

NEBRASKA ADMINISTRATIVE CODE

TITLE 123 – NEBRASKA DEPARTMENT OF ENVIRONMENTAL QUALITY

Chapter 1 – DEFINITIONS

- 001 “Abandonment” means the permanent removal from service of a wastewater works.
- 002 “Alternative design” means a design for a wastewater structure, prepared by a professional engineer, to provide safe and reliable service, when it is impractical to meet the design standards for wastewater works contained in State regulations.
- 003 “As-built drawings” or “Record drawings” mean drawings that are prepared during or following construction to describe the completed construction, including all changes made during construction.
- 004 “BODs” means the five-day measure of the pollutant parameter biochemical oxygen demand (BOD).
- 005 “Bypass” means the intentional diversion of waste streams from any portion of a treatment facility.
- 006 “Combined sewer” means a wastewater collection system, that is designed and constructed to transport both sanitary wastewater (domestic, commercial and industrial wastewaters) and storm water through a single pipe to a publicly owned treatment works.
- 007 “Complete retention” means a type of wastewater treatment facility that does not discharge to waters of the state, to subsurface disposal systems, or to wastewater irrigation systems, but uses evaporation, evapotranspiration, and seepage within allowable limits, to dispose of the wastewater.
- 008 “Constructed wetlands” for the specific purposes of this title, means a manmade treatment basin, planted with emergent plant species, designed and constructed according to engineering standards to treat wastewater.
- 009 “Construction permit” means a written authorization from the Director to construct, install, change or make alterations in, or additions to, a wastewater works.
- 010 “Controlled discharge lagoon” means a discharging wastewater lagoon system operated to store wastewater for extended periods and to periodically discharge treated effluent in accordance with permits.
- 011 “Cross connection” means any physical arrangement whereby a potable water supply system is connected, directly or indirectly, with any other water system, including a wastewater system.
- 012 “Curvilinear sewer” means a sanitary sewer section where the horizontal alignment is curved.
- 013 “Department” means the Nebraska Department of Environmental Quality.

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014 “Design standards” or “Standards” means the minimum engineering requirements for the design of wastewater works.

015 “Director” means the Director of the Department of Environmental Quality.

016 “Discharge” or “Discharging” for the specific purposes of this title, means the introduction of wastewater, either treated or untreated, from a point source into any part of a collection system, storage facility, or wastewater treatment unit; or to waters of the State or the natural environment.

017 “Domestic wastewater” means human body waste and household type wastes including bath and toilet wastes, laundry wastes, kitchen wastes, and other similar wastes.

018 “Facultative lagoon” means a shallow wastewater lagoon where biological treatment from both aerobic and anaerobic microorganisms occurs and that relies on algae and wind action to provide oxygen for aerobic processes.

019 “Freeboard” means the vertical distance between the design full liquid level and the level at which an uncontrolled overflow from a wastewater lagoon, or other wastewater treatment unit would occur.

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020 “Force main” means a wastewater pipe that conveys wastewater by the force of pumping pressure.

021 “Gravity sewer” means a wastewater collection pipe that slopes towards the destination point and conveys wastewater by the force of gravity.

022 “Grinder pump” means a pump, equipped with a shredding ring and cutter bar that grinds wastewater solids into small particles creating a wastewater slurry.

023 “Ground water” means water occurring beneath the surface of the ground that fills available openings in rock or soil materials such that they may be considered saturated.

024 “Industrial” means a production, food processing, manufacturing, or similar establishment that generates wastewater.

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025 “Inverted siphon” means a depressed sewer structure, having at least two barrels, that uses hydraulic head pressure on the downward sewer section to force wastewater up the rising section.

026 “Land application” means the controlled application of effluent onto the land surface to achieve a designed degree of treatment through natural, physical, chemical and biological processes within the plant-soil-water matrix.

027 “Lift station” means a facility housing wastewater pumps and their appurtenances.

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028 “Liner” means the compacted soil or other material used to seal the bottom or sides of a wastewater lagoon, sand filter, constructed wetland, or other wastewater treatment unit so that the seepage rate of liquids from the treatment unit into the surrounding soil is controlled.

029 “Livestock truck wash” means a facility that washes trucks used for hauling livestock.

030 “Livestock waste control facility” means any structure or combination of structures utilized to control livestock waste until it can be used, recycled, or disposed of in an environmentally acceptable manner. Such structures include, but are not limited to, diversion terraces, holding ponds, debris basins, liquid manure storage pits, lagoons or other such devices utilized to control livestock wastes.

031 “Mechanical WWTF” or “Mechanical plant” means a wastewater treatment facility that uses separate treatment units for grit removal, physical settling, biological treatment, clarification, sludge treatment, and disinfection, as applicable, where treatment processes are enhanced by mechanical or electrical devices.

032 “National Pollutant Discharge Elimination System Permit” or “NPDES permit” means any permit issued by the Director, after June 12, 1974, to regulate the discharge of pollutants pursuant to Sections 402, 307, 318, and 405 of the Clean Water Act. (See NDEQ Title 119 for rules and regulations of the NPDES program.)

033 “100-year flood” means the flood having a one per cent chance of being equaled or exceeded in magnitude in any given year.

034 “On-site wastewater treatment systems” means any system of piping, treatment devices, or other appurtenances that convey, store, treat, or dispose of domestic or nondomestic wastewater, but not including wastewater from a livestock waste control facility, on the property where it originates, or on nearby property under the control of the user, which system is not connected to a public sewer system. An on-site wastewater treatment system begins at the end of the building drain. All systems except septic systems are limited to a maximum size of 1000 gallons per day to be considered an on-site wastewater treatment system. The word “onsite” used in this Title is equivalent to the word “on-site”.

035 “Operator” means any person who regularly makes recommendations or is responsible for process control decisions at a wastewater treatment facility. Operator shall not include a person whose duties are limited solely to laboratory testing or maintenance or who exercises general or indirect supervision only.

036 “Operation and maintenance manual” means a bound manual that contains the information necessary to operate and maintain a wastewater works.

037 “Overflow structure” means a diversion structure in a wastewater collection system that discharges wastewater to the ground surface or to waters of the State, circumventing the wastewater treatment facility, usually during high flow conditions.

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038 “Owner” means the owner of any facility or activity subject to regulation under this title.

039 “Person” means any individual; partnership; limited liability company; association; public or private corporation; trustee; receiver; assignee; agent; municipality or other governmental subdivision; public agency; other legal entity; or any officer or governing or managing body of any public or private corporation, municipality, governmental subdivision, public agency, or other legal entity.

040 “Plans and specifications” means the construction drawings prepared by an engineer, showing the design, location, and dimensions of the project and the written requirements for materials, equipment, construction standards and workmanship that fully describe the construction requirements.

041 “Potable water” means water that is safe for human consumption as determined by the Nebraska Health and Human Services System, Title 179, Regulations Governing Public Water Systems.

042 “Pretreatment facility ” means a wastewater treatment facility owned by a commercial or industrial user which discharges pretreated wastewater to a publicly owned treatment works.

043 “Primary cells” means the initial cells in a lagoon system that receive untreated wastewater.

044 “Primary treatment” means a physical treatment process that removes particulate solids from wastewater by settling.

045 “Professional engineer” means a person who is licensed as a professional engineer by the Nebraska Board of Engineers and Architects. The board may designate a professional engineer, on the basis of education, experience, and examination, as being licensed in a specific discipline or branch of engineering signifying the area in which the professional engineer has demonstrated competence.

046 “Public water system” means a system for providing the public with water for human consumption through pipes or, after August 5, 1998, other constructed conveyances, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days per year. Public water system includes (a) any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system and (b) any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system. Public water system does not include a special irrigation district. A public water system is either a community water system or a non-community water system.

047 “Rapid infiltration cell” means a manmade basin designed and constructed according to engineering standards to provide treatment to wastewater as it percolates through soil in a cycle of dosing and drying periods.

048 “Raw wastewater” means wastewater that is untreated.

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049 “Sanitary sewer” or “Sewer” means pipes, conduits, manholes, cleanouts, and all other constructions, devices, appurtenances, and facilities used for collecting or transporting wastewater to an ultimate point for storage, treatment, or disposal. This does not include storm sewers conveying storm water runoff.

050 “Satellite lift station” means a wastewater pumping station located within the wastewater collection system, excluding pumping units having a flow less than 2000 gallons per day and serving four or fewer service connections, and also excluding pumping stations that are part of a wastewater treatment facility.

051 “Secondary cells” means lagoon cells that receive wastewater from primary lagoon cells.

052 “Seepage rate” means the rate of water loss through the liner of a wastewater lagoon or the liner of other wastewater storage or treatment units.

053 “Service connection” means a pipe transporting wastewater from an individual building to a sanitary sewer main.

054 “Sewage sludge” or “Sludge” means any solid, semi-solid, or liquid residue removed during the treatment of wastewater. Sewage sludge includes, but is not limited to, solids removed during primary, secondary, or advanced wastewater treatment, scum, septage, portable toilet pumpings, type III marine sanitation device pumpings, and sewage sludge products. Sewage sludge does not include grit or screenings, or ash generated during the incineration of sewage sludge.

055 “Small diameter gravity sewer” means a wastewater collection system utilizing settling tanks at each service connection and variable grade sewer pipes at least four inches in diameter to transport wastewater to a wastewater treatment facility.

056 “Small diameter pressure sewer” means a pressurized wastewater collection system where service connections use septic tank effluent pumps or grinder pumps to pressurize the sewer system.

057 “Solids settling pit” means a concrete treatment unit where wash water from a truck wash facility has settleable solids and/or floatable solids separated from the wash water, and allows the liquid wastewater to flow through to a wastewater lagoon.

058 “Solids storage unit” for the specific purpose of this title means a part of a livestock truck wash where the solids removed from a solids settling pit are stored and dried so that liquids drain back to the wastewater works.

059 “Standard specifications and plate drawings” means specifications and drawings that have been approved for general use by a municipality or engineering firm for the construction of sanitary sewers and appurtenances designed to be built within the municipal jurisdiction or by the clients of the engineering firm.

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060 “Storm sewer” means a collection system designed and constructed to collect storm water runoff, snow melt runoff, and surface runoff and drainage.

061 “Synthetic liner” means a man-made membrane that is installed in a wastewater structure to restrict seepage.

062 “Vegetated submerged bed constructed wetlands” means a shallow treatment basin where wastewater is treated as it moves horizontally through gravel media in which wetland plants grow, and the water surface is controlled below the top surface of the gravel media.

063 “Wash pad” means an area designed and constructed to conduct washing activities and to contain the wastewater generated by the washing activity.

064 “Wastewater” means the combination of the liquid or water carried wastes removed from residences, institutions, and commercial and industrial establishments, together with such ground water, surface water, and storm water as may be present.

065 “Wastewater collection systems” means pipes, conduits, wastewater pumping stations, force mains, inverted siphons, and all other constructions, devices, appurtenances, and facilities used for collecting or transporting wastes to an ultimate point for storage, treatment, or disposal.

066 “Wastewater cell” or “Cell” means a lagoon, basin, pond, constructed wetland, sand filter or other excavation, usually with earthen dikes, that is designed and constructed as part of a wastewater treatment facility.

067 “Wastewater lagoon” or “lagoon” means a detention, storage, or holding pond, usually with earthen dikes, designed and constructed to treat or store wastewater.

068 “Wastewater solids” means any solid or semi-solid material contained in or removed from a wastewater stream, including solids accumulated from washing operations at a truck wash facility.

069 “Wastewater treatment facility” or “WWTF” means a group or assemblage of processes, devices and structures for the treatment or removal of pollutants from wastewater.

070 “Wastewater works” shall mean facilities for collecting, conveying, storing, pumping and treating wastewater and the disposal of the treated effluent and sludges.

071 “Water main” means a pressurized water pipe that is part of a system providing potable water to the public, but is not a privately owned service connection.

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072 “Water well” means any excavation that is drilled, cored, bored, washed, driven, dug, jetted, or otherwise constructed for the purpose of exploring for ground water, monitoring ground water, utilizing the geothermal properties of the ground, obtaining hydrogeologic information, or extracting water from or injecting fluid as defined in Neb. Rev. Stat. §81-1502 into the underground water reservoir. Water well does not include any excavation made for obtaining or prospecting for oil or natural gas or for inserting media to repressure oil or natural gas bearing formations regulated by the Nebraska Oil and Gas Conservation Commission.

073 “Waters of the State” means all waters within the jurisdiction of this State including all streams, lakes, ponds, impounding reservoirs, marshes, wetlands, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface or underground, natural or artificial, public or private, situated wholly or partly within or bordering upon the State.

Legal Citation: Title 123, Ch. 1, Nebraska Department of Environmental Quality

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Chapter 4- PROHIBITED NEW CONSTRUCTION

001 New construction of the following facilities is prohibited:

001.01 Combined sewers, except for modifications to existing combined sewers that are necessary to maintain service in the system or where a modification is an intermediate step in an overall program to separate existing combined sewer systems.

001.02 WWTF outfall structures designed to discharge directly to impounded surface waters listed in Title 117, Nebraska Surface Water Quality Standards.

001.03 Cross connections between potable water supplies and wastewater appurtenances that could allow wastewater to contaminate the potable water supply.

001.04 Inflow structures, including downspouts, piping systems, trenches and storage structures, that discharge water from roof drains, exterior storm water drains, ground water or foundation drains, or that discharge single-pass non-contact cooling water to a public sanitary sewer system, unless it is authorized by permit or regulation. This rule does not prohibit maintenance work, replacements, modifications or changes to existing inflow structures if no new areas or sources of inflow water are connected to the public sanitary sewer.

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002 No person shall construct extensions to a sanitary sewer system if the receiving WWTF is not capable of meeting requirements imposed by a permit issued under Title 119, Rules and Regulations Pertaining to the Issuance of Permits Under the National Pollutant Discharge Elimination System, or where the WWTF is already loaded at or near its design capacity and cannot adequately treat or store the proposed additional flow, unless the person obtains an enforceable order from the Department authorizing the construction. This does not apply to interceptor sewers or relief sewers that will have no direct service connections.

Enabling Legislation: Neb. Rev. Stat. §81-1505(8)

Legal Citation: Title 123, Ch. 4, Nebraska Department of Environmental Quality

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Chapter 5- DESIGN STANDARDS AND SPECIFICATIONS

The Department gives credit to the Recommended Standards for Wastewater Facilities, prepared by the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers as the primary source for the design standards included in Chapter 5.

001 General Design Criteria

001.01 Wastewater works shall be designed in accordance with the design standards listed in this Title. Where specific standards are not included in this Title, the design engineer shall submit a proposed design to the Department for review and approval. The Department shall consider approving designs that follow generally accepted engineering guidelines and standards published by national engineering societies, federal environmental agencies, public health boards, or in engineering textbooks used by accredited university engineering programs.

001.02 The hydraulic design of wastewater works shall be based on historical flow records. In the absence of flow records, an average daily flow of at least 100 gallons per person per day from domestic sources shall be used. This includes a normal allowance for infiltration and inflow. Flow from commercial, institutional, and industrial sources shall be estimated from similar facilities that have historic flow records.

001.03 The organic loading rates used for designing wastewater treatment facilities shall be based on historical influent data, if at least one year of monthly sampling data exists. In the absence of such data, the design of wastewater treatment facilities shall use an organic loading rate of at least 0.17 pounds of five-day biochemical oxygen demand (BOD5) per person per day and a suspended solids loading rate of at least 0.20 pounds per person per day from domestic sources. The organic loading from commercial, institutional, and industrial sources shall be estimated from similar facilities that have loading records.

001.04 The design of discharging WWTF shall be adequate to meet all NPDES permit limits. Flow measurement equipment and sampling locations shall be included in the design as required to meet NPDES permit monitoring requirements.

001.05 The design of wastewater collection systems shall not include overflow structures of any kind. The design of wastewater treatment facilities shall not include passive or unvalved bypass structures that discharge to the ground surface or to waters of the state.

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001.06 Wastewater works shall be designed to prevent untreated or partially treated wastewater from entering floodwaters of a 100-year flood and shall prevent floodwaters from entering the wastewater works. The deck of lift stations, the top of earthen dikes, and the top of all other structures designed to store, convey, or treat wastewater or sludge shall be at least one foot above the 100-year flood elevation.

001.07 All WWTF shall have an alternative source of power to provide pumping of wastewater through the treatment facility. The alternative source of power shall be adequate to pump the peak day flow rate. This requirement shall be met by either an engine generator or by a second independent electrical supply source. Storage and subsequent treatment may also be used to meet this requirement.

001.08 All WWTF that have disinfection units shall have backup power provided for the disinfection process.

001.09 Each WWTF shall be enclosed with a fence, unless exempted by the Department. Fences shall be at least 42-inches high and shall be adequate to keep out grazing animals, if located in rural areas, or pets and unauthorized persons if located in public areas. Suitable warning signs shall be posted.

001.10 All weather access roads shall be provided to wastewater works, as necessary, to maintain normal operations of the wastewater works.

002 Gravity Sewers

002.01 Gravity sewers shall be designed to achieve a minimum velocity of 2.0 feet per second when flowing full based on Manning's Equation, using an "n" value of 0.013 (Refer to Chapter 6, 002 for approval of alternative designs).

002.02 The minimum diameter of public gravity sewer mains carrying raw domestic wastewater shall be eight inches, except that six-inch sewers may be used if the distance between manholes is not greater than 400 feet, the total length of six-inch sewer is not greater than 800 feet, and the sewer is located where it will not need to be extended for future growth.

002.03 Gravity sewers shall be designed with a uniform slope between manholes. This does not apply to inverted siphons.

002.04 Where velocities greater than 15 feet per second are attained, special provisions shall be made to protect sewers from displacement by impact forces and erosion.

002.05 Sewers with slopes of 20% or greater shall be reinforced with concrete anchors. Erosion collars shall be provided around steep sewers where migrating storm water could cause erosion of pipe bedding.

002.06 Curvilinear sewers are restricted to simple curves. The radius of curvature shall not be less than the pipe manufacturer's recommendation or be less than 100 feet. Elbows or couplings with deflections greater than three degrees shall not be used at pipe joints to create a curvilinear sewer. Curvilinear alignments shall not be achieved by bending the pipe barrel.

002.07 Inverted siphons shall include at least two barrels, each not less than six-inches in diameter. Adequate head shall be provided to assure velocities of at least 3.0 feet/second in all barrels when flowing at their maximum hydraulic capacity. Inlet and outlet control structures shall be designed with adequate clearances for inspections and cleaning to occur. For two-barrel siphons, the inlet and outlet control structures shall be designed so that flow can be diverted to either barrel to accommodate cleaning.

002.08 Sewers shall be laid at least 10 feet horizontally from any existing or proposed water main. The distance shall be measured from the outside edges of the two pipes. Where it is not practical to maintain the 10 foot horizontal separation, the sewer may be laid closer if the water main is in a separate trench or on an undisturbed earth shelf located on one side of the sewer, and the bottom of the water main is at least 18 inches above the top of the sewer. Where 10 feet of separation cannot be met, both the sewer and water main shall be constructed of water main quality pipe and pressure tested to 150 pounds per square inch.

002.09 Sewers crossing water mains shall be laid to provide 18 inches of vertical separation, measured from the outside edges of the two pipes. A full length of sewer pipe shall be centered on the crossing so that its joints are as far as possible from the water main. When providing 18 inches of vertical separation is not achievable, one of the following two alternatives shall be met to protect the water main. Either the sewer main shall be constructed of water main quality pipe and pressure tested to 150 pounds per square inch, or one of the mains shall be encased in a watertight encasement pipe. Where the crossing is at a right angle, the protection shall extend for 10 feet on each side of the crossing. Where the crossing is at an acute angle, the protection shall extend to all points within 10 feet of the water main, measured perpendicular to the water main.

002.10 Sewers shall not be laid closer than 50 feet horizontally from any water well.

002.11 Sewer pipe shall be installed with proper bedding, haunching, and backfill material to adequately support the pipe and maintain its grade and alignment.

002.12 The following acceptance tests shall be performed on newly constructed gravity sewers.

002.12A Alignment Test. For straight sections of sewer, an alignment test using either a lamp or a laser beam shall be performed. The light or laser beam shall be visible through the sewer between adjacent manholes.

002.12B Water Infiltration/Exfiltration Test. The measured leakage shall not exceed ~~100~~ gallons per inch of pipe diameter per mile per day, with a minimum head pressure of two feet above the highest point of the sewer pipe. The Low-Pressure Air Test may substitute for this test.

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002.12C Low-Pressure Air Test. The American Society for Testing and Materials (ASTM) test shall be specified for the pipe material being tested. The Infiltration/Exfiltration test may substitute for this test.

002.12D Deflection Test. A 5% deflection test shall be performed on flexible sewer pipe. A rigid ball or mandrel, sized at 95% of the inside diameter of the pipe, shall pass freely through the pipe without the aid of mechanical pulling devices. The test shall be performed after the backfill has been in place at least 30 days.

002.13 Manholes shall be provided at sewer main intersections, at changes of slope, pipe diameter, or alignment of straight sections, and at distances not greater than 400 feet. Where modern sewer cleaning equipment is available, manhole spacing up to 600 feet may be used. Manhole spacing beyond 600 feet will be considered for sewers 30 inches in diameter or greater. Cleanouts may be installed only at the end of six-inch or eight-inch sewer laterals that are less than 400 feet long if the minimum slope requirement is met.

002.14 Drop manholes shall be provided wherever the invert of the entering sewer is 24 inches or more above the invert of the manhole. For new construction, the drop pipe shall be outside of the manhole and encased in concrete to protect the manhole from unequal backfill pressures. Drop manholes will not necessarily be required for manholes installed on large diameter trunk or interceptor sewers where the invert of sewer laterals are set above the manhole invert to prevent standing water in the sewer laterals.

002.15 Manhole ring and cover assemblies exposed to street traffic shall weigh at least 300 pounds. Manhole steps, if provided, shall be made of corrosion resistant material.

002.16 The minimum diameter of manholes shall be 48 inches. The minimum diameter of the access opening shall be 22 inches.

002.17 The flow channels through manholes shall be shaped to conform to the shape of the connecting sewer pipes. Concrete benches shall be installed on each side of the flow channels and slope towards the channels with a minimum 1.0 % slope.

002.18 Sewers shall be sized for the peak hourly flow, which is the average daily flow times a peak factor (F). Where historical flow records are not adequate to determine the peak factor in a service area, the peak factor shall be calculated by the following formula, where P is the population equivalent of the service area in thousands.

$$F = \frac{18 + \sqrt{P}}{4 + \sqrt{P}}$$

002.19 Privately owned sanitary sewers for mobile home parks, recreational vehicle parks (RV parks) or campgrounds may be designed according to the following design standards as an alternative to the standards listed in 002.01-002.18 above.

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002.19A Sanitary sewers within the park or campground shall be at least six inches in diameter. The minimum slope for six-inch sewers shall be 1.0%. Wyes and tee pipe connections are allowed at intersections in place of manholes.

002.19B Cleanouts shall be installed at the upstream end of each sanitary sewer, at each change of direction, at each sewer intersection, at each change in pipe diameter, and installed at least every 150 feet of sewer length if one-way cleanouts are used or every 300 feet if two-way cleanouts are used.

002.19C Service lines shall be at least four-inches in diameter. No more than two living units or campsites shall connect to a four-inch service line. The minimum slope for four-inch service lines shall be 2.0%.

002.19D Service lines for RV parks or campgrounds shall include a trap below the frost line or be provided with removable gas-tight caps.

002.20 Small diameter gravity sewers shall meet the following design standards:

002.20A Septic tanks or interceptor tanks, used to provide primary treatment, shall have a tank capacity of at least 1000 gallons and meet all other design criteria of NDEQ Title 124, Rules and Regulations For the Design, Operation and Maintenance of On-Site Wastewater Treatment Systems.

002.20B Manholes shall be installed at major impact points where flow measurement or sampling is necessary for regulatory or planning purposes.

002.20C Where manholes are not installed, cleanouts shall be installed at the upstream end of each small diameter gravity sewer, at each change in pipe diameter, at significant changes of grade, at pipe intersections, and installed at least every 500 feet of sewer length if one-way cleanouts are used or every 1000 feet if two-way cleanouts are used.

002.20D Small diameter gravity sewers shall have a minimum diameter of four inches.

002.20E Small diameter gravity sewers shall be installed below the frost line.

002.20F Small diameter gravity sewers shall pass the American Society for Testing and Materials (ASTM) low-pressure air test before being placed into service (See 002.12C).

002.21 Small diameter pressure sewers, using grinder pumps or septic tank effluent pumps, shall meet the following design standards.

002.21A Cleanouts shall be installed at the upstream end of each small diameter pressure sewer, at each change in pipe diameter, at pipe intersections, and installed at least every 500 feet of sewer length.

002.21B Isolation valves shall be installed for each branch sewer line and not less than every 1000 feet of force main length.

002.21C Air release valves shall be installed at local high points in the pressure sewer profile.

002.21D Small diameter pressure sewers shall be installed below the frost line.

002.21E Each grinder pump or effluent pump shall have an audio or visual high-water alarm provided.

002.21F Each service line shall include an isolation valve and two check valves. A check valve included in the pump unit counts towards this requirement.

002.21G Standard dimension ratio (SDR) 26 polyvinyl chloride (PVC) pipe shall not be used in diameters smaller than two inches.

003 Lift Stations

003.01 Lift stations shall be protected from vandalism by fencing or lockable structures. Lift stations shall be located so they are accessible to maintenance vehicles during all times of the year.

003.02 Where ground water is encountered, lift stations shall be designed to withstand buoyant forces.

003.03 Multiple pumps shall be provided for all lift stations, except where four or fewer service connections are served and the total flow is less than 2000 gallons per day. Where two pumps are provided each shall be capable of pumping the peak hourly flow. Where three or more pumps are provided, they shall be sized to pump the peak hourly flow when the largest pump is out of service. The control system shall have the ability to automatically alternate the pumps in operation.

003.04 Lift stations pumping raw wastewater shall be designed to achieve a velocity of at least 2.0 feet per second in the force main.

003.05 Pumps handling raw wastewater shall have suction and discharge openings at least four inches in diameter and be capable of pumping solid spheres at least three inches in diameter. This requirement does not apply to grinder pumps. Each pump shall have an individual intake opening.

003.06 For custom built wet wells, the wet well floors shall be sloped toward the pump inlets to minimize the accumulation of grit and wastewater solids

003.07 Check valves and shutoff valves shall be placed on the discharge pipe of each pump with the check valve located between the pump and the shutoff valve. Check valves shall be located on horizontal pipe sections, except for ball check valves, which may be located on vertical sections. For satellite lift stations, the check valves and shut-off valves shall be located in a separate chamber out of the wet well. Check valves that are an integral part of the pump may be used if the pump and valve can be removed from the wet well without maintenance personnel entering the wet well.

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003.08 Where a valve pit is installed adjacent to a lift station it shall include a drain line back to the lift station wet well. The drain line shall include a flap valve to prevent gases from entering the valve pit.

003.09 Where a wet well/dry well type lift station is used, the dry well shall be sealed off from the wet well so that wastewater and sewer gases cannot enter the dry well.

003.10 Where dry wells are located below the ground surface, permanent mechanical ventilation shall be provided. Wet wells shall be provided with permanent mechanical ventilation if valves, screens, or other equipment is located in the wet well that must be inspected and maintained by personnel entering the wet well.

003.11 When continuous mechanical ventilation is provided in wet wells, it shall provide at least 12 complete air changes per hour. Continuous ventilation in dry wells shall provide at least six complete air changes per hour. Intermittent mechanical ventilation, in either case, shall provide at least 30 air changes per hour. The direction of forced air shall be into the wet well or dry well.

003.12 Each satellite lift station shall be equipped with an alarm system that is activated by power failure or a high water level. If the lift station serves at least 25 service connections and less than 24 hours of storage capacity exists at the lift station and in the collection system before a backup or sanitary sewer overflow occurs, the alarm shall be telemetered to the responsible parties 24-hours a day. Where less than 25 service connections exist or where 24 hours of storage capacity is provided an audio and visual alarm shall be provided.

003.13 Lift stations must be provided with emergency provisions to avoid backups into basements or sanitary sewer overflows. One of the following emergency provisions shall be provided at each lift station:

003.13A The lift station shall be connected to two independent electrical substations;

003.13B A storage capacity of 24 hours of flow is provided in the upstream sewer system or by storage structures, before a backup or sanitary sewer overflow occurs;

003.13C A permanent engine driven electrical generator is installed;

003.13D A portable electrical generator is kept available within one hour of travel time and two hours of storage capacity exists before a backup or sanitary sewer overflow occurs; or

003.13E A portable pump and adequate hose or piping is kept available within one hour of travel time and two hours of storage capacity exists before a backup or sanitary sewer overflow occurs.

003.13F Another method approved by the Department.

003.14 All satellite lift stations shall be designed with a riser pipe on the downstream force main. The riser pipe shall be fitted with quick connection couplings and shutoff valves, as necessary, to be used in emergencies with a portable pump.

004 Force Mains

004.01 Force mains shall be sized so that a cleaning velocity of at least 2.0 feet per second is achieved at the minimum pumping rate of the lift station.

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004.02 The minimum diameter of force mains transporting raw domestic wastewater shall be four inches.

004.03 Force mains shall be designed with air relief valves located at high points in the force main. Vacuum relief valves may be required where an evaluation of the design indicates they are needed.

004.04 Force mains discharging into manholes shall enter the manhole no more than two feet above the gravity flow line.

004.05 Force mains and all installed valves and appurtenances shall be designed to withstand the pumping shutoff head pressure. Force mains shall be pressure tested equal to water mains.

004.06 Force mains shall maintain the same separation distances to water mains and wells required for gravity sewers. See Chapter 5, 002.08 - 002.10.

004.07 Wastewater pumps shall be selected that operate effectively over the range of head loss conditions that will exist over the life of the system. Piping system head capacity curves shall be prepared for both the new pipe condition using the appropriate coefficient of roughness and for the aged pipe condition that will result after years of service. For the aged condition, a Hazen Williams "C" value not higher than 120 shall be used for polyvinyl chloride (PVC), polyethylene or lined ductile iron, and for unlined iron or steel pipe a "C" value no higher than 100 shall be used.

005 Wastewater Lagoons

005.01 The seepage rate of wastewater lagoons shall not exceed one-eighth inch per day at the design maximum water depth. A lower seepage rate, or zero seepage, shall be required if the Department determines that additional ground water protection is required. Ground water monitoring wells shall be required where the Department determines that monitoring is necessary.

005.02 The liners of wastewater lagoons shall be tested prior to the lagoon being placed into service. The test results shall be submitted to the Department for review. Synthetic liners shall be tested according to the manufacturer's instructions or other tests required by the Department. Soil liners shall have the seepage rate measured by one of the following tests:

005.02A An independent soils testing laboratory shall determine the coefficient of permeability from undisturbed core samples taken from the liner. The seepage velocity shall be calculated using Darcy's Law at the design maximum water depth. Each permeability test shall pass the seepage test. Areas that do not pass shall be reworked and retested. The minimum number of core samples that shall be tested is listed in the following table.

Permeability Testing
Number of Core Samples per Lagoon Cell

Water Surface Area of Lagoon Cell (Acres)	Permeability Tests Required from Cell Floor	Permeability Tests Required From Side Slopes
0-1	1	1
1-2	2	1
2-3	3	2
3-4	4	2
4-6	5	3
6-8	6	3
8-10	7	4
10-12	8	4
12-15	9	5
15-18	10	5
18-21	11	6
21-24	12	6
Greater than 24 acres	One per two acres	One per four acres

005.02B The seepage rate shall be tested directly by filling the cell with water and measuring the change of water level over time. The test shall run at least 21 days. A control device must be used to measure the effects of rainfall and evaporation during the test. If the water depth during the test is less than the design depth, the test result shall be adjusted to calculate the seepage rate at the design water depth of the cell. This test shall be conducted under the supervision of a professional engineer.

005.02C Wastewater lagoons with a water surface area less than one acre may use a two-barrel test. One barrel, without a bottom, shall measure the seepage rate and the other barrel, with a solid bottom, shall be used as a reference to account for rainfall and evaporation. A professional engineer shall supervise this test and verify the results.

005.02D Another method approved by the Department.

005.03 The bottom elevation of soil liners for wastewater lagoons shall be constructed at least four feet above the seasonal high ground water level, including the level of any perched ground water.

005.04 Wastewater lagoons shall not be constructed within 100 feet from any water well or within 1000 feet from a community public water supply well.

005.05 Wastewater lagoons shall not be constructed within 50 feet from a property line or within 200 feet from an existing dwelling, measured from the normal high water level of the lagoon.

005.06 Wastewater lagoons shall be designed and constructed to prevent storm water runoff from flowing into the cells and to prevent storm water runoff or surface water flow from eroding the earthen dikes.

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005.07 The top of wastewater lagoon dikes shall be constructed at least one foot above the 100-year flood elevation at the site.

005.08 The top of wastewater lagoon dikes shall have a minimum width of eight feet to accommodate maintenance vehicles.

005.09 Wastewater lagoons shall be provided with influent flow measurement equipment capable of measuring the total influent flow. Elapsed time meters on lift station pump controls are acceptable to meet this requirement.

005.10 Discharging wastewater lagoons shall be equipped with an effluent sampling location and a primary flow-measuring device to measure the discharge flow rate. Primary flow devices include parshall flumes, palmer-boelus flumes, V-notch weirs, rectangular weirs, trapezoidal weirs or similar devices. Level monitoring equipment or flow meters shall be included with the primary flow-measuring device for continuous discharge lagoons, but is not required for controlled discharge lagoons.

005.11 All wastewater lagoons shall be completely enclosed by a fence, unless exempted by the Department. The fencing shall be at least 42 inches high and shall include at least one lockable gate, a minimum of 10 feet wide.

005.12 A warning sign shall be posted on each side of a wastewater lagoon system. Sides longer than 500 feet shall have one sign for every 500 feet or fraction thereof. The signs shall be at least 12 inches by 24 inches in size and clearly show the words "No Trespassing, Wastewater Lagoon" or similar language.

005.13 The organic loading rate of facultative lagoon systems shall not exceed 30 pounds of five-day biochemical oxygen demand (BOD5) per acre per day for primary cells. The organic loading rate for the entire lagoon system shall not exceed 25 pounds of BOD5 per acre per day.

005.14 Facultative lagoons shall have a maximum water depth of six feet in primary cells and eight feet in secondary cells. Greater depths may be approved if mechanical aeration is provided.

005.15 Discharging wastewater lagoon systems shall be designed with multiple cells that operate in series. Where two or more primary cells are provided, a control structure shall be designed to split the flow proportionally or to divert the influent flow to either cell.

005.16 The finished floor elevation of wastewater lagoons shall not vary more than three inches from the design elevation or grade.

005.17 After seepage testing is completed, newly constructed wastewater lagoons shall be filled with two feet of water to protect the liner from damage and to reduce odors when the lagoons first receive wastewater. Lagoon cells that will not be placed into immediate service shall follow the requirements of Chapter 11, 008.04.

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005.18 Rapid Infiltration (RI) Cells shall be designed according to the following design standards.

005.18A RI cells shall have at least 10 feet from the bottom of the cell to the seasonal high ground water level.

005.18B RI cells shall be designed to operate in a cycle consisting of a water application period followed by a drying period. The length of the drying period shall be adequate to restore aerobic conditions to the soil and shall not be shorter than the application period. The application period shall include all time that any standing water is visible in the cell.

005.18C RI systems that discharge to ground water shall be designed to achieve a total nitrogen concentration of 10 milligrams per liter (mg/l) or less entering ground water.

005.18D Ground water monitoring wells shall be required at all rapid infiltration systems.

006 Mechanical Plants

006.01 Flow Measurement

006.01A Plants with an average daily design flow less than 50,000 gallons per day shall have either influent or effluent flow measurement. Lift station elapsed time meters will satisfy this requirement.

006.01B Plants with an average daily design flow of 50,000 gallons per day or greater shall have continuous flow measurement and totalizing equipment.

006.01C Flow measurement equipment shall be sized to function accurately over the full range of flows received at the treatment plant. The flow measurement equipment shall be protected from freezing.

006.02 Bar Screens & Comminutors

006.02A Every mechanical plant shall have either screening devices or comminutors installed.

006.02B At least two flow channels shall be provided for screens or comminutors. Each channel shall be designed to handle the peak hourly flow.

006.02C Comminutors shall be located after grit removal facilities. If grit removal is not provided, the flow channels upstream of comminutors shall have a gravel trap installed to protect the comminutor from damage.

006.02D Where a comminutor is installed, a bypass bar screen shall also be provided. Flows exceeding the operating capacity of the comminutor shall automatically be diverted to the bar screen channel.

006.03 Grit Removal

006.03A Grit removal facilities, when provided, shall be located after screening devices, but prior to comminutors or other treatment units.

006.03B Ventilation shall be provided for grit removal facilities that are covered or housed in a building. Fresh air shall be continuously forced into the facility at a minimum rate of 12 air changes per hour or intermittently at a minimum rate of 30 air changes per hour.

006.03C Grit removal facilities shall be provided with drains to dewater the unit for maintenance and be equipped with a bypass line.

006.03D Grit removal facilities shall be provided with means to dry and store grit prior to disposal. Grit removal and grit handling facilities shall be protected from freezing.

006.04 Primary Clarifiers

006.04A Plants with an average daily design flow of 100,000 gallons per day or greater shall have multiple primary clarifiers, if primary clarifiers are part of the facility. Each clarifier shall be capable of independent operation. When a single primary clarifier is provided, a bypass line to the secondary treatment unit shall be provided.

006.04B The minimum sidewall depth of primary clarifiers shall be 10 feet.

006.04C The horizontal distance from the inlet to outlet shall be at least 10 feet, unless the design includes a method to prevent short-circuiting.

006.04D The surface overflow rate shall not exceed 1000 gallons per day per square foot at the average daily flow or 3000 gallons per day per square foot at the peak hourly flow. Returned flows from later treatment units shall be included in the flow used to calculate the surface overflow rate.

006.05 Activated Sludge Basins

006.05A The dimensions of each aeration tank shall be such that it maintains effective mixing and utilization of air. Vertically mixed tanks shall have a liquid depth of not less than 10 feet or greater than 30 feet. Horizontally mixed tanks shall have a minimum liquid depth of 5.5 feet.

006.05B All aeration tanks shall have a freeboard of not less than 18 inches. Aeration tanks using mechanical surface aerators shall have at least three feet of freeboard.

006.05C Inlets and outlets for each aeration basin shall be suitably equipped with valves, gates, stop plates, weirs, and other devices to permit controlling the flow to any unit and maintain reasonably constant liquid levels. Where multiple aeration basins are provided, the hydraulic properties of the inlets and outlets shall be sized to carry the design peak instantaneous flow with any single aeration tank out of service.

006.05D Channels and pipes that carry solids in suspension shall be designed to maintain a self-cleansing velocity at all rates of flow within the design limits. Open channels shall be designed to prevent splashing out of the channel.

006.05E The shape of aeration tanks, the location of influent and return sludge pipes, and the aeration equipment shall be designed to prevent short-circuiting through the tanks.

006.05F The rate of sludge return shall be controlled by means of variable speed motors, drives, valves, or timers to pump sludge at the required rates. If motor driven return sludge pumps are used, a minimum of two pumps is required. The pumps shall be sized to meet the required pumping rates with the largest pump out of service. Pumps shall have at least a 3-inch suction and discharge opening. No standby unit is required for air lift pumps, provided the design facilitates rapid and easy cleaning. Airlift pumps shall be at least 3 inches in diameter. Airlift pumps used to waste or return sludge shall be designed so their operation is unaffected by changes of air demand of other treatment units.

006.05G Return sludge piping shall be at least four inches in diameter and designed to maintain a velocity of not less than two feet per second when return facilities are operating at normal return rates. Suitable devices shall be provided for measuring and controlling the return rate. The flow shall be returned near the inlet or head end of the aeration tank, so that it rapidly mixes with the influent. Return sludge piping shall be designed to provide the operator easy access for collection of return sludge samples.

006.05H Sludge wasting facilities shall be provided for all activated sludge facilities. Sludge wasting facilities include units such as sludge thickening tanks, sludge digestion facilities, sludge storage tanks, dewatering facilities or any practical combination of these units. A means of measuring, controlling, and sampling of waste activated sludge must be provided.

006.05I Aeration equipment shall be capable of maintaining a minimum dissolved oxygen concentration of 2.0 milligrams per liter in the mixed liquor at all times and provide thorough mixing of the mixed liquor. For all activated sludge processes, except extended aeration, the minimum oxygen requirements shall be 1.1 pounds of oxygen per pound of the design peak hourly five-day biochemical oxygen demand (BOD₅) applied to the aeration tank. For the extended aeration process the minimum oxygen requirement shall be 1.5 pounds of oxygen per pound of the design peak hourly BOD₅ applied to the aeration tank.

Where nitrification is required, the oxygen requirement for oxidizing ammonia must be added to the above requirement for oxidation of five-day biochemical oxygen demand. The minimum

nitrogenous oxygen requirement shall be 4.6 pounds of oxygen per pound of the design peak hourly total Kjeldahl nitrogen applied to the aeration tank.

006.05J The design of the diffused air system shall be based on either standard engineering equations that calculate the transfer efficiency using such factors as tank depth, alpha and beta factors, device transfer efficiencies, wastewater temperature and altitude of the plant or empirically determined air requirements. Designs based on standard engineering equations shall include the transfer efficiency in the specifications.

Empirical air requirements for all activated sludge processes, except extended aeration, shall be a minimum of 1500 cubic feet of air (at standard conditions of pressure, temperature, and humidity) per pound of five-day biochemical oxygen demand (BOD₅) applied to the aeration tank. For the extended aeration process the air requirements shall be 2050 cubic feet of air per pound of BOD₅ applied to the aeration tank.

006.05K The specified capacity of blowers or air compressors shall take into account the range of ambient air conditions that may occur at the site.

006.05L A minimum of two blowers shall be provided for any activated sludge facility. The capacities of blowers or air compressors shall be able to meet the air demand of the system with the largest unit out of service.

006.05M Plants with less than four independent aeration tanks shall be designed to allow removal of the diffusers for service or replacement without dewatering the tank.

006.05N In the absence of specific design information, the oxygen requirements shall be calculated using a transfer rate not to exceed two pounds of oxygen per horsepower per hour. The design requirements of a mechanical aeration system shall maintain a dissolved oxygen concentration of two milligrams per liter in the mixed liquor at all times throughout the tank, maintain solids in suspension, and meet the oxygen demand requirements with the largest unit out of service.

006.06 Trickling Filters

006.06A Trickling filters shall be preceded by primary sedimentation to remove scum, grease, and floatable debris or by other suitable treatment facilities.

006.06B The volume of trickling filter media shall be based upon pilot testing with the particular wastewater or by using design equations. The volume of media shall be calculated on the design maximum day organic loading. The design volume shall also include treatment of the organic loading of recycle flows from other treatment units such as, digester supernatant, mechanical dewatering supernatant, or others.

006.06C Media shall have a minimum depth of six feet above the underdrains. Rock or slag media shall not exceed 10 feet in depth. Manufactured media shall not exceed the depth recommended by the manufacturer.

006.06D Rock media shall not contain more than five percent by weight of pieces whose longest dimension is three times the least dimension. It shall be free of thin, elongated and flat pieces, dust, clay, sand, or fine material and shall conform to the following size and grading.

Passing 4 ½ inch screen - 100%
Retained on 3 inch screen – 95-100% by weight
Passing 2 inch screen – 0 – 2% by weight
Passing 1 inch screen – 0-1% by weight

006.06E Manufactured media shall be resistant to ultraviolet degradation, disintegration, erosion, aging, all common acids and alkalis, organic compounds, and fungus or biological attack. Media shall be structurally capable of supporting the weight of a person or a suitable access walkway shall be provided for maintenance of the distributor. Manufactured media for carbonaceous treatment shall not have a specific area greater than 30 square feet per cubic foot. Manufactured media for second stage ammonia treatment shall not have a specific area greater than 45 square feet per cubic foot.

006.06F The piping system, including dosing and distributor equipment, shall be designed to provide capacity for the design peak hourly flow including the recirculation rate. The design recirculation ratio (ratio of recirculation flow to design average flow) shall be based on the amount of variation in plant flow between design minimum daily flow and design peak hourly flow.

006.06G The piping system shall be designed for recirculation as required to achieve the design wetting rate, or design dosing rate, and to achieve the design treatment efficiencies. The design of recirculation facilities shall provide for continuity of service, variable recirculation rates, measurement of the recirculation rate, and subject to control by the plant operator. A minimum of two recirculation pumps must be provided.

006.06H The wastewater shall be distributed by rotary, fixed nozzle, or other suitable distributor that ensures uniform distribution over the entire surface area. The distribution equipment shall be able to apply wastewater at the design hydraulic loading rate (gallons per minute per square foot) or dosing rate (inches per revolution). At design average flow, the deviation from a calculated uniformly distributed volume per square foot of the filter surface shall not exceed plus or minus 10 percent at any point.

006.06I There shall be a minimum of 12 inches of clearance between the media and the distribution arms.

006.06J A freeboard of four feet or more shall be provided for tall manufactured uncovered trickling filters to contain windblown spray.

006.06K Appropriate valves, sluice gates, or other structures shall be provided to enable flooding of the filter. Access shall be provided around the periphery of the underdrain system to allow flushing of the underdrains.

006.06L The underdrain system shall cover the entire floor of the filter. Inlet openings into the underdrains shall have an unsubmerged combined area equal to at least 15 percent of the surface area of the filter. The underdrains shall have a minimum slope of one percent. Effluent channels shall be designed to produce a minimum velocity of two feet per second at design average daily flow rates including recirculated flows.

006.06M The underdrain system and effluent channels shall be designed to permit free passage of air. The size of the drains and channels shall be designed such that no more than 50 percent of their cross-sectional area will be submerged under design peak flow conditions. Forced ventilation shall be provided for covered trickling filters to insure adequate oxygen for process requirements. The design of ventilation equipment shall provide for operator control of air-flow in accordance with outdoor seasonal temperatures.

006.06N All distribution devices, underdrains, channels, and pipes shall be installed so that they allow for proper maintenance.

006.07 Intermediate and Final Clarifiers

006.07A Facilities with an average daily design flow of 100,000 gallons per day or greater shall have multiple final clarifiers. Effective flow splitting devices and control appurtenances shall be provided to permit proper proportioning of flows and solids to each unit, throughout the expected range of flows.

006.07B The minimum distance between inlet and outlet shall be 10 feet, unless the design includes a method of preventing short-circuiting. The minimum side water depth shall be 12 feet. Walls of settling tanks shall extend at least six inches above the surrounding ground surface and shall have a minimum of 12 inches of freeboard.

006.07C Surface overflow rates shall be calculated based on design average and design peak hourly influent flow conditions. The solids loading rate shall be calculated based on the design average daily flow or design maximum day flow plus the design maximum return sludge rate plus the design mixed liquor suspended solids (MLSS).

006.07D Influent pipes and center columns of circular clarifiers shall have a maximum velocity of 2.0 feet per second. Inlet structures shall be designed to dissipate the inlet velocity, to distribute the flow equally both horizontally and vertically and to prevent short-circuiting. Corner pockets and dead ends shall be eliminated and corners fillets or channeling shall be used where necessary. Provisions shall be made to eliminate or remove floating materials from inlet structures.

006.07E Overflow weirs shall be adjustable to correct for differential settlement. Weirs shall be located to optimize hydraulic detention time and minimize short-circuiting. The loading rate at design peak hourly flow shall not exceed 20,000 gallons per day per lineal foot of weir for plants with a design flow less than one million gallons per day (MGD) or 30,000 gallons per day per lineal foot of weir for plants with a design flow greater than one million gallons per day. Weir troughs shall be designed to prevent submergence at design peak hourly flow and maintain a velocity of 1.0 foot per second at one-half the design average flow.

006.07F Provisions for scum collection and removal shall be provided for all clarifiers. Scum shall be discharged to a sludge treatment unit or scum storage unit that prevents recycling of the scum through the secondary treatment units. Scum shall not be discharged to the head of the plant, unless it can be permanently removed from the system in a primary clarifier or similar treatment unit.

006.07G All final and intermediate clarifiers shall have a mechanical sludge scraper or collection system. Suction withdrawal shall be provided for activated sludge final clarifiers with a diameter greater than 60 feet. Each settling tank shall have its own sludge withdrawal lines to insure adequate control of sludge wasting from each tank.

006.07H All settling tanks shall be equipped with appropriate equipment such as machinery covers, walkways, handrails, area lighting, and slip resistance surfaces that enhance the safety of the operator. The design shall provide for convenient and safe access to routinely checked items such as gear-boxes, scum removal mechanisms, baffles, weirs, inlet areas, and effluent channels.

006.08 Sludge Treatment, Storage, and Disposal

006.08A Facilities for the treatment and storage of sludge shall be provided at all mechanical wastewater treatment plants, unless arrangements are made for processing sludge at another treatment facility. Where sludge is hauled off site for treatment and disposal, an all-weather access road to the treatment plant shall be provided.

006.08B Treatment plants using suspended growth processes (activated sludge variations) shall, at a minimum, be provided with on-site sludge storage facilities to allow for proper sludge wasting and operational control of the treatment process.

006.08.C Sludge withdrawal piping shall have a minimum diameter of eight-inches for gravity withdrawal, and six-inches for pump suction and discharge lines. There shall be a minimum of four feet of head above the discharge pipe where withdrawal is by gravity. Provisions for draining and flushing discharge lines shall be provided for all gravity sludge piping. The minimum slope for gravity piping shall be three percent. A minimum positive head of 24 inches shall be provided at the suction side of centrifugal pumps. Suction heads for positive displacement pumps shall not exceed 10 feet.

006.08D Anaerobic Sludge Digestion

006.08D1 Digester tanks shall be covered with either a fixed or floating cover. Covers shall be sealed to protect against gas leaks. The top of the tank shall have at least two manholes, not less than 30 inches in diameter, in addition to the gas dome.

006.08D2 The tank bottom shall slope towards the withdrawal pipe. A minimum bottom slope of 1:12 is required for tanks equipped with a suction mechanism for sludge withdrawal. A minimum slope of 1:4 is required where sludge is to be removed by gravity.

006.08D3 Where mixing equipment is not provided within the digester, multiple sludge inlets, outlets, and other suction or discharge points shall be used to achieve mixing and allow for flexibility of operation. One inlet shall discharge above the liquid level near the tank center to facilitate the breakup of scum. Raw sludge inlets shall be designed to avoid short-circuiting.

006.08D4 An unvalved, vented overflow shall be included to prevent damage to the digester in case of accidental overfilling. The overflow shall return the sludge to a treatment unit.

006.08D5 Where rational calculations are not submitted to justify the required tank capacity for heated, anaerobic digestion of domestic wastewater sludge, the minimum volume for completely mixed systems shall be 1000 cubic feet of active digester volume for each 80 pounds of volatile solids per day. Where partial mixing is provided, the minimum volume shall be 1000 cubic feet of active digester volume for each 40 pounds of volatile solids per day.

006.08D6 In two stage systems, where the secondary digesters are utilized for thickening and storage, the volume of the secondary digesters shall not be used to meet the volume requirement for sludge digestion.

006.08D7 The digester gas system shall be designed so that gas is under positive pressure during all normal operations, including during sludge removal from the digester. All enclosed building areas where gas leaks could occur shall be provided with ventilation systems.

006.08D8 Supernatant piping shall not be less than six-inches in diameter.

006.08E Aerobic Digestion

006.08E1 Where aerobic digesters are used, multiple units shall be provided where the design average wastewater flow is at least 100,000 gallons per day.

006.08E2 Volatile suspended solids loading shall not exceed 300 pounds per 1,000 cubic feet of volume per day in the digestion units.

006.08E3 A minimum of 15 days of solids retention time shall be provided for waste activated sludge and 20 days for a combination of primary and waste activated sludge, or for primary sludge alone. In order to qualify as a Process to Significantly Reduce Pathogens (See Title 119 – Rules and Regulations Pertaining to the Issuance of Permits Under the National Pollutant Discharge Elimination System, Chapter 12, 004), aerobic digestion processes shall have a minimum mean cell residence time of 40 days at 20° Celsius and 60 days at 15° Celsius. If supernatant separation is performed in the digestion tank, additional volume is required to allow for decanting. This added volume shall not be included in the determination of mean cell residence or solids retention time.

006.08E4 Sufficient air shall be provided to keep solids in suspension and maintain a dissolved oxygen concentration of 1.0 milligram per liter. The minimum amount of air supply shall be 30 cubic feet per minute per 1000 cubic feet of tank volume with the largest blower out of service. The minimum requirement for mechanical aerators shall be 1.0 horsepower per 1000 cubic feet of digester volume.

006.08E5 Facilities shall be provided for the separation and decanting of supernatant. The supernatant draw off unit shall be designed to prevent recycling of scum and grease back to the wastewater treatment processes. A method for the collection and disposal of scum and grease shall be provided.

006.08E6 An unvalved high-level overflow shall be provided to return digester overflow back to the head of the plant or to a secondary treatment unit to protect against accidental overfilling.

006.09 Disinfection

006.09A Chlorine Disinfection

006.09A1 The chlorination system and equipment shall be sized to produce an effluent meeting applicable bacterial limits at design peak flow conditions.

006.09A2 Where 100 or 150 pound chlorine gas cylinders are used, the cylinders shall be stored in an upright position with adequate support brackets and chains at the two-thirds cylinder height for each cylinder. Storage containers for hypo-chlorite solutions shall be of sturdy, non-metallic lined construction and shall be provided with secure tank tops and pressure relief and overflowing piping. Storage tanks shall be vented outside. Tanks shall be located where leakage will not cause corrosion or damage to other equipment. A means of secondary containment to control spills and facilitate cleanup shall be provided.

006.09A3 Scales for weighing cylinders and containers shall be provided at all plants using chlorine gas.

006.09 A4 The disinfectant shall be mixed as rapidly as possible. A minimum contact time of 15 minutes at design peak hourly flow or maximum pumping rate shall be provided after thorough mixing. The chlorine contact tank shall be constructed to reduce short-circuiting.

006.09A5 Piping systems shall be as simple as possible and selected and manufactured to be suitable for chlorine service. Piping shall be well supported and protected against temperature extremes. The chlorine piping shall be color-coded and labeled to distinguish it from other plant piping. Piping and fittings for chlorine and sulfur dioxide shall be designed so that interconnection between the two systems cannot occur.

006.09A6 If gas chlorination equipment or chlorine cylinders are to be in a building used for other purposes, a gas-tight room shall separate this equipment from other portions of the building. Floor drains from the chlorine room shall not be connected to floor drains from other rooms. Doors to this room shall open to the outside, and shall be equipped with panic hardware. Rooms shall be at ground level and should permit easy access to all equipment. Storage areas for one-ton cylinders shall be separated from the feed area. A clear glass, gas-tight window shall be installed in an exterior door or interior wall of the chlorinator room to permit the units to be viewed without entering the room.

006.09A7 Forced, mechanical ventilation shall be installed that provides one complete air exchange per minute when the room is occupied. The entrance to the air exhaust duct from the room shall be near the floor. The point of discharge shall be located so as not to contaminate the air inlet of another building. Air inlets shall be located to provide cross ventilation with air at such a temperature that will not adversely affect the chlorination equipment. The outside air inlet shall be at least three feet above grade. The vent hose from the chlorinator shall discharge to the outside atmosphere above grade.

006.09A8 Switches for fans and lights shall be located outside the room at the entrance. If the fan can be controlled from more than one point, a labeled signal light indicating fan operation should be provided at each entrance.

006.09A9 Respiratory protection equipment, meeting the requirements of National Institute for Occupational Safety and Health (NIOSH) shall be available where chlorine gas is handled, and shall be stored at a convenient location, but not inside any room where chlorine is used or stored.

006.09B Dechlorination

006.09B1 The dechlorination chemical shall be introduced at a point in the process where the hydraulic turbulence is adequate to assure complete and thorough mixing. If no point exists, mechanical mixing shall be provided. A minimum of 30 seconds for mixing and contact time shall be provided at the design peak hourly flow or maximum rate of pumping.

006.09C Ultraviolet (UV) Radiation Disinfection

006.09C1 For facilities with a design average day flow of 100,000 gallons or more, a UV disinfection system shall consist of multiple banks of lamp modules in series that are capable of continuously disinfecting the effluent with one bank out of service.

006.09C2 Provisions shall be made for easy removal and inspection of the UV lamps without draining the disinfection chamber.

006.09C3 The contact chamber shall be designed so that the UV lamps remain submerged at all times during operation and to maintain a near constant water level at all design flow conditions.

007 Truck Wash Wastewater Treatment Facilities

007.01 Livestock Truck Washes

007.01A Livestock truck washes shall either connect to a public sanitary sewer system or to a wastewater works designed and constructed according to the following standards.

007.01B Livestock truck washes shall include wash pads that capture all wash water from the washing operation and convey it to the wastewater works. Wash pads shall be constructed of concrete or another impermeable material.

007.01C One of the following wastewater systems shall be used for livestock truck washes.

- 1) A complete retention facultative lagoon system.
- 2) A wastewater storage pond and land application system.
- 3) A solids separation system, wastewater storage pond and land application system.
- 4) Another system proposed by the owner and approved by the Department.

007.01D Lagoons and storage ponds used for truck washes shall meet the design standards and testing requirements in Chapter 5, 005.

007.01E Wastewater facilities designed to separate solids from the wash water for separate handling and disposal shall include a settling pit and a solids storage unit as specified below.

007.01E1 Solids settling pits shall be constructed of concrete and shall be watertight. Pits shall have at least 24-hour detention time and be designed to contain both floatable and settleable solids. The design shall include a method to remove solids from the pit.

007.01E2 Solids storage units shall be watertight structures designed to dry and store solids removed from solids settling pits. A drain system shall return surplus water back to the solids settling pit or to the lagoon. At least 120 days of solids storage shall be provided with controls to prevent storm water runoff.

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007.01F The hydraulic design of the WWTF shall be based on historic flow records from other facilities using similar washing equipment. Where verifiable flow records do not exist, a flow not less than 1500 gallons per truck washed shall be used for design.

007.01G The solids handling capacity shall be based on data from similar facilities or on specific data from the owner's operation, such as the size of animals, the length of trips, the type of bedding material, and manure production rates. In the absence of specific data, the design shall assume ten cubic feet of solids (bedding and manure) generated from each truck washed.

007.01H Livestock truck washes shall receive written approval, including site approval, from the Department prior to land applying wastewater or wastewater solids.

007.01I Irrigation piping networks used to apply lagoon water shall be equipped with check valves, vacuum relief valves, and low pressure drains, as necessary, to protect ground water wells or other sources or irrigation water from contamination from the back flow of lagoon water.

007.01J Livestock truck wash projects that are submitted for approval must include a written management plan adequate to prevent chemical tank trucks, garbage trucks, septage haulers, or other vehicles that could contain hazardous, toxic, or pathogenic wastes from using the livestock truck wash. Any security devices or structures described in the management plan to regulate usage must be shown on the plans submitted for approval.

007.01K A livestock truck wash that was reviewed and approved by the Department as part of an animal feeding operation (AFO) that has received approval for the livestock waste control facility under Title 130, Livestock Waste Control Regulations, is exempt from the construction permit requirements of this Title.

008 Constructed Wetlands

008.01 Primary treatment shall be provided for constructed wetlands. Lagoons shall not be used to provide primary treatment for vegetated submerged bed constructed wetlands unless a reliable means to remove algae is provided.

008.02 Multiple constructed wetland cells shall be provided if the design flow is 5000 gallons per day or greater. Bypass structures shall be included to allow each cell to be isolated.

008.03 Constructed wetland systems shall be designed to prevent storm water runoff from entering any part of the wastewater works, unless specifically designed to treat runoff.

008.04 Constructed wetland cells that treat domestic strength wastewater shall have seepage rates no greater than one-eighth inch per day. Liners for constructed wetlands cells that treat higher strength wastewater shall meet the seepage rate specified by the Department for the specific waste.

008.05 The bottom of the soil liner shall be at least four feet above the seasonal high ground water level.

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008.06 Effluent structures shall be equipped with water level control devices capable of controlling the water depth in the wetland cell anywhere from the maximum design level to the bottom of the cell.

008.07 The gravel media installed in vegetated submerged bed constructed wetlands shall be graded gravel, sized not less than three-eighths inch or larger than one-inch in diameter. Except that:
008.07A Up to six inches of washed pea gravel may be laid above the media to aid in plant rooting, and
008.07B One-inch to three-inch cobbles may be installed at the influent and effluent ends to assist in flow distribution and collection.

Enabling Legislation: Neb. Rev. Stat. §81-1504(10)

Legal Citation: Title 123, Ch. 5, Nebraska Department of Environmental Quality

NEBRASKA ADMINISTRATIVE CODE

Title 123 - NEBRASKA DEPARTMENT OF ENVIRONMENTAL QUALITY

Chapter 7- SUBMISSION OF ENGINEERING DOCUMENTS

001 To apply for a construction permit, the following items shall be submitted to the Department for review:

001.01 For a new or modified wastewater treatment facility:

001.01A A facility plan or engineering report. (See Chapter 7, 006)

001.01B A construction permit application form, provided by the Department (see Appendix A). This form is not required if the same information is provided in other submittals.

001.01C The construction plans and specifications. (See Chapter 8)

001.01D Other information specified by the Department.

001.02 For wastewater collection systems:

001.02A A construction permit application form, provided by the Department (see Appendix A). This form is not required if the same information is provided in other submittals.

001.02B A calculation of the maximum design flow at impact points for the proposed sewer. This flow calculation does not need to be submitted for six-inch or eight-inch sewers where the maximum flow is less than 50% of the capacity of the sewer.

001.02C An engineering report shall be required for satellite lift stations with design average daily flows above 100,000 gallons per day.

001.02D The following statement, signed by a professional engineer, or an explanation from the professional engineer stating why the statement cannot be signed. This statement may be signed on the construction permit application form.

I have reviewed the available design data, flow records, and compliance history of the receiving WWTF. In my professional judgment, the WWTF has the hydraulic and treatment capacity to receive the additional wastewater from this sewer addition and remain in compliance with applicable Department regulations.

001.02E The construction plans and specifications. (See Chapter 8)

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001.02F Other information specified by the Department.

002 Facility Plans, engineering reports, plans, and specifications for wastewater works shall be prepared by professional engineers registered to practice in the State of Nebraska and shall be properly sealed, signed and dated. Facility plans for WWTF shall be submitted to the Department for review at least 60 days prior to the initiation of design work.

003 The Department will only approve the final construction documents. Plans and specifications marked 'preliminary', 'for review only', or containing similar statements will not be approved.

004 A minimum of two sets of plans and specifications shall be submitted to the Department for review and approval. One set of the documents will be kept for the Department's records. All other copies will be returned to the person who submitted them with the Department's action indicated on them. At least one set of plans shall not have been reduced and shall show the drawings at full scale.

005 An operation and maintenance manual (O&M manual) shall be prepared for all wastewater treatment facilities and satellite lift stations, unless exempted by the Department. Where a sanitary sewer system contains multiple lift stations, a single operation and maintenance manual may be kept for all lift stations in the system and revised to include information on new facilities as needed. For upgrades to WWTF, an existing O&M manual may be modified to describe the upgraded facility. New or revised O&M manuals shall be submitted for the Department's records within 90 days after the completion of construction. O&M manuals shall include the following:

005.01 A description of the facility, with site drawings, flow diagrams, tables of treatment and flow capacities, locations of controls, and other information as applicable.

005.02 Copies of regulatory requirements and permits held by the facility, including NPDES permit, Nebraska Pretreatment Program permit, bypass reporting requirements, local sewer use ordinances, ground water monitoring requirements, and other similar information.

005.03 A listing of record keeping requirements and copies of record keeping forms, including discharge monitoring report forms, non-compliance report forms, daily flow log forms, ground water monitoring forms, equipment maintenance forms, and other similar forms.

005.04 Technical discussions on the operation of each control structure, lift station, and treatment unit, the discharge of wastewater effluent, and the proper disposal of grease, screenings, grit, and sludge shall be included. Start-up, unit bypass, and shut-down procedures, normal and emergency operating methods, and the correction of common problems shall be explained.

005.05 A description of the electric, gas, water, and telecommunications utilities serving the facility, including utility contact information.

005.06 The manufacturer's literature and maintenance requirements for all mechanical and electrical equipment.

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005.07 A discussion on environmental, health, and safety issues surrounding the facility, with a list of emergency phone numbers.

005.08 A discussion on laboratory tests necessary to operate treatment facilities and a list of the lab records that shall be kept.

005.09 A complete maintenance schedule.

006 A facility plan or engineering report shall contain the detailed planning information that is necessary to evaluate the engineer's recommendation. Facility plans shall include the following:

006.01 A description of existing facilities, the existing service area and population, the current average and peak wastewater flows, a description of the wastewater characteristics, an infiltration and inflow analysis, a summary of commercial and industrial wastewater contributors, a description of existing treatment units and their condition, a review of historical problems and non-compliance events, and the reasons for considering the proposed project.

006.02 Maps showing the location of the existing WWTF and areas available for expansion shall be included. Floodplains, wetland areas, existing housing, depth to ground water, and the location of wells and water utility structures shall be shown.

006.03 The future service area, design population, design flow, and pollutant loading for the projected design life of treatment facilities.

006.04 A description of regulatory requirements that pertain to the wastewater works, including present and proposed draft NPDES permit limits, best management practices, sludge disposal requirements, and the name of the receiving stream.

006.05 A comparison of alternatives that can meet the present and future regulatory requirements shall be included. Alternatives shall be ranked for treatment effectiveness, energy efficiency, land requirements, capital and operational costs, ease and flexibility of operation, reliability, environmental impacts, and owner preferences, as applicable.

007 The plans and specifications for design build projects may be submitted to the Department for review and approval in separate phases only if the Department has reviewed and approved a comprehensive wastewater plan prior to submittal of plans and specifications.

008 Projects receiving funding from the Wastewater Treatment Facilities Construction Loan Fund may need to submit additional information and complete other requirements. Refer to Title 131, Rules and Regulations for the Wastewater Treatment Facilities and Drinking Water Construction Assistance Programs.

Enabling Legislation: Neb. Rev. Stat. §81-1504(10), 81-1504(30), 81-1505(8)

Legal Citation: Title 123, Ch.7, Nebraska Department of Environmental Quality

NEBRASKA ADMINISTRATIVE CODE

Title 123 - NEBRASKA DEPARTMENT OF ENVIRONMENTAL QUALITY

Chapter 9- CONSTRUCTION OF WASTEWATER WORKS

001 Construction shall be in accordance with the approved plans and specifications. When changes to the approved plans and specifications are desired, the following types of changes shall be submitted to the Department for review and approval:

001.01 Changes that affect the hydraulic or treatment capacity of a wastewater works.

001.02 Changes to the location or elevation of a wastewater works.

001.03 Changes that alter or modify a treatment process.

001.04 Changes to the method of discharging wastewater, to the discharge location, or that increase wastewater seepage into the ground.

001.05 Changes to the number of installed appurtenances (for example: manholes, diffusers, valves) from the number originally approved in the plans and specifications.

001.06 Changes to the type of mechanical equipment or to the materials specified.

001.07 Changes to the construction quality acceptance testing requirements for the wastewater works.

001.08 Changes to the pipe material, location, slope, or diameter of a sanitary sewer or wastewater piping system or the construction of additional sewers or pipes.

001.09 ~~Changes that could increase the health or safety risk to utility workers or the public.~~

002 Projects receiving Wastewater Treatment Facilities Construction Loan Fund (commonly referred to as the State Revolving Fund) financing, under Title 131, Rules and Regulations for the Wastewater Treatment Facilities and Drinking Water Construction Assistance Programs shall submit all change orders and addenda to the Department for review and approval.

003 Where changes, as listed in Chapter 9, 001, are made to the approved plans and specifications, a set of as-built or record drawings shall be submitted for the Department's records.

004 Upon completion of construction, a written ~~statement~~ from the design engineer, ~~or another professional engineer knowledgeable about the construction,~~ shall be submitted to the Department stating that construction has been completed in accordance with the approved plans and specifications.

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Enabling Legislation: Neb. Rev. Stat. §81-1504(10)

Legal Citation: Title 123, Ch. 9, Nebraska Department of Environmental Quality

NEBRASKA ADMINISTRATIVE CODE

Title 123 - NEBRASKA DEPARTMENT OF ENVIRONMENTAL QUALITY

Chapter 10- ABANDONMENT OF WASTEWATER WORKS

001 Wastewater works that are permanently removed from service shall be abandoned in accordance with the regulations in this chapter.

002 Abandoned sanitary sewers or wastewater piping within an abandoned WWTF shall have the pipe ends permanently capped or plugged to prevent small animals, vectors, or water from entering the pipes.

003 Abandoned manholes shall have the inlet and outlet piping permanently plugged, have at least the upper three feet of the structure removed, and be filled with compacted soil.

004 The abandonment of wastewater lagoons shall be completed in the following manner:

004.01 Abandoned lagoons shall have the lagoon site re-graded to restore normal drainage to the area and prevent ponding.

004.02 The lagoons shall be drained of water down to the sludge layer. The wastewater disposal method shall be submitted to the Department and receive approval.

004.03 ~~For lagoons that have received only domestic wastewater, a~~ sludge layer less than six-inches thick may be buried on-site during re-grading of the lagoon dikes and the surrounding area. The sludge shall be incorporated into the soil or receive at least one foot of cover material over the sludge layer.

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004.04 Sludge amounts in excess of six inches must be removed from the lagoon site and disposed in accordance with applicable federal and state regulations.

004.05 Control structures shall be removed to a least three feet below grade and filled with compacted soil.

004.06 Synthetic lagoon liners or covers shall be removed from the site.

005 The abandonment of mechanical WWTF and pumping stations shall be completed in the following manner:

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005.01 The facility shall be emptied of wastewater, grit, sludge, and other wastewater residues. All wastewater and solids shall be disposed in accordance with applicable regulations.

005.02 Hazardous chemicals shall be removed from the site. Title 123

005.03 Pumps, comminutors, blowers, and other mechanical equipment shall be removed from the site.

005.04 The structure of manholes, wet wells, and other deep confined basins shall be removed to at least three feet below grade and filled with compacted soil.

006 Monitoring wells located at WWTF shall be properly abandoned according to Title 178, Regulations Governing Water Well Construction, Pump Installation and Water Well Decommissioning Standards.

Enabling Legislation: Neb. Rev. Stat. §81-1505(8)

Legal Citation: Title 123, Ch. 10, Nebraska Department of Environmental Quality



For NDEQ USE ONLY	
Permit Number	_____
Reviewed By	_____
Date Approved	_____

**CONSTRUCTION PERMIT APPLICATION FORM
WASTEWATER WORKS**

A. Owner's Name and Mailing Address:

For Municipalities/SIDs: Board Chairperson, Mayor, Utility Superintendent, or City Administrator
For Commercial or Industrial Facilities: Owner, Designated Company Officer
For Private Developments: Owner, Developer, or Association President

Name and Title	Phone	Fax
Mailing Address	City	State Zip

B. Project Engineer Information:

Name of Project Engineer	Firm	Phone	Fax	Email
Mailing Address	City	State	Zip	

C. Project Information:

Project Name	Project Number
Legal Description: _____	_____
¼ ¼ Sect. Town. Range County	Latitude Longitude

D. Project Types: (Check all that apply)

- | | |
|--|---|
| <input type="checkbox"/> Gravity Sewer System | <input type="checkbox"/> New WWTF |
| <input type="checkbox"/> Lift Station and Force Main | <input type="checkbox"/> Modification to WWTF |
| <input type="checkbox"/> Other Collection System | <input type="checkbox"/> Industrial Pretreatment Facility |

E. For Sanitary Sewer Extensions: Name of Receiving WWTF _____

F. Engineering Certification for Sanitary Sewers: Check box if not applicable

I have reviewed the available design data, flow records, and compliance history of the receiving WWTF. In my professional judgment, the WWTF has the hydraulic and treatment capacity to receive the additional wastewater from this sewer addition and remain in compliance with applicable Department regulations. (If unable to sign certification, attach explanation)

_____	_____
Project Engineer's Signature	Date

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- Deleted:** receiving the flows from this sanitary sewer addition
- Deleted:** and that
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