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| Minnesota Pollution Control Agency (MPCA), 520 Lafayette Road North, St. Paul, MN 55155-4194 | High pH Lime Sludge Stabilization Review Checklist  NPDES/SDS Permit Program  National Pollutant Discharge Elimination System (NPDES)/ State Disposal System (SDS)  Doc Type: Plan/Specification Review Summary |

**Purpose:** This checklist is intended for use by design engineers, to assist Minnesota Pollution Control Agency (MPCA) review engineers in the efficient review of planning and design documents. The information requested is the minimum technical data necessary for MPCA staff to review proposed designs and to determine whether there is reasonable assurance that the treatment system, when constructed, will comply with permit conditions, regulations, and criteria of the MPCA.

**Instructions:** The information in this checklist is based on the ***Recommended Standards for Wastewater Facilities published by the Great Lakes Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (Ten State Standards) 2014 Edition,*** other accepted engineering references, and MPCA recommendations. Specific references, other than Ten State Standards, are listed where appropriate. The checklist is organized according to the numbering sequence found in Ten State Standards to allow for ease in locating the entire content and text of the recommendations.

The checklist is designed so that a “**yes**” answer indicates compliance with Ten State Standards et al.

A “**no**” answer indicates a deviation from Ten State Standards et al. Answering “no” to any question will require justification that can be provided at the end of the checklist and possibly supporting information, from wastewater treatment plant operational data, to demonstrate how the intent of the recommendation will be met. Additional information may be requested based on site specific conditions.

A “**N/A**” answer means not applicable because the equipment associated with the question is not included in the design.

Wastewater Treatment Facility information

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| --- | --- | --- | --- | --- |
| **Date** (mm/dd/yyyy): | |  | **MPCA Project No:** |  |
| **Title of project:** |  | | | |

Permittee information

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Facility name: | |  | | | | |
| Contact name and title: | | |  | NPDES/SDS Permit No: | MN |  |
| Email: |  | | | Phone number: |  | |

Design Engineer information

|  |  |  |  |
| --- | --- | --- | --- |
| Contact name: |  | Contact phone number: |  |
| Email: |  |  |  |

**Phase:**   Planning Phase  Design Phase

Influent Characteristics

|  |  |  |  |
| --- | --- | --- | --- |
| **Solids concentration** |  | % |  |
| **Sludge flow per day** |  | gpd |  |

86. High pH Stabilization

*(Only use a “NA” answer if the equipment associated with the question is not included in the design)*

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| ***86.1 General.*** Alkaline material may be added to liquid primary or secondary sludges for sludge stabilization in lieu of digestion facilities; to supplement existing digestion facilities; or for interim sludge handling. | | | |
|  | **Yes** | **No** | **N/A** |
| Does the design account for the increased sludge quantities for storage, handling, transportation, and disposal methods and associated costs if supplemental dewatering is not provided and additional volumes of sludge are generated? |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***86.2 Operational Criteria*** | | | **Yes** | **No** | **N/A** |
| Will sufficient alkaline material be added to liquid sludge in order to produce a homogeneous mixture with a minimum pH of 12 after two hours of vigorous mixing? | | |  |  |  |
| Will the pH of the sludge be raised to 12 or higher by alkali addition and, without the addition of more alkali, remain at 12 or higher for two hours and then at 11.5 or higher for an additional 22 hours to meet vector attraction reduction requirements of 40 CFR 503.33 part b(6)? (U.S. EPA January 2023) | | |  |  |  |
| Will sufficient lime be added to the sewage sludge to raise the pH to 12 after two hours of contact to meet pathogen reduction requirements of 40 CFR 503? (U.S. EPA January 2023) | | |  |  |  |
| Are facilities for adding supplemental alkaline material provided to maintain the pH of the biosolids during interim biosolids storage periods? | | |  |  |  |
| ***86.3 Odor Control and Ventilation*** | | | | | |
| Are odor control facilities provided for sludge mixing and treated sludge storage tanks when located within one-half mile of residential or commercial areas? | | |  |  |  |
| Has the reviewing authority been contacted for design and air pollution control objectives to be met for various types of air scrubber units? | | |  |  |  |
| Is ventilation provided for indoor sludge mixing, storage or processing facilities in accordance with Paragraph 42.75? | | |  |  |  |
| ***86.4 Mixing Tanks and Equipment*** | | | | | |
| **86.41 Tanks** | | | | | |
| Are the mixing tanks designed to operate as either a batch or continuous flow process? | | |  |  |  |
| Are a minimum of two tanks provided? | | |  |  |  |
| Will the tanks provide a minimum of two hours contact time in each tank? | | |  |  |  |
| Are the following items considered in determining the number and size of tanks: peak sludge flow rates, storage between batches, dewatering or thickening performed in tanks, repeating sludge treatment due to pH decay of stored sludge, sludge thickening prior to sludge treatment, and type of mixing device used and its associated maintenance or repair requirements? | | |  |  |  |
| **86.42 Equipment** | | | | | |
| Is the mixing equipment designed to provide vigorous agitation within the mixing tank, maintain solids in suspension, and provide for a homogenous mixture of the sludge solids and alkaline material? | |  | |  |  |
| Will mixing be accomplished either by diffused air or mechanical mixers? | |  | |  |  |
| If diffused aeration is used, will an air supply of 30 cfm/1000 ft3 of mixing tank volume be provided with the largest blower out of service? | |  | |  |  |
| When diffusers are used, will the nonclog type be provided and will they be designed to permit continuity of service? | |  | |  |  |
| When mechanical mixers are used, are the impellers designed to minimize fouling with debris in the sludge and consideration made to provide continuity of service during freezing weather conditions? | |  | |  |  |
| ***86.5 Chemical Feed and Storage Equipment*** | | | | | |
| **86.51 General.** Alkaline material is caustic in nature and can cause eye and tissue injury. | | | | | |
| Is equipment for handling or storing alkaline material designed for adequate operator safety? Refer to Section 57 for proper safety precautions. | |  | |  |  |
| Will storage, slaking, and feed equipment be sealed as airtight as practical to prevent contact of alkaline material with atmospheric carbon dioxide and water vapor and to prevent the escape of dust material? | |  | |  |  |
| Will all equipment and associated transfer lines or piping be accessible for cleaning? | |  | |  |  |
| **86.52 Feed and Slaking Equipment** | | | | | |
| Is the design of the feeding equipment determined by the treatment plant size, type of alkaline material used, slaking required, and operator requirements? | |  | |  |  |
| Is equipment either batch or automated type? | |  | |  |  |
| Are automated feeders of the volumetric or gravimetric type depending on accuracy, reliability, and maintenance requirements? | |  | |  |  |
| Are manually operated batch slaking of quicklime (CaO) avoided unless adequate protective clothing and equipment are provided? | |  | |  |  |
| At small plants, will hydrated lime (Ca(OH)2) be used instead of quicklime due to safety and labor-saving reasons? | |  | |  |  |
| Identify type of chemical to be used: |  | | | | |
| Will lime dosage for pretreatment sludge stabilization meet the following criteria? (M&E 2014)   * Primary sludge at 3-6 percent solids: 120-340 lb Ca(OH)2/ton dry solids * Waste activated sludge at 1-1.5 percent solids: 420-860 lb Ca(OH)2/ton dry solids | |  | |  |  |
| Are quicklime bins designed with a 55 to 60 degree slope to the bin outlet and hydrated lime bins with a 60 to 66 degree slope? (MOP8 2018) | |  | |  |  |
| Does the design include a vibrator on hoppers and silos to ensure flow of lime to the outlet? (MOP 8 2018) | |  | |  |  |
| Is feed piping at least 2 inches in diameter? (MOP 8 2018) | |  | |  |  |
| Will feed and slaking equipment be sized to handle a minimum of 150% of the peak sludge flow rate including sludge that may need to be retreated due to pH decay? | |  | |  |  |
| Will duplicate units for chemical feeding be provided? | |  | |  |  |
| **86.53 Chemical Storage Facilities** | | | | | |
| Will alkaline material be delivered in either bag or bulk form depending upon the amount of material used? | |  | |  |  |
| Will material delivered in bags be stored indoors and elevated above floor level? | |  | |  |  |
| Will bags be of the multi-wall moisture-proof type? | |  | |  |  |
| Will dry bulk storage containers be as airtight as practical and contain a mechanical agitation mechanism? | |  | |  |  |
| Are storage facilities sized to provide a minimum of a 30-day supply? | |  | |  |  |
| ***86.6 Sludge Storage.*** Refer to Section 89 for general design considerations for sludge storage facilities. The design should incorporate the following considerations for the storage of high pH stabilized biosolids. | | | | | |
| **86.61 Liquid Storage** | | | | | |
| Is the storage of liquid high pH stabilized biosolids in a lagoon avoided? | |  | |  |  |
| Will liquid high pH stabilized biosolids be stored in a tank or vessel equipped with rapid biosolids withdrawal mechanisms for biosolids disposal or retreatment? | |  | |  |  |
| Are provisions made for adding alkaline material in the storage tank? | |  | |  |  |
| Is mixing equipment in accordance with Paragraph 86.42 provided in all storage tanks? | |  | |  |  |
| **86.62 Dewatered Sludge** | | | | | |
| Will on-site storage of dewatered high pH stabilized biosolids be limited to 30 days? | |  | |  |  |
| Are provisions for rapid retreatment or disposal of dewatered biosolids stored on-site made in case of biosolids pH decay? | |  | |  |  |
| **86.63 Off-Site Storage** | | | | | |
| Is off-site storage of high pH stabilized biosolids avoided unless specifically allowed by the regulatory agency? | |  | |  |  |

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| ***86.7 Disposal*** | | | |
| Are immediate biosolids disposal methods and options recommended to be utilized in order to reduce the biosolids inventory on the treatment plant site and the amount of biosolids that may need to be retreated to prevent odors if sludge pH decay occurs? |  |  |  |
| If a land application disposal option is utilized for high pH stabilized biosolids, will the biosolids be incorporated into the soil during the same day of delivery to the site? |  |  |  |

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| Justification for all questions answered with a “no”: |
|  |
| Additional comments: |
|  |

**References**

GLUMRB (2014 Edition) *Recommended Standards for Wastewater Facilities* (Ten State Standards), Health Research, Inc., Health Education Services Division, Albany NY.

Metcalf & Eddy, Inc. (2014) *Wastewater Engineering, Treatment and Resource Recovery*, 5th ed., McGraw-Hill, New York. (M&E 2014)

U.S. EPA (January 2023) *Pathogens and Vector Attraction in Sewage Sludge,* U.S. EPA, Center for Environmental Solutions and Emergency Response, Office of Research and Development, Cincinnati OH. (U.S. EPA January 2023)

WEF (2018) *Design of Municipal Wastewater Treatment Plants, Manual of Practice No. 8*, 5th Ed., Water Environment Federation, Alexandria, VA. (MOP8 2018)

**Acronym definitions**

cfm/ft3 cubic feet per minute per feet cubed

ft3 feet cubed

gpd gallons per day

lb pound