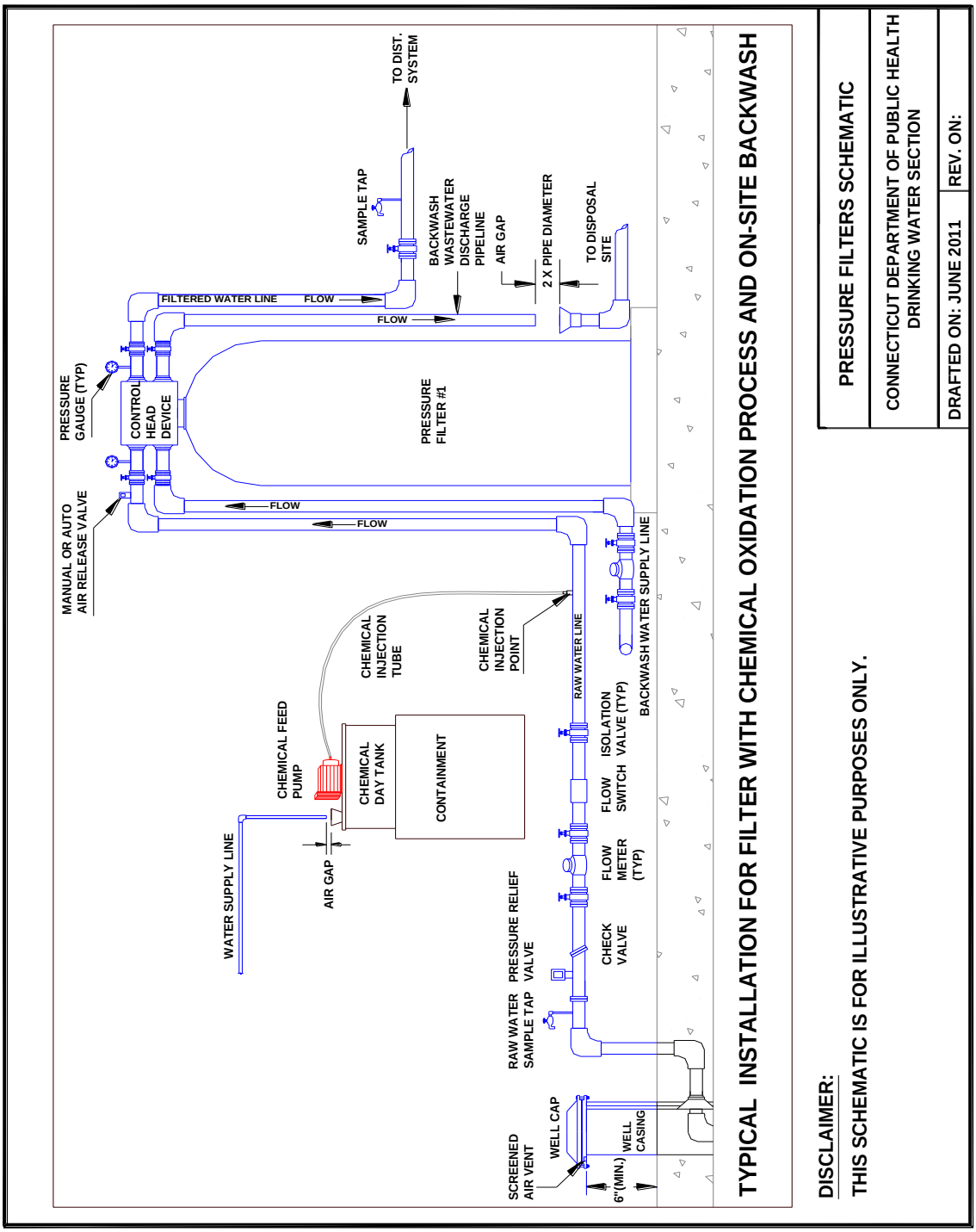
TYPICAL SCHEMATICS



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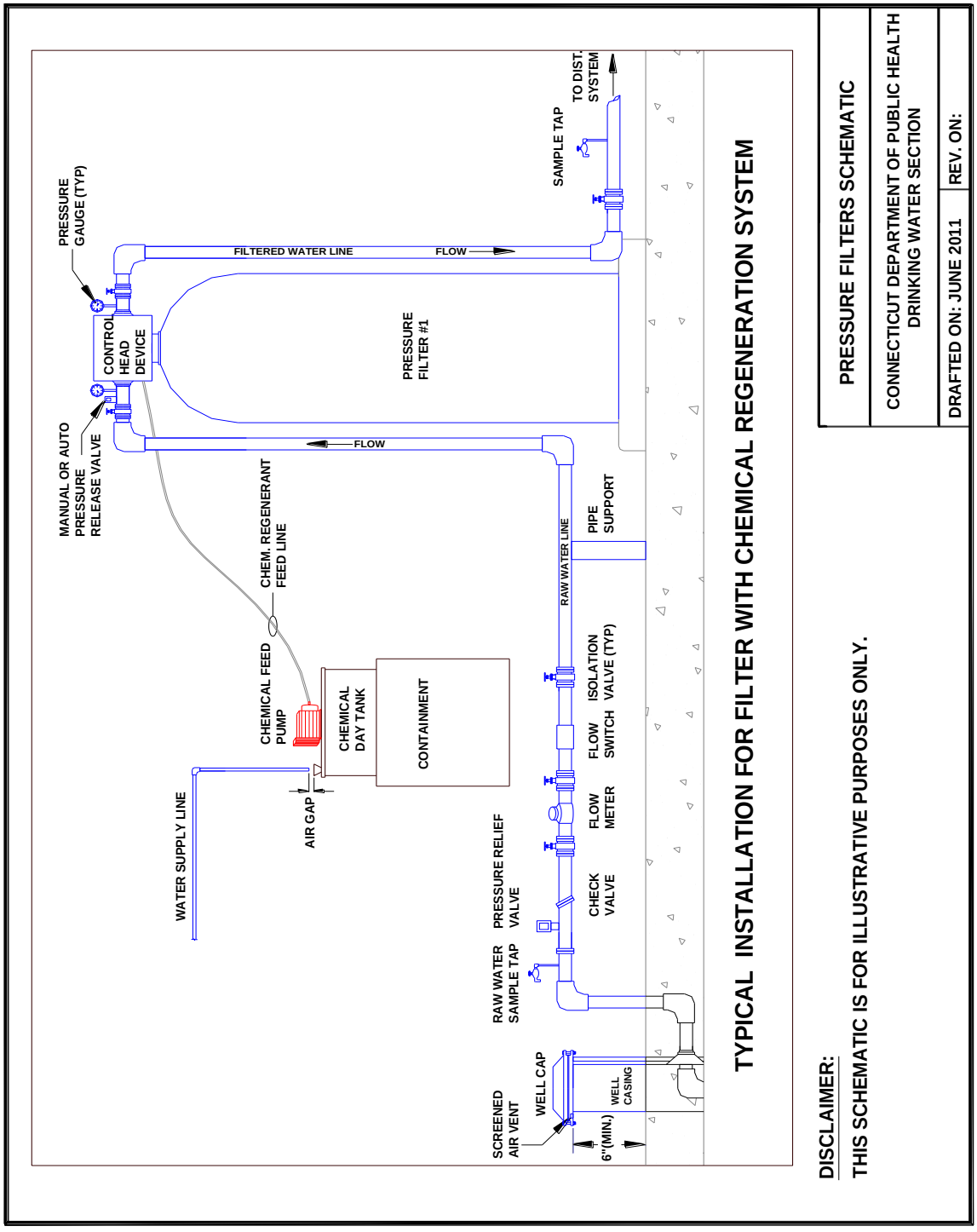

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