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| --- | --- |
| Minnesota Pollution Control Agency (MPCA), 520 Lafayette Road North, St. Paul, MN 55155-4194 | Filtration 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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **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

|  |  |  |  |
| --- | --- | --- | --- |
| Average Wet Weather flow rate: |  | gpm |  |
| Peak Hourly flow rate: |  | gpm |  |

112. High Rate Effluent Filtration

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

|  |
| --- |
| ***112.1 General***  **112.11 Applicability** |

|  | | | | | | | | | | | | | **Yes** | | **No** | | **N/A** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Will a pre-treatment process such as chemical coagulation, flocculation and sedimentation, or other acceptable process precede the filter units where effluent suspended solids requirements are less than 10 mg/L? | | | | | | | | | | | | |  | |  | |  | |
| Will a pre-treatment process such as chemical coagulation, flocculation and sedimentation, or other acceptable process precede the filter units where secondary effluent can fluctuate or filters follow secondary treatment with a significant amount of algae? (MOP 8 1998) | | | | | | | | | | | | |  | |  | |  | |
| Identify the pre-treatment process: | | |  | | | | | | | | | | | | | | | |
| **112.12 Design Considerations** | | | | | | | | | | | | | | | | | | |
| Is care given in designing pipes or conduits ahead of filter units, if applicable, to minimize shearing of floc particles? | | | | | | | | | | | | |  | |  | |  | |
| Is consideration given in the plant design to provide flow equalization facilities to moderate filter influent quality and quantity? | | | | | | | | | | | | |  | |  | |  | |
| ***112.2 Filter Types*** | | | | | | | | | | | | | | | | | | | |
| Are filters of the gravity type or pressure type? | | | | | | | | | | | | |  | |  | | |  | |
| Identify type of filter: |  | | | | | | | | | | | | | | | | | | |
| Are pressure filters provided with ready and convenient access to the media for inspection or cleaning? | | | | | | | | | | | | |  | |  | | |  | |
| Are filters of the gravity type where abnormal quantities of greases or similar solids that result in filter plugging are expected? | | | | | | | | | | | | |  | |  | | |  | |
| ***112.3 Filtration Rates*** | | | | | | | | | | | | | | | | | | | |
| **112.31 Allowable Rates** | | | | | | | | | | | | | | | | | | | |
| Are the filtration rates such that they do not exceed 5 gpm/ft2 based on the design peak hourly flow rate applied to the filter units? | | | | | | | | | | | | |  | |  | | |  | |
| Identify the filtration rate based on peak hourly flow and all filters in service: | | | | | | | | | | |  | gpm/ft2 | | | | | | | |
| Identify the filtration rate based on total area with one unit out of service: | | | | | | | | | | |  | gpm/ft2 | | | | | | | |
| Is the expected design maximum suspended solids loading to the filter also considered in determining the necessary filter area? | | | | | | | | | | | | |  | |  | | |  | |
| Identify total system head loss provided: | | | |  | | | | | feet | | | | | | | | | | |
| **112.32 Number of Units** | | | | | | | | | | | | | | | | | | | |
| Will the total filter area be provided in two or more units, and the filtration rate be calculated on the total available filter area with one unit out of service? | | | | | | | | | | | | |  | |  | | |  | |
| Was consideration given to redundancy during backwash events and peak flow conditions? | | | | | | | | | | | | |  | |  | | |  | |
| Identify number of units: | | | |  | | | | | | | | | | | | | | | |
| Identify surface area for each filter unit: | | | |  | | | | ft2 | | | | | | | | | | | |
| ***112.4 Backwash*** | | | | | | | | | | | | | | | | | | | |
| **112.41 Backwash Rate** | | | | | | | | | | | | | | | | | | | |
| Is the backwash rate adequate to fluidize and expand each media layer by a minimum of 20 percent based on the media selected? | | | | | | | | | | | | |  | |  | | |  | |
| Is the backwash system capable of providing variable backwash rates? | | | | | | | | | | | | |  | |  | | |  | |
| Are minimum and maximum backwash rates based on demonstrated satisfactory field experience under similar conditions? | | | | | | | | | | | | |  | |  | | |  | |
| Does the design provide for a minimum backwash period of 10 minutes? | | | | | | | | | | | | |  | |  | | |  | |
| **112.42 Backwash Pumps** | | | | | | | | | | | | | | | | | | | |
| Are pumps for backwashing filter units sized and interconnected to provide the required backwash rate to any filter with the largest pump out of service? | | | | | | | | | | | | |  | |  | | |  | |
| Identify size and number of backwash pumps: | | | | |  | | | | | gpm | | | | | | | | | |
| Is filtered water from the clear well or chlorine tank used as the source of backwash water? | | | | | | | | | | | | |  | |  | | |  | |
| Identify backwash water source location: | | | | |  | | | | | | | | | | | | | | |
| Will waste filter backwash be adequately treated? | | | | | | | | | | | | |  | |  | | |  | |
| **112.43 Backwash Surge Control** | | | | | | | | | | | | | | | | | | | |
| Will the rate of return of waste filter backwash water to treatment units be controlled so that the rate does not exceed 15 percent of the design average daily flow rate to the treatment unit? | | | | | | | | | | | | |  | |  | | |  | |
| Is the hydraulic and organic load from waste backwash water considered in the overall design of the treatment plant? | | | | | | | | | | | | |  | |  | | |  | |
| Will surge tanks have a minimum capacity of two backwash volumes, although additional capacity should be considered to allow for operational flexibility? | | | | | | | | | | | | |  | |  | | |  | |
| Identify surge tank volume: | | | | | |  | | | | gallons | | | | | | | | | |
| Where waste backwash water is returned for treatment by pumping, will adequate pumping capacity be provided with the largest unit out of service? | | | | | | | | | | | | |  | |  | | |  | |
| **112.44 Backwash Water Storage** | | | | | | | | | | | | | | | | | | | |
| Will total backwash water storage capacity provided in an effluent clearwell or other unit equal or exceed the volume required for two complete backwash cycles? | | | | | | | | | | | | |  | |  | | |  | |
| Identify volume of water needed per backwash: | | | | | |  | | | | gallons | | | | | | | | | |
| Identify clearwell backwash volume: | | | | | |  | | | | gallons | | | | | | | | | |
| Is the elevation of the clearwell (or stilling box overflowing to clearwell) above the surface of the media to prevent accidental dewatering of media? (MOP 8 1998) | | | | | | | | | | | | |  | |  | | |  | |
| ***112.5 Filter Media Selection*** | | | | | | | | | | | | | | | | | | | |
| Will selection of proper filter media type and size depend on the required effluent quality, the type of treatment provided prior to filtration, the filtration rate selected, and filter configuration? | | | | | | | | | | | | |  | |  | | |  | |
| In dual- or multi-media filters, will media size selection consider compatibility among media? | | | | | | | | | | | | |  | |  | | |  | |
| Will media be selected and provided to meet specific conditions and requirements relative to the project under consideration? | | | | | | | | | | | | |  | |  | | |  | |
| Identify type of media filter: | | | | | | |  | | | | | | | | | | | | |
| Identify type(s) of media: | | | | | | |  | | | | | | | | | | | | |
| Identify nominal pore size for cloth media if applicable: | | | | | | |  | | | | | | | | | | | | |
| Is the selection and sizing of the media based on demonstrated satisfactory field experience under similar conditions? | | | | | | | | | | | | |  | |  | | |  | |
| Will all media have a uniformity coefficient of 1.7 or less? | | | | | | | | | | | | |  | |  | | |  | |
| Is the uniformity coefficient, effective size, depth, and type of media set forth in the specifications? | | | | | | | | | | | | |  | |  | | |  | |
| ***112.6 Filter Appurtenances*** | | | | | | | | | | | | | | | | | | |
| Are filters equipped with washwater troughs, surface wash or air scouring equipment, means of measurement and positive control of the backwash rate, equipment for measuring filter head loss, positive means of shutting off flow to a filter being backwashed, and filter influent and effluent sampling points? | | | | | | | | | | | | | |  | |  |  | |
| If automatic controls are provided, is there a manual override for operating equipment, including each individual valve essential to the filter operation? | | | | | | | | | | | | | |  | |  |  | |
| Is the underdrain system designed for uniform distribution of backwash water (and air, if provided) without danger of clogging from solids in the backwash water? | | | | | | | | | | | | | |  | |  |  | |
| If air is to be used for filter backwash, will separate backwash blower(s) be provided? | | | | | | | | | | | | | |  | |  |  | |
| Identify air scour rate: | |  | | scfm/ft2 | | | | | | | | | | | | | | |
| Are provisions made to allow for periodic chlorination of the filter influent or backwash water to control slime growth? | | | | | | | | | | | | | |  | |  |  | |
| When chemical disinfection is not provided at the plant, will manual dosage of chlorine compounds be performed? | | | | | | | | | | | | | |  | |  |  | |
| Are provisions made to allow for dewatering the filter? | | | | | | | | | | | | | |  | |  |  | |
| ***112.7 Access and Housing*** | | | | | | | | | | | | | | | | | | |
| Will each filter be designed and installed so that there is ready and convenient access to all components and the media surface for inspection and maintenance, without taking other units out of service? | | | | | | | | | | | | | |  | |  |  | |
| Will housing for filter units be provided? | | | | | | | | | | | | | |  | |  |  | |
| Will the housing be constructed of suitable corrosion-resistant materials? | | | | | | | | | | | | | |  | |  |  | |
| Will all controls be enclosed and the structure housing filters, controls, and equipment be provided with adequate heat and ventilation equipment to minimize problems with excess humidity? | | | | | | | | | | | | | |  | |  |  | |
| ***112.8 Proprietary Equipment*** | | | | | | | | | | | | | | | | | | |
| Is data provided which supports the capability of the equipment to meet effluent requirements under design conditions if proprietary filtration equipment, not conforming to the preceding requirements, is proposed? Refer to Paragraph 53.2. | | | | | | | | | | | | | |  | |  |  | |

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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.

WEF (1998) *Design of Municipal Wastewater Treatment Plants, Manual of Practice No. 8,* Water Environmental Federation, Alexandria, VA. (MOP 8 1998)

**Acronym definitions**

ft2 feet squared

gpm gallons per minute

gpm/ft2 gallons per minute/feet squared

scfm/ft2 standard cubic feet per minute/feet squared