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

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

83. Sludge Thickeners

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

| ***83.1 Design Considerations*** | | | | | **Yes** | | **No** | | **N/A** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Does the design of the gravity thickener consider the type and concentration of sludge, the sludge stabilization processes, storage requirements, the method of ultimate sludge disposal, chemical needs, and the cost of operation? | | | | |  | |  | |  |
| Are provisions made for adequate control of process operational problems and odors at the gravity thickening tank and any following unit processes if used for unstabilized sludge? | | | | |  | |  | |  |
| Is particular attention given to the pumping and piping of the concentrated sludge and possible onset of anaerobic conditions? | | | | |  | |  | |  |
| Number of units: |  | | | | | | | | |
| Dimensions: |  | | feet | | | | | | |
| Side wall depth: |  | | feet | | | | | | |
| Solids loading: |  | | lb/ft2/day | Recommended loadings below from M&E 2014 | | | | | |
| Hydraulic overflow rate: |  | | gpd/ft2 | Recommended overflow rates below from M&E 2014 | | | | | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Type of sludge** | **Solids Concentration, %** | | **Solids Loading**  lb/ft2/day | **Maximum Hydraulic Overflow Rate**  gpd/ft2 | | Unthickened | Thickened | | Primary | 1-6 | 3-10 | 20-30 | 380-760 | | Air - activated | 0.5-1.5 | 2-3 | 4-8 | 100-200 | | Extended aeration activated | 0.2-1.0 | 2-3 | 5-8 | | Primary and trickling filter | 1-6 | 3-9 | 12-20 | 150-300 | | Primary and waste activated | 0.5-1.5 | 2-6 | 5-14 | | 2.5-4.0 | 4-7 | 8-16 |   Refer to M&E 2014 for additional sludge types and their recommended solids loading and overflow rates | | | | | | | | | |
| Surface area: |  | | ft2 |  | | | | | |
| Underflow solids concentration: |  | | % |  | | | | | |
| Underflow withdrawal range: |  | | gpm |  | | | | | |
| Underflow withdrawal: | | Continuous  Intermittent | | | | | | | |
| Are provisions made for measuring the depth of the sludge bed? (M&E 2014) | | | | |  |  | |  | |

|  |  |  |  |
| --- | --- | --- | --- |
| ***83.2 Prototype Studies*** | | | |
| Are process selection and unit process design parameters based on prototype studies if the sizing of other plant units is dependent on thickener performance? |  |  |  |
| Are the design criteria based on a testing program that can include batch settling tests, bench-scale settling tests, and pilot scale testing? (M&E 2014) |  |  |  |

|  |
| --- |
| 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)

**Acronym definitions**

ft2 feet squared

gpd gallons per day

gpd/ft2 gallons per day per feet squared

gpm gallons per minute

lb/ft2/day pounds per feet squared per day