pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Filter Bed Evaluation Program Requirements

Section 109.703(b)(5) of the Pennsylvania Safe Drinking Water regulations requires water suppliers using surface water or GUDI sources with filtration facilities to implement a filter bed evaluation program, acceptable to the Department of Environmental Protection (Department) See 25 Pa. Code § 109.703(b)(5). The evaluation program includes an evaluation of filter media, filter bed expansion, valves, surface sweep and sampling of filter turbidities over one entire filter run. The results of the evaluation must be maintained on file for at least five years and submitted to the Department upon request as provided in 25 Pa. Code §§ 109.701(a)(6) and (d)(1).

Does the Filter Bed Evaluation Program Requirements apply to my filter plant?

The Filter Bed Evaluation Program requirements apply to all filter plants. The following details focus on systems equipped with rapid rate granular media filtration (i.e. Conventional, Direct, Inline Filtration). All remaining filter plants (those using membrane, DE, slow sand, bag and cartridge filtration technologies) should follow their filter manufacturer-specific recommendations to implement a filter evaluation program for their filters which do not utilize rapid rate media. All filter plants are required to maintain Filter Bed Evaluation program results on file and make these files available to the Department upon request.

Is my filter evaluation program acceptable to the Department?

A filter evaluation program that would be considered acceptable to the Department would be one that:

- Includes an evaluation of filter media, filter bed expansion, valves, surface sweeps (or air scour as applicable) and sampling of filter turbidities over one entire filter run.
- Follows the filter manufacturer's recommended procedures and the water industry best management practices related to conducting filter evaluations such as those provided by the American Water Works Association.
- Maintains adequate records documenting filter evaluation program findings, which are readily available to the Department upon request.
- Is implemented on a frequency which identifies problems with the physical integrity of filter components before finished water quality or quantity is significantly degraded.

How often should I implement my filter evaluation program?

Water suppliers should clearly define in their filter evaluation program how frequently they will conduct filter evaluation activities. As an example, a water supplier may state, "the filter media depth and media sieve analysis will be evaluated annually for each filter." Other filter evaluation activities, such as measuring filter bed expansion, will be completed and documented at least once per calendar quarter for each filter. It is very important to note that the frequency and detail of specific evaluation program components should be increased as needed, whenever routine evaluations identify that problems exist which may compromise the integrity of the filter. For example, if quarterly bed expansion measurements reveal that expansion of a particular filter is noticeably decreased, that filter should be evaluated further to determine the cause(s).

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How often should I have my filter media tested? Do I need to sample every filter every year?

A representative number of filters should be sampled each year, considering differences in filter design, age of media, and filter performance. For example, a filter plant that has eight filters where four filters consist of filter media that is ten years old and the other four filters consist of media that is five years old. In this instance, if all filters are performing similarly relative to filter bed expansion, filter run time, headloss and turbidity removal, then the minimum number of filter media samples that would be considered representative would be one sample from each group of four filters each year. Overall, this filter plant should sample media for at least two filters per year. In contrast, if this same filter plant has one filter which is performing significantly worse than the others, a third media sample should also be collected from that worst performing filter.

If the results of the filter media analysis from this subset of representative filters reveal no significant concerns or degradation in media condition, no additional sampling would be required. However, if the annual media analysis results are outside of the design specifications for the facility or specifications set forth in the Part II of the Department's Public Water Supply Manual, then filter plant staff should consider media analysis of additional filters to determine the extent of the problem.

Overall, the specific filters which are sampled should be rotated each year to obtain filter media results from all filters such that each individual filter is sampled at least once every 3 to 4 years.

Where should I maintain my filter evaluation program results?

The filter evaluation program results must be maintained on file and submitted to the Department upon request. The Department will review filter evaluation results during inspections, sanitary surveys and Filter Plant Performance Evaluations. Overall, it is very important for water suppliers to review the data produced by their filter evaluation program in order to determine if corrective actions are needed for any particular individual filter / filter component.

What type of filter evaluation results should be documented and maintained on file?

Water suppliers should document both measurable and visual results (i.e. photos). Measurable results may include: media depth, filter bed expansion, and filter media analysis results. Visual results may include: the photos of mudballs, depressions, mounding, filter boiling, missing surface wash nozzles, and uncontrolled air.

Water suppliers should document all filter deficiencies that were identified and describe the corrective actions that were taken.

Water suppliers must report to the Department within 1-hour of discovery all filter deficiencies which have the potential to adversely affect the quality or quantity of drinking water, per 25 Pa. Code § 109.701(a)(3)(iii).

A public water supplier may use the attached "Filter Bed Evaluation Results Form," Attachment A, to document the results or they may use their own form if it captures at least the same information.

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Where can I find more information about creating and interpreting filter profiles?

Additional information regarding filter profiles can be found on the Department's elibrary website in the document called *Checklist for Producing Filter Profiles* Doc. No. 3900-FM-BSDW0004. Also, a power point presentation is available that provides tips on interpreting filter profiles. The presentation can be found on the Department's website by searching the words "interpreting filter profiles."

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Attachment A

Filter Bed Evaluation Program Results Form

PWSID#:	System Name:
Plant Name:	Filter #:
Date:	

ANNUAL Evaluation Filter Media AWWA B100 Analysis FILTER #			
Garnet			
	Effective Size (mm)	Uniformity Coefficient	Acid Solubility/ Weight Loss (%)
Filter media design specifications.			
Record the media analysis result.			
Was result within the desired range?			
Describe any corrective actions taken.			

Filter Bed Evaluation Program Results Form

ANNUAL Evaluation Filter Media AWWA B100 Analysis FILTER #			
Sand			
	Effective Size (mm)	Uniformity Coefficient	Acid Solubility/ Weight Loss (%)
Filter media design specifications.			
Record the media analysis result.			
Was result within the desired range?			
Describe any corrective actions taken.			

Filter Bed Evaluation Program Results Form

ANNUAL Evaluation Filter Media AWWA B100 Analysis FILTER #			
Anthracite			
	Effective Size (mm)	Uniformity Coefficient	Acid Solubility/ Weight Loss (%)
Filter media design specifications.			
Record the media analysis result.			
Was result within the desired range?			
Describe any corrective actions taken.			

Filter Bed Evaluation Program Results Form

ANNUAL Evaluation Filter Media AWWA B604/B605 Analysis FILTER #				
Granular Activated Carbon				
	Effective Size (mm)	Uniformity Coefficient	Water Soluble Ash Content (%)	Iodine #
Filter media design specifications.				
Record the media analysis result.				
Was result within the desired range?				
Describe any corrective actions taken.				

Filter Bed Evaluation Program Results Form

ANNUAL Evaluation Filter Media Depth FILTER #				
	Garnet	Sand	Anthracite	Granular Activated Carbon
Design specifications for filter media depth (inches).				
Record the measured filter media depth (inches).				
Was result within the design specification?				
Describe any corrective actions taken.				

Filter Bed Evaluation Program Results Form

ANNUAL Evaluation Filter Effluent Control Valve FILTER #	
Does the SCADA output match the filter effluent flow meter output?	
Does the valve produce stable flow rates?	
What is the filter effluent flow rate reading while the valve is closed?	
What date was the filter effluent flow meter last calibrated?	
What was the maximum filter effluent flow rate (gpm/ft^2) during the most recent filter run?	
What is the design flow rate of the filters (gpm/ ft^2)?	
Describe any deficiencies identified:	
Describe any corrective actions taken:	

Filter Bed Evaluation Program Results Form

ANNUAL Evaluation Sketch of Filter #
The following space can be used for depicting the filter and the location of any deficiencies seen during the visual observation of the filter bed. You can use the following acronyms to mark the location of these deficiencies: B=Boiling; MB=Mud Balls; M=Mounding; D=Depressions; C=Cracks; S=Separation

Filter Bed Evaluation Program Results Form

QUARTERLY Evaluation Filter Bed Expansion FILTER #				
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Filter Bed Expansion (%) Target.				
Record the filter bed expansion (%) result.				
Did filter bed expansion result meet the desired target?				
Describe any corrective actions taken.				

Filter Bed Evaluation Program Results Form

QUARTERLY Evaluation Filter Free Board FILTER #				
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Free board design specification (inches).				
Record the free board measurement (inches).				
Did free board measurement equal the design specification?				
Describe any corrective actions taken.				

Filter Bed Evaluation Program Results Form

QUARTERLY Evaluation – Surface Sweeps FILTER #	
Do surface sweeps rotate?	
Are there any missing nozzles?	
Are there any clogged nozzles?	
Are any of the nozzles missing the rubber cover (check valve)?	
Are the surface sweeps level?	
Is the spindle worn? (Does it leak water or have excessive play?)	
Record the distance between the bottom of the surface sweep and top of filter bed.	
Is the surface wash effective at preventing mudball formation?	
Document the flow rate applied to the surface sweeps.	
Does the surface sweep flow rate meet the design specifications of the facility?	
Describe any deficiencies identified:	
Describe any corrective actions taken:	

QUARTERLY Evaluation – Air Scour Filter #	
Does the air scour provide for an even distribution of agitation across the filter bed during air scour operation?	
Is the air scour effective at preventing mudball formation?	
What is the pressure (psi/ft^3) of air applied during the air scour operation?	
What is the design air pressure (psi/ft^3)?	
Describe any deficiencies identified:	
Describe any corrective actions taken:	

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QUARTERLY Evaluation – Individual Filter Effluent Turbidity Profile FILTER #	
Attach a turbidity profile graph of the filter for an entire filter run from backwash to backwash inclusively labeling times for all performance spikes and events. Use PADEP's *Checklist for Producing Filter Profiles* Doc. No. 3900-FM-BSDW0004 for directions on producing a filter profile.	
What is the date and time of start of the backwash?	
What were the backwash rates and times used for each stage of the backwash?	
What is the date and time of filter-to-waste start and stop?	
What volume of water was used for filter-to-waste?	
What was the filter effluent turbidity when it was put back online after the backwash?	
What is the date and time when the filter was placed back into service?	
What was the filter effluent turbidity when the filter was first placed into service?	
How many hours was the filter in service?	
What was the maximum filter effluent turbidity when the filter was in service?	
What was the date and time of the maximum filter effluent turbidity when the filter was in service?	
What was the average (settled) turbidity of the water applied to the filter when the filter was in service?	
What was the maximum filtration rate (gpm/ft^2) while the filter was in service?	
Were there any rapid flow changes when the filter was in service?	
What was the filter effluent turbidity when the filter was taken out of service for backwashing at the end of the filter run?	
What is the date and time when the filter was taken offline for backwashing?	
How does the performance of this filter compare to your other filters? Rank filters from best to worst based on the maximum filter effluent turbidity of each filter. Attach ranking.	
Does the performance of this filter meet the performance goals established by your filter evaluation program?	

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QUARTERLY Evaluation – Individual Filter Effluent Turbidity Profile FILTER #
Describe any deficiencies identified:
Describe any corrective actions taken:
Additional Findings FILTER #
The following space can be used for additional narrative to describe any filter deficiencies that were not thoroughly captured in other areas of this form:

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QUARTERLY Evaluation – Individual Filter Effluent Turbidity Profile FILTER #
Describe any corrective actions taken:
Photos
Photos should be taken to document the current condition of the filter bed as well as documenting any mudballs, depressions, mounding, filter boiling, missing surface wash nozzles, uncontrolled air etc.. Please attach photos to this form:

Use additional sheets or reverse side to provide more information if needed.

☐ I acknowledge that water system staff will notify the Department immediately upon discovery of any filter deficiencies which have the potential to adversely affect the quality or quantity of drinking water per 25 Pa. Code § 109.701(a)(3)(iii).

☐ The information contained herein is true and correct to the best of my knowledge, information and belief. The information given is subject to the penalty provisions of the Crimes Code regarding unsworn falsification to authorities (18 P.S.C.S.A. §4904).

Responsible Official's Name (printed):	
Responsible Official's Signature:	Date: