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| Minnesota Pollution Control Agency (MPCA), 520 Lafayette Road North, St. Paul, MN 55155-4194 | Pump Station and Raw Sewage Pumps 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 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: |  | NPDES/SDS Permit No: | MN |
| Email: |  | Phone number: |  |

Design Engineer information

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

**Phase:**  Planning Phase  Design Phase

**Type of pumping station:**  Wet/dry well  Submersible  Screw  Suction-lift

Influent Characteristics

|  |  |  |
| --- | --- | --- |
|  | **gallons per minute, gpm** | **million gallons per day, mgd** |
| **Average Wet Weather (AWW) flow** |  |  |
| **Peak Hourly (PH) flow** |  |  |

Chapter 40 Wastewater Pumping Stations

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

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| --- | --- | --- | --- |
| ***41. General*** | | | |
| ***41.1 Flooding*** | **Yes** | **No** | **N/A** |
| Is the wastewater pumping station structure and electrical and mechanical equipment protected from physical damage by the 100 year flood? |  |  |  |
| Will the wastewater pumping stations remain fully operational and accessible during the 25 year flood? |  |  |  |
| ***41.2 Accessibility and security*** | **Yes** | **No** | **N/A** |
| Is the pumping station readily accessible by maintenance vehicles during all weather conditions? |  |  |  |
| Is the pumping station located off traffic way of streets and alleys? |  |  |  |
| Will security fencing and access hatches with locks be provided? |  |  |  |
| ***41.4 Safety*** | | | |
| Are there adequate provisions made to protect maintenance personnel from hazards? |  |  |  |
| Is equipment for confined space entry in accordance with OSHA and regulatory agency requirements provided for all wastewater pumping stations? |  |  |  |
| ***42. Design*** | | | |
| **42.21 Separation** | | | |
| Is the dry well, including the superstructure, completely separated from the wet well? |  |  |  |
| Are common walls gas tight? |  |  |  |
| **42.22 Equipment removal** |  |  |  |
| Have provisions been made to facilitate removing pumps, motors, and other mechanical and electrical equipment? |  |  |  |
| Will individual pump and motor removal be possible without interfering with the continued operation of remaining pumps? |  |  |  |
| **42.23 Access and safety landings** | | | |
| **42.231 Access** | | | |
| Will suitable and safe means of access for persons wearing self-containing breathing apparatus be provided to dry wells and to wet wells? |  |  |  |
| Will access to wet wells containing either bar screens or mechanical equipment requiring inspection or maintenance conform to Paragraph 61.13 of Ten State Standards? |  |  |  |
| **42.232 Safety landings** | | | |
| For built-in-place pump stations, does the stairway to the dry well have rest landings at vertical intervals not to exceed 12 feet? |  |  |  |
| For factory built pump stations over 15 feet deep, is a rigidly fixed landing provided at vertical intervals not to exceed 10 feet? |  |  |  |
| When a landing is used, is a suitable and rigidly fixed barrier provided to prevent individuals from falling past the intermediate landing to a lower level? |  |  |  |
| If a manlift or elevator is used in lieu of landings in a factory-built station, is emergency access included in the design? |  |  |  |
| **42.24 Buoyancy** | | | |
| Has buoyancy of the pumping station structures been considered and if necessary, adequate provisions made for protection? |  |  |  |
| **42.25 Construction materials** | | | |
| Are materials selected that are appropriate under conditions of exposure to hydrogen sulfide and other corrosive gases, greases, oils and other constituents frequently present in wastewater? |  |  |  |
| Is contact between dissimilar metals avoided or other provisions made to minimize galvanic action? |  |  |  |
| ***42.3 Pumps*** | | | |
| **42.31 Multiple units** | | | |
| Are multiple pumps provided? |  |  |  |
| If only two pumps are provided, are they the same size? |  |  |  |
| Do units have the capacity, such that with any unit out of service, the remaining units will have capacity to handle the design peak hourly flow? |  |  |  |
| Will the pumps be tested by the manufacturer and include a hydrostatic test and an operating test? |  |  |  |
| **42.32 Protection against clogging** | | | |
| **42.322 Separate sanitary wastewater** | **Yes** | **No** | **N/A** |
| Are pumps that handle separate sanitary wastewater from 30 inch or larger sewer protected with bar racks? |  |  |  |
| **42.33 Pump openings** |  |  |  |
| Are pumps that handle raw wastewater capable of passing solid spheres of at least 3 inches in diameter? |  |  |  |
| Are pump suction and discharge openings at least 4 inches in diameter? |  |  |  |
| **42.33 Priming** |  |  |  |
| Is the pump placed so that under normal operating conditions it will operate under a positive suction head, except for suction lift pumps? |  |  |  |
| **42.35 Electrical equipment** | | | |
| Do the electrical systems and components in the wet well or enclosed or partially enclosed spaces where hazardous gases or vapors may be present, comply with the National Electrical Code requirements of Class I, Division I, Group D locations? |  |  |  |
| Is equipment in the wet well suitable for use under corrosive conditions? |  |  |  |
| Is a fused disconnect switch located above ground provided for the main power feed? |  |  |  |
| Does equipment exposed to the weather meet NEMA 3R or 4 at a minimum? |  |  |  |
| Are outdoor control panels provided with a 110 volt power receptable inside the control panel? |  |  |  |
| Is Ground Fault Circuit Interruption protection provided for all outdoor outlets? |  |  |  |
| **42.36 Intake** | | | |
| Does each pump have an individual intake? |  |  |  |
| Is wet well and intake design such that turbulence near the intake is avoided and vortex formation is prevented? |  |  |  |
| **42.37 Dry well dewatering** | | | |
| Is a sump pump, equipped with dual check valves, provided in the dry well to remove leakage or drainage with discharge above the maximum high water level of the wet well? |  |  |  |
| Do all floor and walkway surfaces have an adequate slope to a point of drainage? |  |  |  |
| Is pump seal leakage piped or channeled directly to the sump? |  |  |  |
| Is the sump pump sized to remove the maximum pump seal water discharge that could occur in the event of a pump seal failure? |  |  |  |
| **42.38 Pumping rates** | | | |
| Are the pumps and controls of main pumping stations selected to operate at varying delivery rates? |  |  |  |
| Are the pumping stations designed to deliver as uniform a flow as practicable to minimize hydraulic surges? |  |  |  |
| Is the station design capacity based on the peak hourly flow determined in accordance with Paragraph 11.24 of Ten State Standards? |  |  |  |
| Is the station design capacity adequate to maintain a minimum velocity of 2 feet per second in the force main? |  |  |  |
| ***42.4 Controls*** | | | |
| Are water level control sensing devices located to prevent undue affects from turbulent flows entering the well or by the turbulent suction of the pumps? |  |  |  |
| Do bubbler type level monitoring systems include dual air compressors? |  |  |  |
| Are provisions made to automatically alternate the pumps in use? |  |  |  |
| Are suction lift stations designed to alternate pumps daily instead of each pumping cycle to extend the life of the priming equipment? |  |  |  |
| ***42.5 Valves*** | | | |
| **42.51 Suction line** | | | |
| Are suitable shutoff valves placed on the suction line of dry pit pumps? |  |  |  |

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| **42.52 Discharge line** | | | **Yes** | **No** | **N/A** |
| Are suitable shutoff and check valves placed on the discharge line of each pump (except screw pumps)? | | |  |  |  |
| Are check valves located between the shutoff valve and the pump? | | |  |  |  |
| Are check valves suitable for the material being handled and are they placed in the horizontal portion of discharge piping except for ball checks, which may be placed in the vertical run? | | |  |  |  |
| Are valves capable of withstanding normal pressures and water hammer? | | |  |  |  |
| Are shutoff and check valves operable from floor level and accessible for maintenance? | | |  |  |  |
| Are outside levers provided for swing check valves? | | |  |  |  |
| ***42.6 Wet wells*** | | | | | |
| **42.61 Divided wells** | | | | | |
| If continuity of pumping station operation is critical, was consideration given to dividing the wet well into two interconnected sections to facilitate repairs and cleaning? | | |  |  |  |
| **42.62 Size** | | | | | |
| Is the effective volume of the wet well based on the design average flow and a filling time not to exceed 30 minutes, unless the facility is designed to provide flow equalization? | | |  |  |  |
| Dimensions of the wet well: |  | feet | | | |
| Capacity: |  | gallons | | | |
| Detention time at AWW flow: |  | minutes | | | |
| Detention time at PH flow: |  | minutes | | | |
| Are the pump manufacturer’s duty cycle recommendations utilized in selecting the minimum cycle time? | | |  |  |  |
| If the anticipated initial flow tributary to the pumping station is less than the design average flow, are provisions made so that the fill time indicated is not exceeded for initial flows? | | |  |  |  |
| If the wet well is designed for flow equalization as part of a treatment plant, are provisions made to prevent septicity? | | |  |  |  |
| **42.63 Floor slope** | | | | | |
| Does the floor of the wet well have a minimum slope of 1 to 1 to the hopper bottom? | | |  |  |  |
| Is the horizontal area of the hopper bottom no greater than necessary for proper installation and function of the inlet? | | |  |  |  |
| **42.64 Air displacement** | | | | | |
| Does the covered wet well have provisions for air displacement to the atmosphere, such as an inverted “j” tube or other means? | | |  |  |  |
| ***42.7 Safety ventilation*** | | | | | |
| **42.71 General** | | | | | |
| Is mechanical ventilation provided for dry wells that are located below the ground surface? | | |  |  |  |
| If screens or mechanical equipment requiring maintenance or inspection are located in the wet well, is there permanently installed ventilation? | | |  |  |  |
| Is there no interconnection between the wet well and dry well ventilation systems? | | |  |  |  |
| **42.72 Air inlets and outlets** | | | | | |
| If the dry well is over 15 feet deep, are multiple inlets and outlets provided? | | |  |  |  |
| Are dampers on exhaust or fresh air ducts and fine screens or other obstructions in air ducts avoided to prevent clogging? | | |  |  |  |
| **42.73 Electrical controls** | | | | | |
| Are switches for operation of ventilation equipment clearly marked and conveniently located? | | |  |  |  |
| Is all intermittently operated ventilation equipment interconnected with the respective pit lighting system? | | |  |  |  |
| Was consideration given to automatic controls where intermittent operation is used? | | |  |  |  |
| Does the manual lighting/ventilation switch override the automatic controls? | | |  |  |  |

|  | **Yes** | **No** | **N/A** |
| --- | --- | --- | --- |
| For a two speed ventilation system with automatic switch over where gas detection equipment is installed, was consideration given to increasing the ventilation rate automatically in response to the detection of hazardous concentrations of gases or vapors? |  |  |  |
| **42.74 Fans, heating, and dehumidification** | | | |
| Is the fan wheel fabricated from non-sparking material? |  |  |  |
| Do the electrical equipment and components meet the requirements in Paragraph 42.35 of Ten State Standards? |  |  |  |
| **42.75 Wet wells** | | | |
| If ventilation is continuous, does it provide at least 12 complete air changes per hour based on 100 percent fresh air? |  |  |  |
| If ventilation is intermittent, does it provide at least 30 complete air changes per hour based on 100 percent fresh air? |  |  |  |
| Is air forced into the wet well by mechanical means? |  |  |  |
| **42.76 Dry wells** | | | |
| If ventilation is continuous, does it provide at least 6 complete air changes per hour based on 100 percent fresh air? |  |  |  |
| If ventilation is intermittent, does it provide at least 30 complete air changes per hour based on 100 percent fresh air? |  |  |  |
| If a system of two speed ventilation is used to conserve heat, does it provide an initial ventilation rate of 30 changes per hour for 10 minutes and automatic switch over to 6 changes per hour? |  |  |  |
| ***42.8 Flow measurement*** | | | |
| Is there indicating, totalizing and recording flow measurement at pumping stations with a 350 gpm or greater design peak hourly flow or pumping stations with variable frequency drives or screw pumps? |  |  |  |
| Is sufficient metering configured to measure the duration of individual and simultaneous pump operation for pump stations with constant output pumps and a design peak hourly flow of up to 350 gpm when elapsed time meters, used in conjunction with annual pumping rate test, are used to measure flow? |  |  |  |
| ***42.9 Water supply*** | | | |
| Is the potable water supply provided such that there will be no physical connection between any potable water supply and the wastewater pumping station which, under any conditions, might cause contamination of the potable water supply? |  |  |  |
| If a potable water supply is brought to the pumping station, does it comply with conditions in Paragraph 56.23 of Ten State Standards? |  |  |  |
| ***43. Suction-lift pump stations*** | | | |
| *Suction-lift pump stations must meet the applicable requirements under Section 42 of Ten State Standards.* | | | |
| ***43.1 Pump priming and lift requirements*** | | | |
| Are the suction-lift pumps of the self-priming or vacuum-priming type? |  |  |  |
| **43.11 Self-priming pumps** | | | |
| Are the self-priming pumps capable of rapid priming and repriming at the “lead pump on” elevation and can this be accomplished automatically under design operating conditions? |  |  |  |
| Is the suction piping sized to not exceed the size of the pump suction and not exceed 25 feet in total length? |  |  |  |
| Does the priming lift at the “lead pump on” elevation include a safety factor of at least 4 feet from the maximum allowable priming lift for the specific equipment at design operation conditions? |  |  |  |
| Is the combined total of the dynamic suction-lift at the “pump off” elevation and the required net positive suction head at the design operating conditions less than 22 feet? |  |  |  |
| **43.12 Vacuum-priming pumps** | | | |
| Is the vacuum-priming pump station equipped with dual vacuum pumps capable of automatically and completely removing air from the suction-lift pump? |  |  |  |
| Are the vacuum pumps adequately protected from damage due to wastewater? |  |  |  |
| Is the combined total of the dynamic suction-lift at the “pump off” elevation and the required net positive suction head at design operating conditions less than 22 feet? |  |  |  |
| ***43.2 Equipment, wet well access, and valve location*** | | | |
| Is the pump equipment compartment above grade or offset and is it effectively isolated from the wet well to prevent a hazardous and corrosive sewer atmosphere from entering the equipment compartment? |  |  |  |
| Is the wet well access at least 24 inches in diameter and not through the equipment compartment? |  |  |  |
| Are gasketed replacement plates provided to cover the opening to the wet well for pump units removed for servicing? |  |  |  |
| Are valves located outside the wet well? |  |  |  |
| ***44. Submersible pump stations*** | | | |
| *Submersible pump stations must meet the applicable requirements under Section 42 of Ten State Standards, expect as modified in this Section.* | | | |
| ***44.1 Construction*** | | | |
| Are the submersible pumps and motors designed specifically for raw wastewater use, including totally submerged operation during a portion of each pumping cycle and do they meet the requirements of the National Electrical Code? |  |  |  |
| Is an effective method to detect shaft seal failure or potential seal failure provided? |  |  |  |
| ***44.2 Pump removal*** | | | |
| Are the submersible pumps readily removable and replaceable without personnel entering or dewatering the wet well or disconnecting any piping in the wet well? |  |  |  |
| ***44.3 Electrical equipment*** | | | |
| **44.31 Power supply and control circuitry** | | | |
| Are the electrical supply, control, and alarm circuits designed to provide strain relief and to allow disconnection from outside the wet well? |  |  |  |
| Are terminals and connectors protected from corrosion by location outside the wet well or through use of watertight seals? |  |  |  |
| **44.32 Controls** | | | |
| Is the motor control center located outside the wet well, readily accessible and protected by a conduit seal or other appropriate measure meeting the requirements of the National Electrical Code? |  |  |  |
| Is the conduit seal located so that the motor can be removed and electrically disconnected without disturbing the seal? |  |  |  |
| Does equipment that is exposed to the weather meet the requirements of weatherproof equipment NEMA 3R or 4 at a minimum? |  |  |  |
| **44.33 Power cord** | | | |
| Are pump motor power cords designed for flexibility and serviceability under conditions of extra hard usage and do they meet the requirements of National Electrical Code standards for flexible cords in wastewater pump stations? |  |  |  |
| Is ground fault interruption protection used to de-energize the circuit in the event of a failure in the electrical integrity of the cable? |  |  |  |
| Are power cord terminal fittings corrosion-resistant and constructed to prevent the entry of moisture into the cable, provided with strain relief appurtenances and designed to facilitate field connecting? |  |  |  |
| ***44.4 Valves*** | | | |
| Are valves required under Paragraph 42.5 of Ten State Standards located in a separate valve chamber? |  |  |  |
| Can the valve chamber be dewatered to the wet well through a drain line with a gas and water tight valve? |  |  |  |
| If check valves are not located in a separate chamber, can they be removed from the wet well in accordance with Paragraph 44.2 of Ten State Standards? |  |  |  |
| Is access to the separate valve chamber provided in accordance with Paragraph 42.231 of Ten State Standards? |  |  |  |

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| ***45. Screw Pump Stations*** | | | | |
| *Screw pump shall meet the applicable requirements under Section 42 of Ten State Standards.* | | | | |
| ***45.1 Covers*** | | **Yes** | **No** | **N/A** |
| Are covers or other means of excluding direct sunlight provided as necessary to eliminate adverse effects caused by temperature changes? | |  |  |  |
| ***45.2 Pump Wells*** | | | | |
| Is a positive means of isolating individual screw pump wells provided? | |  |  |  |
| ***45.3 Bearings*** | | | | |
| Can submerged bearings be lubricated by an automated system without pump well dewatering? | |  |  |  |
| ***46. Alarm Systems*** | | | | |
| Is there an alarm system with a backup power source? | |  |  |  |
| Is the alarm capable of being activated in case of power failure, dry well sump and wet well high water levels, pump failure, unauthorized entry or any other cause of pump station malfunction? | |  |  |  |
| Is the alarm system capable of transmitting and identifying alarm conditions to a municipal facility that is staffed 24 hours a day? | |  |  |  |
| If a municipal facility does not have staff available 24 hours a day and 24 hours holding capacity is not provided, can the alarm be transmitted to municipal offices during normal working hours and to a home of a responsible person in charge of the lift station during off-duty hours? | |  |  |  |
| In lieu of a transmitting system, is an audio-visual alarm system provided? | |  |  |  |
| ***47. Emergency Operation*** | | | | |
| ***47.2 Emergency Pumping Capability*** | | | | |
| If on-system overflow prevention with adequate storage capacity is not provided, is emergency pumping capability available? | |  |  |  |
| Is emergency pumping capability accomplished by connection of the station to at least two independent utility substations, by provision of portable or in-place internal combustion engine equipment to generate electrical or mechanical energy, or by the provision of portable pumping equipment? | |  |  |  |
| Type of emergency pumping capability: |  | | | |
| Does emergency pumping comply with the conditions in Paragraph 56.1 of Ten State Standards? | |  |  |  |
| Does the emergency standby system have sufficient capacity to start up and maintain the total rated running capacity of the station? | |  |  |  |
| Is there a portable pump connection to the force main with rapid connection capabilities and appropriate valves outside the dry well and wet well? | |  |  |  |
| Is emergency contact information posted near the pump station that is readily visible by persons outside the pump station site? | |  |  |  |
| ***47.3 Emergency High Level Overflows*** | | | | |
| Are all structures that are capable of bypassing controlled by a lockable, manually operated valve? | |  |  |  |
| ***47.4 Equipment Requirements*** | | | | |
| Do engine driven pumps meet the requirements of Section 47.4 of Ten State Standards? | |  |  |  |

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| ***48. Instruction and equipment*** | | | |
| Are complete sets of operational instructions, including emergency procedures and maintenance schedules, provided for wastewater pumping stations and portable equipment? |  |  |  |

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

**References**

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