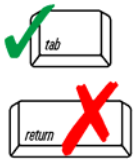
Massachusetts Department of Environmental Protection
Bureau of Resource Protection – drinking water program

Water Supply Facility Checklist for Potassium Hydroxide (KOH) or Sodium Hydroxide (NaOH) for Permit Review/Approval

Instructions to Applicant

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



The purpose of this Drinking Water Program (DWP) Facility Checklist is to assist the public water systems to prepare drinking water program permit applications that comply with all MassDEP regulations, policies, and guidelines. Completion of this checklist will ensure that the applicant has considered all minimum permitting aspects identified by the MassDEP Drinking Water Program. Massachusetts registered professional engineer must complete the appropriate section(s) of the checklist for the permit requested (including any brief explanations), sign the certification statement, and submit this checklist, brief explanations (where noted), and certification with the permit application (BRP WS 23A, BRP WS 23B, BRP WS 23C, BRP WS 24, BRP WS 25, BRP WS 29, BRP WS 34 or other BRP WS permit application). The DWP staff will use these documents to expedite the review/approval of the permit application.

For this particular checklist it is understood when the following words are used that the words "chemical", "corrosion control", "pH", "pump", "caustic", and "feeder" shall mean Potassium Hydroxide (KOH) and/or Sodium Hydroxide (NaOH).

If more than one chemical application, well, or treatment plant will be used, a separate checklist will be required.

N/A means "not applicable."

A. Facility Information

PWS Name

City/Town | PWS ID # | Source Code #

Treatment Facility | Permit Application #

Check form submitted: ☐ BRP WS 34 ☐ BRP WS 29 ☐ BRP WS 25

☐ BRP WS 24 ☐ BRP WS 23C ☐ BRP WS 23B ☐ BRP WS 23A

☐ other BRP WS

MassDEP Transmittal #

Check which chemical will be used: ☐ KOH ☐ NaOH

B. Project Checklist

1. **Project description**, including any DEP waivers granted:

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B. Project Checklist (cont'd)

2. Treatment

Answer the following questions regarding treatment. Please note that the questions and sections correspond with the standards contained in the Massachusetts Department of Environmental Protection Drinking Water Program's latest editions of Guidelines and Policies for Public Water Systems.

Chapter 5.1.4 Treatment	**Yes**	**No**	**N/A**
1. **Pilot facility studies**: Was a pilot study or in-plant demonstration, including the engineer's design recommendations, submitted to and approved by MassDEP prior to preparing plans and specifications?	☐	☐	☐
Chapter 5.8 Corrosion Control			
2. Does the water system currently exceed the lead and/or copper action levels?	☐	☐	☐
3. Will optimal corrosion control treatment in accordance with 310 CMR 22.06B be installed and operated?	☐	☐	☐

If yes, describe process:

_____

_____

3. Chemical Application

Answer the following questions regarding chemical application. Please note that the questions and sections correspond with the standards contained in the Massachusetts Department of Environmental Protection Drinking Water Program's latest editions of Guidelines and Policies for Public Water Systems. Some new questions have been added as updates.

Chapter 6.0 Chemical Application	**Yes**	**No**	**N/A**
Plans & Specifications			
1. Are descriptions of feed equipment, including maximum, average, and non-zero minimum feed ranges (expressed in daily/monthly use and gallons/volume/weight per hour), provided?	☐	☐	☐
2. Are the locations of feeders, piping layout, and points of application shown?	☐	☐	☐
3. Are descriptions of storage and handling facilities provided?	☐	☐	☐
4. Are there specifications for the chemicals to be used?	☐	☐	☐
5. Are there operating and control procedures, including proposed application rates?	☐	☐	☐
6. Are descriptions of testing equipment and procedures provided?	☐	☐	☐

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B. Project Checklist (cont'd)

	Yes	No	N/A
7. Do the plans include a chemical schematic of all pH equipment and piping including sampling and monitoring locations?	☐	☐	☐
Chemical Application			
8. Are chemicals applied at points and by means to assure maximum treatment efficiency?	☐	☐	☐
9. Are chemicals applied at points and by means to provide maximum safety to consumers?	☐	☐	☐
10. Are chemicals applied at points and by means to provide maximum safety to operators?	☐	☐	☐
11. Are chemicals applied at points and by means to assure satisfactory mixing of the chemicals with the water?	☐	☐	☐
12. Are chemicals applied at points and by means to provide maximum flexibility of operation through various points of application?	☐	☐	☐
13. Are chemicals applied at points and by means to prevent backflow, prevent back-siphonage, prevent bypassing of treatment units, and eliminate multiple points of feed through common manifolds?	☐	☐	☐
14. Is completed chemical injection point into a pipeline that uses an injection nozzle with corporation stop, ball check (to prevent backflow), and safety chain/cable, or uses a diffuser pipe into a basin?	☐	☐	☐
General Equipment Design			
15. Will the feeders be able to supply, at all times, the necessary amounts of chemicals at an accurate rate, throughout the range of feed?	☐	☐	☐
16. Are the chemical-contact materials and surfaces resistant to the aggressiveness of the chemical solution?	☐	☐	☐
17. Are corrosive chemicals introduced in such a manner as to minimize potential for corrosion?	☐	☐	☐
18. Are chemicals that are incompatible not fed, stored or handled together?	☐	☐	☐
19. Are all chemicals conducted from the feeder to the point of application in separate conduits?	☐	☐	☐
20. Are chemical feeders as near as practical to the feed point?	☐	☐	☐
21. Is pump sized in specifications such that pump will not operate at a point no lower than 10% of feed range dial at any time for greater metering accuracy?	☐	☐	☐
22. Is pump sized in specifications such that pump will not deliver more than 2,000 % of optimal chemical dosage in mg/l to help prevent potential overfeeds?	☐	☐	☐

Water Supply Facility Checklist for Potassium Hydroxide (KOH) or Sodium Hydroxide (NaOH) for Permit Review/Approval

B. Project Checklist (cont'd)

Section 6.1 Facility Design	Yes	No	N/A
Feeders and Metering Pumps			
23. Does the chemical feed system include a minimum of two feeders, of which the standby unit or a combination of units is of sufficient capacity to replace the largest unit during shutdown?	☐	☐	☐
24. Is a separate feeder system used for each chemical applied?	☐	☐	☐
25. Are spare parts available for all feeders to replace parts that are subject to wear and damage, such as, anti-siphon valves, belts, tubing, etc.?	☐	☐	☐
Control of Feeders and Metering Pumps			
26. Are feeders manually or automatically controlled in setting stroke length, with automatic controls designed so as to allow override by manual controls?	☐	☐	☐
27. Are chemical feed rates proportioned or automatically flow paced to water flow?	☐	☐	☐
28. Is a means to measure treated water flow (in gpm and total gallons) provided?	☐	☐	☐
29. Are provisions made for measuring the daily net quantities of chemicals used in ml, gallons, or pounds?	☐	☐	☐
30. Are chemical feeders synchronized to start and stop (electrically interlocked with appropriate upstream water pump motor or thermal type flow switch) with the flow of water being treated as the primary electrical interlock?	☐	☐	☐
31. Will the chemical metering pumps interlock system be hard wired or use a twist type plug and receptacle with pilot light "on or energized" indicator to help prevent overfeeds?	☐	☐	☐
32. Will the controls be configured such that the chemical metering pumps are restarted only at the water treatment facility following an alarm initiated shutdown?	☐	☐	☐
33. If scales are used, are scales accurate to measure 0.5% of the load in pounds?	☐	☐	☐
Positive Displacement Solution Pumps			
34. Are positive displacement type solution pumps used to feed liquid chemicals?	☐	☐	☐
35. Does each feeder have a pressure relief valve (that is safely tubed or piped back into the daytank, solution tank, carboy shipping container, or 1,000 ml calibration chamber used as a suction chamber) on the discharge line for operator safety?	☐	☐	☐

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B. Project Checklist (cont'd)

	Yes	No	N/A
36. Is there a clear calibration chamber (in ml) or mass flow meter mounted near each feed pump to aid the operator in setting the pump rate?	☐	☐	☐
Liquid Chemical Feeders - Siphon Control			
37. Do liquid chemical feeders provide discharge at a point of positive pressure or provide vacuum relief; and provide an air gap or anti-siphon device?	☐	☐	☐
38. If a peristaltic pump is used, is an anti-siphon or back-pressure valve used on discharge line?	☐	☐	☐
39. Do liquid chemical feeders provide other suitable means or combinations as necessary to prevent chemical solutions from being siphoned into the water supply, such as a diaphragm type operated back-pressure valve or diaphragm type operated anti-siphon valve located where visible and easily accessible to the operator?	☐	☐	☐
Cross-Connection Control			
40. Is cross connection control in this permit provided in accordance with regulations of the MassDEP Drinking Water Regulations (310 CMR 22.22), and any filtered water feed points and un-filtered water feed points are not cross connected via the daytank and chemical feeder?	☐	☐	☐
Location of Chemical Feed Equipment			
41. Is the chemical feed equipment located in a separate room to reduce hazards and vapors?	☐	☐	☐
42. Is the chemical feed equipment conveniently located near points of application to minimize length of feed lines?	☐	☐	☐
43. Is the chemical feed equipment readily accessible with adequate space provided for servicing, repair, and observation of operation?	☐	☐	☐
44. Is the chemical feed equipment located either above or inside the containment area?	☐	☐	☐
In Plant Service Supply			
45. Is the in plant service water supply (if used in this permit) ample in quantity and adequate in pressure?	☐	☐	☐
46. Is the in plant service water supply provided with a means for measurement if preparing specific solution concentrations by dilution?	☐	☐	☐
47. Is the in plant service water supply (if used in this permit) properly protected against backflow and back-siphonage?	☐	☐	☐

B. Project Checklist (cont'd)

Chemical Storage and Process Tanks	Yes	No	N/A
48. Is space provided for:			
a. at least 30 days of chemical supply to meet average treated water demand?	☐	☐	☐
b. convenient and efficient handling of chemicals?	☐	☐	☐
49. Are storage tanks and pipelines for liquid chemicals dedicated to the specific chemicals?	☐	☐	☐
50. Will the chemicals be stored in covered or unopened shipping containers, unless the chemical is transferred into an approved covered storage unit?	☐	☐	☐
51. Do bulk liquid chemical tanks have:			
a. a means to visually observe liquid level that is calibrated to indicate the liquid volume in the tank?	☐	☐	☐
b. a proper vent that is separate from any other chemical vent?	☐	☐	☐
c. an overflow with minimum size and capacity equal to the fill pipe?	☐	☐	☐
d. a minimum 6-inch high containment curb?	☐	☐	☐
e. label to designate the chemical name contained?	☐	☐	☐
f. a threaded and capped ball valved drain that discharges to a containment area or holding tank?	☐	☐	☐
g. vent(s) sized at 150% of fill pipe diameter to prevent excess pressures or vacuum?	☐	☐	☐
h. a bulk solution tank fill valve station labeled with the chemical name, 4 digit UN number, and formula of the chemical, and provisions for locking when not in use, and provide containment for minor releases during the fill process?	☐	☐	☐
i. a cover?	☐	☐	☐
j. a high level liquid sensor that activate audible and visual alarms mounted at locations that will alert both the treatment system operator and tank truck delivery driver to prevent overfilling of bulk tank(s)?	☐	☐	☐
k. have a ball shut off valve on inside fill pipe to prevent backflow of chemical when hose is disconnected, and to guard against any unauthorized fill ups?	☐	☐	☐
l. a design to minimize accidental splashing, and is overflow brought down to 12-24 inches from floor that discharges over a splash plate, and away from any sensitive equipment?	☐	☐	☐

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B. Project Checklist (cont'd)

	Yes	No	N/A
m. outside vent(s) terminating to prevent contamination, such as, in a down turned position, and covered with a 24-mesh corrosion-resistant screen?	☐	☐	☐
n. if penetrating a roof, does vent terminate at least 24 inches above the roof to prevent snowmelt from entering bulk tank?	☐	☐	☐
o. an inside building location or above ground location?	☐	☐	☐
52. Do containment areas provide:			
a. a bermed area capable of containing 110% of the volume of the chemicals stored within the area?	☐	☐	☐
b. no floor drains or sump pumps unless the flow is directed to a separate containment area or tank?	☐	☐	☐
c. a sump or sloped to a low area to allow pumpage?	☐	☐	☐
d. an overflow from chemical storage tanks that discharges to the containment area?	☐	☐	☐
e. separate containment for chemicals that are not compatible, such as, acids and bases?	☐	☐	☐
f. a leak/spill detection alarm device?	☐	☐	☐
53. If overflow discharge to the outside of the containment area, can overflows do one of the following? a. discharge to a holding tank with a minimum volume equal to 25% of the storage tank, or b. discharge to a separate covered containment area with a minimum volume equal to 25% of the storage tank, or c. have an overflow capacity in the storage tank with a minimum volume equal to 25% of the capacity of the tank and a high audio and visual level alarm that will be set at the full level, excluding the overflow volume?	☐	☐	☐
54. Are two solution tanks of adequate volume provided, if necessary, to assure continuity of supply in servicing a solution tank?	☐	☐	☐
55. Are all chemical solutions kept covered and are the openings in bulk tanks with access openings curbed and fitted with tight overhanging	☐	☐	☐
56. Subsurface locations for bulk solution tanks:			
a. do they assure freedom from sources of possible contamination?	☐	☐	☐
b. are they located in a double walled containment vault with a spill/leak detection device?	☐	☐	☐

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B. Project Checklist (cont'd)

	Yes	No	N/A
57. Are overflow pipes:			
a. directed downward into the containment area, with the end screened or otherwise protected?	☐	☐	☐
b. located where noticeable?	☐	☐	☐
58. Is each large tank provided with a valved drain, protected against backflow in accordance with Cross Connection Control Regulations and liquid chemical feeders guidance, and located so that chemicals from equipment failure, spillage, or accidental drainage will not enter the water in conduits or treatment or storage basins?	☐	☐	☐
59. If a smaller system, does design show a caustic chemical fed directly from a scale mounted shipping container no larger than 30 gallons?	☐	☐	☐
60. Is a covered, labeled, and vented day tank provided when bulk storage tank(s) are provided?	☐	☐	☐
61. Are the day tank(s) sized to hold no more than a 30 - 60 hour chemical supply at average treated water demand rate?	☐	☐	☐
62. Are precise means (scale mounting, ultrasonic level sensing, gauge rods with floats, or visual calibration where ratio of tank height to diameter are meaningful) provided to measure the volume or weight of caustic fed daily?	☐	☐	☐
63. Transfer of Chemicals:			
a. Are motor or magnetic-driven transfer pumps to daytank provided?	☐	☐	☐
1. Is a liquid level limit switch on daytank cover provided to automatically shut off transfer pump when daytank is full?	☐	☐	☐
b. Is filling of daytank done manually and not automated and filled by a safe means?	☐	☐	☐
Feed Lines			
64. Are feed lines as short and straight as possible in length of run and:			
a. of durable, corrosion resistant material?	☐	☐	☐
b. easily accessible?	☐	☐	☐
c. protected against freezing?	☐	☐	☐
d. readily cleanable?	☐	☐	☐
e. properly protected and secured?	☐	☐	☐

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B. Project Checklist (cont'd)

	Yes	No	N/A
65. Does the suction feed line(s) slope upward from the chemical source to the metering pump without loops to help avoid air-entrapment with a foot-valve?	☐	☐	☐
66. Are the feed lines designed consistent with scale-forming or solids depositing properties of the water, chemical, solution or mixture conveyed?	☐	☐	☐
67. Are the feed lines color-coded yellow with green band, labeled with chemical name, and show arrows for direction of flow?	☐	☐	☐
68. Are any outside underground feed lines in secondary containment?	☐	☐	☐
69. Are any outside underground secondary containment of feed lines sloped to a location where any leaks are visually noticeable?	☐	☐	☐
Handling			
70. Are carts, elevators, drum skids, drum trucks and other appropriate means provided for lifting chemical containers to minimize excessive lifting by operators?	☐	☐	☐
71. Are provisions made for disposing of drums or barrels by an approved procedure which will minimize exposure?	☐	☐	☐
Housing			
72. Are floor surfaces smooth, impervious, slip-proof and well drained?	☐	☐	☐
73. Do vents from feeders, storage facilities and equipment exhaust discharge to the outside atmosphere above grade and remote from air intakes, doors, windows, and parked vehicles?	☐	☐	☐
74. Is adequate ventilation and heating provided that conforms to all local and/or state codes?	☐	☐	☐
Section 6.2 Chemicals			
Shipping Containers			
75. Do specs state that chemical shipping containers shall be fully labeled to include chemical name, purity, concentration, supplier name and address?	☐	☐	☐
Specifications			
76. Do specs state that chemicals shall meet latest ANSI/AWWA and NSF 60 specifications?	☐	☐	☐

B. Project Checklist (cont'd)

	Yes	No	N/A
Assay			
77. Are there provisions for assay of chemicals bulk delivered, such as, a labeled sampling tap on fill line to bulk tank to verify accuracy of chemical specifications?	☐	☐	☐
78. Will recommendation that visual and chemical sampling of chemical during delivery be conducted to verify the correct chemical is being added be included in standard operating procedure (SOP)?	☐	☐	☐
Section 6.3 Operator Safety			
Other Protective Equipment and Systems			
80. Are a safety deluge shower and eyewash installed between the location of the hazard and the nearest means of egress?	☐	☐	☐
81. If a bulk chemical tank over 1,000 gallons is used, are safety deluge shower and piped eye-washing device approved by ANSI Z358.1-2004?	☐	☐	☐
82. Does activation of deluge shower or eyewash initiate a visual and audible alarm to remote location?	☐	☐	☐
83. Is a water-holding tank that will allow water to come to room temperature installed in the water line feeding the safety deluge shower and piped eye washing device?	☐	☐	☐
84. Will a sufficient amount of spill absorbent be stored on site for any uncontrolled discharges?	☐	☐	☐
85. Will a standard operating procedure (SOP) for caustic be posted in a protective shop envelope on the wall for the operator, and will the caustic MSDS be available on site?	☐	☐	☐

4. Chapter 7.0 Pumping Facilities

Answer the following questions regarding pumping facilities. Please note that the questions and sections correspond with the standards contained in the Massachusetts Department of Environmental Protection Drinking Water Program's Guidelines and Policies for Public Water Systems.

1. Are analyzer discharges in compliance with DEP fact sheet "Registration of Discharges to the Ground From Pump Houses and Other Public Water System Facilities Including Discharges from In-line Analyzers"?	☐	☐	☐
2. Is a representative labeled sample tap located 100 feet downstream available for daily pH testing of the treated water?	☐	☐	☐

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B. Project Checklist (cont'd)

5. Other Chapter 2 & 12 questions, and Chapter 6.1.3 Chemical Safety Control Strategy for Critical Chemical Control Systems

	Yes	No	N/A
1. Are a portable pH meter, 2 different calibration standards, and labware accessories available for testing?	☐	☐	☐
2. Is a representative labeled raw water sample tap available?	☐	☐	☐
3. Amount of sodium to be added to the water, if NaOH is used, at recommended pH optimum dosages is (fill in number) mg/l	☐	☐	☐
4. Is a continuous pH analyzer with two alarm contacts available to prevent pH overfeed or pH underfeed conditions?	☐	☐	☐
5. Is there an emergency under and over-feed alarm system?	☐	☐	☐
6. Is there any emergency automatic phone, radio, or cellular dialer alarm to a properly certified operator to report a chemical under or over-feed?	☐	☐	☐
7. Are controls designed so that if a chemical feed pump is in the manual mode, the operator is notified locally by a visual and/or audible alarm and/or remotely by an autodialer?	☐	☐	☐
8. Does each metering pump have a HOA (hand, off, automatic) switch, and a timer on hand mode so chemical metering pump will automatically shut down after no more than one hour or a spring loaded HOA switch?	☐	☐	☐
9. Will each HOA switch show proper signage on site explaining usage?	☐	☐	☐
10. If not staffed 24/7/365, will the chemical feed pumps and water flow or water pumps automatically shut down and notify the operator if a pH underfeed or overfeed occurs?	☐	☐	☐
11. Will the chemical feed system be linked to a computer SCADA or alarm system via radio or leased phone lines?	☐	☐	☐
12. Do the plans and specifications include a description of the "Chemical Safety Control Strategy for Critical Chemical Feed Systems" as described in section 6.1.3?	☐	☐	☐
13. Is a pH analyzer provided to monitor the treated water, or was a pH analyzer waiver granted by MassDEP in writing?	☐	☐	☐
14. Is the pH analyzer interlocked so that if pH is out of range, then the water flow or water pumps and metering pump will automatically shut down and an alarm will be sent to the certified operator?	☐	☐	☐
15. Is powering of all caustic metering pumps configured to prevent overriding of the safety shut down system?	☐	☐	☐
16. Will the SOP include procedures to test all pH alarms and controls (both high and low) quarterly?	☐	☐	☐

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B. Project Checklist (cont'd)

	Yes	No	N/A
17. Are the chemical feed system operational parameters recorded by a chart recorder, electronic data logger, or SCADA system?	☐	☐	☐
18. Will the applicant's emergency response plan be updated to include the caustic component?	☐	☐	☐

6. Detailed Explanation

Please attach a brief explanation for any question answered "No" and "N/A" in the checklist. The brief explanation should explain why the applicant/applicant's engineer does not feel this item is necessary to maintain the integrity of the design and/or operation of the facility.

Detailed explanation of the following question(s) is attached:

Section #	Page #	Question #

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – drinking water program

Water Supply Facility Checklist for Potassium Hydroxide (KOH) or Sodium Hydroxide (NaOH) for Permit Review/Approval

C. Certification

A. Applicant's Engineer

I hereby certify, as a Professional Engineer registered in Massachusetts, that the Drinking Water Facilities Checklist is a true and accurate representation on the information contained in my plans and specifications submitted with this permit application.

Signature/Stamp of Professional Engineer

Date

Printed Name

Title

Employer

Phone Number | Email Address

Signature/Stamp of Second Professional Engineer (if needed)

Date

Printed Name

Title

Employer

Phone Number | Email Address

B. Applicant

This checklist and attached permit application are submitted on behalf of water representative:

City/Town

Address

PWS Name | PWS ID # | Phone Number

Applicant Name/Title | Email Address

Signature | Date