



MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 20—Clean Water Commission
Chapter 8—Minimum Design Standards

WORKING DOCUMENT
Strawman

**The Department presents these draft materials for
stakeholder review and discussion only.
Subject to the Red Tape Reduction review.**

The Missouri Department of Natural Resources has identified 10 CSR 20-8, Minimum Design Standards, as a potential rulemaking amendment. This workgroup has been convened for the purpose of informal and voluntary public participation and discussions regarding the development of this rule prior to initiating formal rulemaking.

Under Governor Greitens' leadership, all state agencies are working to reduce regulations and other government processes that unnecessarily burden individuals and businesses while doing little to protect or improve public health, safety, and our natural resources. The Missouri Department of Natural Resources is committed to limiting regulation to what is necessary to protect Missouri's environment, implementing statutory mandates, and maintaining state control of programs. Any further proposed changes to rules discussed on this page are being developed with these goals in mind. We welcome your comments to help ensure that our regulations provide required protections but do not add unnecessary costs.

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Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 20—Clean Water Commission
Chapter 8—*[Design Guides]* Minimum Design Standards

10 CSR 20-8.110 Engineering— Reports, Plans, and Specifications

[PURPOSE: The following criteria have been prepared as a guide for the preparation of engineering reports or facility plans and detail plans and specifications. This rule is to be used with rules 10 CSR 20-8.120 through 10 CSR 20-8.220 for the planning and design of the complete treatment facility. This rule reflects the minimum requirements of the Missouri Clean Water Commission in regard to adequacy of design, submission of plans, approval of plans, and approval of completed wastewater treatment facilities. It is not reasonable or practical to include all aspects of design in these standards. The design engineer should obtain appropriate reference materials which include but are not limited to: copies of all ASTM International standards, design manuals such as Water Environment Federation’s Manuals of Practice (MOPs), and other sewer and wastewater treatment design manuals containing principles of accepted engineering practice. Deviation from these minimum requirements will be allowed where sufficient documentation is presented to justify the deviation. These criteria are taken largely from the 2004 edition of the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers Recommended Standards for Wastewater Facilities and are based on the best information presently available. These criteria were originally filed as 10 CSR 20-8.030. It is anticipated that they will be subject to review and revision periodically as additional information and methods appear.]

PURPOSE: The following minimum criteria have been prepared as a standard for the design of wastewater systems. This rule is to be used with rules 10 CSR 20-8.110 through 10 CSR 20-8.500 for the planning and design of a treatment facility. It is not reasonable or practical to include all aspects of design in these standards. The design engineer may use other appropriate reference materials for these design aspects not addressed in this rule, which include but are not limited to: copies of all ASTM International and American Water Works Association (AWWA) standards pertaining to wastewater systems and appurtenances, design manuals such as Water Environment Federation’s Manuals of Practice, Department prepared guides and other wastewater design manuals containing principles of accepted engineering practice. This rule specifies minimum standards for the design and construction of wastewater systems, in addition to engineering experience and judgement in accordance with standards of practice.

[(1) Definitions. Definitions as set forth in the Clean Water Law and 10 CSR 20-2.010 shall apply to those terms when used in this rule, unless the context clearly requires otherwise. Where the terms “shall” and “must” are used, they are to mean a mandatory requirement insofar as approval by the Missouri Department of Natural Resources (department) is concerned, unless justification is presented for deviation from the requirements. Other terms, such as “should,” “recommend,” “preferred,” and the like, indicate the preference of the department for consideration by the design engineer.

(A) Deviations. Deviations from these rules may be approved by the department when engineering justification satisfactory to the department is provided. Justification must

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substantially demonstrate in writing and through calculations that a variation(s) from the design rules will result in either at least equivalent or improved effectiveness. Deviations are subject to case-by-case review with individual project consideration.]

[(2) Applicability. This rule shall apply to all facilities with a design flow of one hundred thousand (100,000) gallons (378.5 m³) per day or greater. This rule shall also apply to all facilities with a design flow of twenty-two thousand five hundred (22,500) gallons (85.2 m³) per day or greater until such time as 10 CSR 20-8.020 is amended.]

(1) Applicability. Wastewater systems shall be designed based on criteria contained in this rule, published standards, applicable federal and state requirements, standard textbooks, current technical literature and applicable safety standards. To the extent of any conflict between the above criteria, the requirement in this rule shall prevail.

(A) This rule shall not apply to animal waste management systems. Regulations for these facilities are found in 10 CSR 20-8.300.

(B) This rule shall not apply to agrichemical facilities. Regulations for these facilities are found in 10 CSR 20-8.500.

[(3)2] General.

[(A) Engineering Services. Engineering services are performed in three (3) steps—

- 1. Engineering report or facility plan;*
- 2. Preparation of construction plans and specifications; and*
- 3. Contractual documents, construction compliance, inspection, administration, and acceptance.*

(B) 10 CSR 20-8.110 Engineering—Reports, Plans, and Specifications covers the items in paragraphs (3)(A)1. and 2. above.

(C) All reports, plans, and specifications must be submitted at least one hundred eighty (180) calendar days prior to the date upon which action by the department is desired, or in accordance with a National Pollutant Discharge Elimination System (NPDES) permit or other departmental schedules. The documents, at the appropriate times, must be submitted for formal approval and should include the engineer's report or facility plan, design drawings, and specifications. Engineering reports or facility plans must be approved by the department prior to the submittal of the design drawings, specifications, and the appropriate permit applications and fees. For projects involving both collection systems and wastewater treatment facilities, the information required in subsection (4)(B) must be included in the facility plan. These documents are used by the owner in programming future action, by the department to evaluate probable compliance with statutes and regulations, and by bond attorneys and investment houses to develop and evaluate financing. Engineering reports and facility plans should broadly describe existing problems; consider methods for alternate solutions including site and/or route selection; estimate capital and annual costs; and outline steps for further project implementation, including financing and approval by the department and other agencies.]

(A) Submittal. Engineering reports or facility plans must be approved by the Department prior to the submittal of the plans, specifications, and the appropriate permit applications and fees.

(B) Engineering Reports or Facility Plans.

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STRAWMAN DRAFT 12/19/17

1. Engineering reports **shall** be completed for projects involving collection systems, pumping stations, and force mains.

2. Facility plans **shall** be completed for projects involving wastewater treatment facility projects and projects receiving Department funding through the grant and loan programs under **10 CSR 20-4, Grants and Loans**.

(C) **Approval.** No approval for construction *[can]* **shall** be issued until final detailed plans and specifications *[with the design engineer's imprint of his/her registration seal with the date and engineer's signature affixed have been]* **are signed, sealed, and dated by a Missouri registered professional engineer**, submitted, and found to be satisfactory by the *[d]*Department.

[(D) Engineering reports and facility plans shall include a statement identifying the continuing authority, a contact person for the authority, and the continuing authority phone number and address, along with the design engineer's imprint of his/her registration seal with the date and engineer's signature affixed to the document.]

[(4) Engineering Report or Facility Plan.

(A) General.

1. The engineering report or facility plan identifies and evaluates wastewater related problems; assembles basic information; presents criteria and assumptions; examines alternate projects, with preliminary layouts and cost estimates; describes financing methods; sets forth anticipated charges for users; reviews organizational and staffing requirements; offers a conclusion with a proposed project for client consideration; and outlines official actions and procedures to implement the project. The planning document must include sufficient detail to demonstrate that the proposed project meets applicable criteria.

2. The overall plan, including process description and sizing, factual data, and controlling assumptions and considerations for the functional planning of wastewater facilities, is presented for each process unit and for the whole system. These data form the continuing technical basis for the detailed design and preparation of construction plans and specifications.

3. Architectural, structural, mechanical, and electrical designs are usually excluded. Sketches may be desirable to aid in presentation of a project. Outline specifications of process units, special equipment, etc., are occasionally included.

4. Engineering reports must be completed for projects involving gravity sewers, pressure sewer systems, wastewater pumping stations, and force mains. Facility plans must be completed for projects involving wastewater treatment facility projects and projects receiving funding through the grant and loan programs under 10 CSR 20-4.

A. Unless required by the department, an engineering report will not have to be submitted for projects limited to only eight-inch (8") (20 cm) gravity sewer extensions.

(B) Engineering Reports. Engineering reports shall contain the following information and other pertinent information as required by the department:

1. Problem defined. Description of the existing system must include an evaluation of the conditions and problems needing correction;

2. Flow loads. The existing and design average and peak flows and waste load must be established. The basis of the projection of initial and future flows and waste load must be

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included and must reflect the existing, or initial service area, and the anticipated future service area. Flow loading information and data needed for new facilities are included in paragraph (4)(C)4. of this rule;

3. Impact on existing wastewater facilities. The impact of the proposed project on all existing wastewater facilities, including gravity sewers, pump stations, and treatment facilities, must be evaluated. Refer to 10 CSR 20-8.120 and 10 CSR 20-8.130;

4. Project description. A written description of the project is required;

5. Drawings. Drawings or sketches identifying the site of the project and anticipated location and alignment of proposed facilities are required;

6. Technical information and design criteria. All technical and design information used to design the collection system(s), pump station(s), etc., must be provided either in the engineering report or in the summary of design and shall include, at a minimum, design tabulation flow, size, and velocities; all pump station calculations including energy requirements; special appurtenances; stream crossings; and system map (report size). Outline unusual specifications, construction materials, and construction methods; maps, photographs, and diagrams; and other supporting data needed to describe the system. If an engineering report is not required, this information must be included in the summary of design. Refer to 10 CSR 20-8.110(5);

7. Site information. Project site information should include topography, soils, geologic conditions, depth to bedrock, groundwater level, floodway or floodplain considerations, distance to water supply structures, roads, residences, and other pertinent site information; and

8. It is preferred that any request for a deviation from 10 CSR 20-8 be addressed along with the engineering justifications in the engineering report. Otherwise, all requests for deviations from 10 CSR 20-8.120 and 10 CSR 20-8.130 must accompany the plans and specifications.

(C) Facility Plans. Facility plans shall contain the following and other pertinent information as required by the department:

1. Problem evaluation and existing facility review—

A. Descriptions of existing system, including condition and evaluation of problems needing correction; and

B. Summary of existing and previous local and regional wastewater facility and related planning documents, if applicable;

2. Planning and service area. Drawings identifying the planning area, the existing and potential future service area, the site of the project, and anticipated location and alignment of proposed facilities are required;

3. Population projection and planning period. Present and predicted population shall be based on a twenty (20)-year planning period. Phased construction of wastewater facilities shall be considered in rapid growth areas. Sewers and other facilities with a design life in excess of twenty (20) years shall be designed for the extended period;

4. Hydraulic capacity.

A. Flow definitions and identification. The following flows for the design year shall be identified and used as a basis for design for sewers, pump stations, wastewater treatment facilities, treatment units, and other wastewater handling facilities. Where any of the terms defined in this section are used in these design standards, the definition contained in this section applies.

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(I) Design average flow—The design average flow is the average of the daily volumes to be received for a continuous twelve (12)-month period expressed as a volume per unit time. However, the design average flow for facilities having critical seasonal high hydraulic loading periods (e.g., recreational areas, campuses, and industrial facilities) shall be based on the daily average flow during the seasonal period.

(II) Design maximum daily flow—The design maximum daily flow is the largest volume of flow to be received during a continuous twenty-four (24)-hour period expressed as a volume per unit time.

(III) Design peak hourly flow—The design peak hourly flow is the largest volume of flow to be received during a one (1)-hour period expressed as a volume per unit time.

(IV) Design peak instantaneous flow—The design peak instantaneous flow is the instantaneous maximum flow rate to be received.

B. Hydraulic capacity for existing collection and treatment systems.

(I) Projections shall be made from actual flow data to the extent possible.

(II) The probable degree of accuracy of data and projections shall be evaluated. This reliability estimation shall include an evaluation of the accuracy of existing data, based on no less than one (1) year of data, as well as an evaluation of the reliability of estimates of flow reduction anticipated due to infiltration/inflow (I/I) reduction or flow increases due to elimination of sewer overflows and backups.

(III) Critical data and methodology used shall be included. Graphical displays of critical peak wet weather flow data (refer to parts (4)(C)4.A.(II), (III), and (IV) of this rule) shall be included for a sustained wet weather flow period of significance to the project.

C. Hydraulic capacity for new collection and treatment systems.

(I) The sizing of wastewater facilities receiving flows from new wastewater collection systems shall be based on an average daily flow of one hundred (100) gallons (0.38 m³) per capita per day plus wastewater flow from industrial facilities and major institutional and commercial facilities unless water use data or other justification upon which to better estimate flow is provided.

(II) The one hundred (100) gallons (0.38 m³) per capita per day figure shall be used, which, in conjunction with a peaking factor from the following Figure 1, included herein, is intended to cover normal infiltration for systems built with modern construction techniques. Refer to 10 CSR 20-8.120.

(III) If the new collection system is to serve existing development, the likelihood of infiltration/inflow (I/I) contributions from existing service lines and non-wastewater connections to those service lines shall be evaluated and wastewater facilities designed accordingly.

D. Combined sewer interceptors. *In addition to the above requirements, interceptors for combined sewers shall have capacity to receive sufficient quantity of combined wastewater for transport to treatment facilities to ensure attainment of the appropriate water quality standards;*

5. Organic capacity.

A. Organic load definitions and identification. *The following organic loads for the design year shall be identified and used as a basis for design of wastewater treatment*

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facilities. Where any of the terms defined in this section are used in these design standards, the definition contained in this section applies.

(I) Biochemical Oxygen Demand—The five (5)-day Biochemical Oxygen Demand (BOD₅) is defined as the amount of oxygen required to stabilize biodegradable organic matter under aerobic conditions within a five (5)-day period.

(a) Total five (5)-day Biochemical Oxygen Demand (TBOD₅) is equivalent to BOD₅ and is sometimes used in order to differentiate carbonaceous plus nitrogenous oxygen demand from strictly carbonaceous oxygen demand.

(b) The carbonaceous five (5)-day Biochemical Oxygen Demand (CBOD₅) is defined as BOD₅ less the nitrogenous oxygen demand of the wastewater.

(II) Design average BOD₅—The design average BOD₅ is generally the average of the organic load received for a continuous twelve (12)-month period for the design year expressed as weight per day. However, the design average BOD₅ for facilities having critical seasonal high loading periods (e.g., recreational areas, campuses, and industrial facilities) shall be based on the daily average BOD₅ during the seasonal period.

(III) Design maximum day BOD₅—The design maximum day BOD₅ is the largest amount of organic load to be received during a continuous twenty-four (24)-hour period expressed as weight per day.

(IV) Design peak hourly BOD₅—The design peak hourly BOD₅ is the largest amount of organic load to be received during a one (1)-hour period expressed as weight per day.

B. Design of organic capacity of wastewater treatment facilities to serve existing collection systems.

(I) Projections shall be made from actual wasteload data to the extent possible.

(II) Projections shall be compared to subparagraph (4)(C)5.C. of this rule and an accounting made for significant variations from those values.

(III) Impact of industrial sources shall be documented.

C. Organic capacity of wastewater treatment facilities to serve new collection systems.

(I) Domestic wastewater treatment design shall be on the basis of at least 0.17 pounds (0.08 kg) of BOD₅ per capita per day and 0.20 pounds (0.09 kg) of suspended solids per capita per day, unless information is submitted to justify alternate designs.

(II) Impact of industrial sources shall be documented.

(III) Data from similar municipalities may be utilized in the case of new systems.

However, thorough investigation that is adequately documented shall be provided to the department to establish the reliability and applicability of such data;

6. Wastewater treatment facility design capacity. The wastewater treatment facility design capacity is the design average flow at the design average BOD₅. Refer to paragraphs (4)(C)4. and (4)(C)5. of this rule for peaking factors that will be required.

A. Engineering criteria. Engineering criteria and assumptions used in the design of the project shall be provided in the facility plan. Refer to subsection (4)(D) of this rule for additional information.

B. If the project includes the land application of wastewater, the requirements in 10 CSR 20-8.220 must be included with the facility plan;

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7. *Initial alternative development. For projects receiving funding through the grant and loan programs in 10 CSR 20-4, the process of selection of wastewater treatment and collection system alternatives for detailed evaluation shall be discussed. All wastewater management alternatives considered and the basis for the engineering judgment for selection of the alternatives chosen for detailed evaluation shall be included;*

8. *Detailed alternative evaluation. The following shall be included for the alternatives to be evaluated in detail.*

A. *Sewer system revisions. Proposed revisions to the existing sewer system including adequacy of portions not being changed by the project.*

B. *Wet weather flows. Facilities to transport and treat wet weather flows in a manner that complies with state and local regulations must be provided. The design of wastewater treatment facilities and sewers shall provide for transportation and treatment of all flows including wet weather flows unless the owner's National Pollutant Discharge Elimination System (NPDES) permit authorizes a bypass.*

C. *Site evaluation. When a site must be used which is critical with respect to these items, appropriate measures shall be taken to minimize adverse impacts.*

(I) Compatibility of the treatment process with the present and planned future land use, including noise, potential odors, air quality, and anticipated sludge processing and disposal techniques, shall be considered. Non-aerated lagoons should not be used if excessive sulfate is present in the wastewater. Wastewater treatment facilities should be separate from habitation or any area likely to be built up within a reasonable future period and shall be separated in accordance with state and local requirements.

(II) Zoning and other land use restrictions shall be identified.

(III) An evaluation of the accessibility and topography of the site shall be submitted.

(IV) Area for future plant expansion shall be identified.

(V) Direction of prevailing wind shall be identified.

(VI) Flood considerations, including the twenty-five (25)-year and one hundred (100)-year flood levels, impact on floodplain and floodway, and compliance with applicable regulations in 10 CSR 20-8 regarding construction in flood-prone areas, shall be evaluated.

(VII) Geologic information, depth to bedrock, karst features, or other geologic considerations of significance to the project shall be included. A copy of a geological site evaluation from the department's Division of Geology and Land Survey providing stream determinations (gaining or losing) must be included for all new wastewater treatment facilities. A copy of a geological site evaluation providing site collapse and overall potentials from the department's Division of Geology and Land Survey must be included for all earthen basin structures. Earthen basin structures shall not be located in areas receiving a severe overall geological collapse potential rating.

(VIII) Protection of groundwater including public and private wells is of utmost importance. Demonstration that protection will be provided must be included. If the proposed wastewater facilities will be near a water source or other water facility, as determined by the department's Division of Geology and Land Survey or by the department's Public Drinking Water Branch addressing the allowable

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distance between these wastewater facilities and the water source must be included with the facility plan. Refer to 10 CSR 20-8.130 and 10 CSR 20-8.140. (IX) Soil type and suitability for construction and depth to normal and seasonal high groundwater shall be determined.

(X) The location, depth, and discharge point of any field tile in the immediate area of the proposed site shall be identified.

(XI) Present and known future effluent quality and monitoring requirements determined by the department shall be included. Refer to subparagraph (4)(C)8.N. of this rule.

(XII) Access to receiving stream for the outfall line shall be discussed and displayed.

(XIII) A preliminary assessment of site availability shall be included.

D. Unit sizing. Unit operation and preliminary unit process sizing and basis shall be discussed.

E. Flow diagram. A preliminary flow diagram of treatment facilities including all recycle flows shall be provided.

F. Emergency operation. Emergency operation requirements as outlined in 10 CSR 20-8.130 and 10 CSR 20-8.140 shall be discussed and provided.

G. The no-discharge option must be examined and included as an alternative in the facility plan.

H. Technology not included in these standards. 10 CSR 20-8.140 outlines procedures for introducing and obtaining approval to use technology not included in these standards. Proposals to use technology not included in these standards must address the requirements of 10 CSR 20-8.140.

I. Biosolids. The solids disposal options considered and method selected must be included. This is critical to completion of a successful project. Compliance with requirements of 10 CSR 20-8.170 and any conditions in the owner's National Pollutant Discharge Elimination System (NPDES) permit must be assured.

J. Treatment during construction. A plan for the method and level of treatment to be achieved during construction shall be developed and included in the facility plan that must be submitted to the department for review and approval. This approved treatment plan must be implemented by inclusion in the plans and specifications to be bid for the project. Refer to paragraph (6)(A)5. and subsection (7)(D) of this rule.

K. Operation and maintenance. Portions of the project which involve complex operation or maintenance requirements shall be identified, including laboratory requirements for operation, industrial sampling, and self monitoring.

L. Cost estimates. Cost estimates for capital and operation and maintenance (including basis) must be included for projects receiving funding through the grant and loan programs in 10 CSR 20-4.

M. Environmental review.

(I) Compliance with planning requirements of local government agencies must be documented.

(II) Any additional environmental information meeting the criteria in 10 CSR 20-4.050, for projects receiving funding through the state grant and loan programs.

N. Water quality reports. Include all reviews, studies, or reports required by 10 CSR 20-7, Water Quality, and approved by the department. Any information or sections in

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- an approved study or report required by 10 CSR 20-7 that addresses the requirements in subsection (4)(C) of this rule can be incorporated into the facility plan in place of these sections;*
9. *Final project selection. The project selected from the alternatives considered under paragraph (4)(C)10. of this rule shall be set forth in the final facility plan document to be forwarded to the department for review and approval, including the financing considerations and recommendations for implementation of the plan; and*
10. *It is preferred that any request for a deviation from 10 CSR 20-8 be addressed along with the engineering justifications in the facility plan. Otherwise, all requests for deviations along with the engineering justification from 10 CSR 20-8.120 through 10 CSR 20-8.220 must accompany the plans and specifications.*
- (D) *Appendices. Technical Information and Design Criteria. Due to the complexity of wastewater facilities or funding issues, the following information shall be included upon the request of the department. All system design information can be submitted as, and for all review purposes will be considered, preliminary design data.*
1. *Process facilities. Criteria selection and basis; hydraulic and organic loadings—minimum, average, maximum, and effect (wastewater and sludge processes); unit dimensions; rates and velocities; detentions concentrations; recycle; chemical additive control; physical control and flow metering; removals; effluent concentrations, etc. (include a separate tabulation for each unit to handle solid and liquid fractions); energy requirement; and flexibility.*
 2. *Process diagrams. Process configuration, interconnecting piping, processing, flexibility; hydraulic profile; organic loading profile; solids profile; solids control system; and flow diagram with capacities, etc.*
 3. *Laboratory. Physical and chemical tests and frequency to control process; time for testing; space and equipment requirements; and personnel requirements—number, type, qualifications, salaries, benefits (tabulate), and a brief description of the laboratory facility. See 10 CSR 20-8.140.*
 4. *Operation and maintenance. Routine special maintenance duties; time requirements; tools, spare parts, equipment, vehicles, safety; maintenance workspace and storage; and personnel requirements—number, type, qualifications, training, salaries, benefits (tabulate).*
 5. *Chemical control. Processes needing chemical addition; chemicals and feed equipment; tabulation of amounts and unit and total costs.*
 6. *Collection systems control. Cleaning and maintenance; regulator and overflow inspection and repair; flow gauging; industrial sampling and surveillance; ordinance enforcement; equipment requirements; trouble-call investigation; and personnel requirements—number, type, qualifications, salaries, benefits, training (tabulate).*
 7. *Control summary. Personnel; equipment; chemicals, utilities, list power requirements of major units; and summation.]*

(3) Hydraulic Capacity and Organic Loading.

(A) Existing Systems.

1. **Hydraulic capacity for wastewater facilities to serve existing collection systems. Projections shall be made from actual flow data to the extent possible using no less than one (1) year of data.**

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2. **Combined sewer interceptors.** In addition to the above requirements, interceptor sewers for combined sewers **shall** have capacity to receive a sufficient quantity of combined wastewater for transport to treatment facilities to ensure attainment of the appropriate water quality standards;

3. **Design of organic capacity of wastewater treatment facilities to serve existing collection systems.** Projections **shall** be made from actual waste load data to the extent possible using no less than one (1) year of data.

4. **Industrial sources.** A list of industrial sources and their documented hydraulic and organic contributions **shall** be submitted to the Department.

(B) New Systems.

1. **Hydraulic capacity for wastewater facilities to serve new collection systems.** Flow estimates **shall** be identified for the design average flow and design peak hourly flow based on the design year and used as a basis for the design of sewers, pump stations, and wastewater treatment facilities.

2. **Peaking factor.** The average design flow value **shall** be used in conjunction with a peaking factor from the following **Equation 110-1**, included herein.

Equation 110-1. Ratio of peak hourly flow to design average flow.

$$\text{Peaking Factor} = Q \text{ Peak Hourly} / Q \text{ Design Avg} = (18 + \sqrt{P}) / (4 + \sqrt{P})$$

Where:

Q Peak Hourly = design peak hourly flow

Q Design Avg = design average flow

P = Population in thousands

3. Where the new collection system is to serve existing development, the likelihood of I/I contributions from existing service lines **shall** be evaluated and design wastewater facilities accordingly.

4. **Organic capacity of wastewater treatment facilities to serve new collection systems.** Organic capacity estimates **shall** be identified for the design average BOD₅ based on the design year and used as a basis for the design of wastewater treatment facilities.

(C) Drinking Water Use Records. When facilities propose drinking water usage as the basis for design average flow, a facility **must** provide at least one (1)-year of drinking water use records in the following form:

1. Provide a minimum of twelve (12) continuous months of drinking water use records for facilities which discharge year-round; or

2. Provide a minimum of continuous daily water use records during the entirety of an operating season for facilities having critical operational schedules (e.g., recreational areas, campuses, and industrial facilities).

(D) Re-Rating a Wastewater Treatment Facility. Department review and approval **must** be requested when a wastewater treatment facility owner proposes to re-rate an existing wastewater treatment facility's current design hydraulic or organic loading. An engineering re-rating analysis **shall** be completed and signed, sealed, and dated by a Missouri registered professional engineer which demonstrates the wastewater

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treatment facility can reliably operate at the proposed re-rated loading rate. The re-rating analysis shall include the following:

1. Hydraulic loading evaluation—

A. Evaluate the wastewater treatment facility's data for the last five (5) years to determine the annual average flow, the maximum monthly average flow, the maximum day flow, and the ratio of the peak flow to annual average flow.

Collect all flow data for these analyses with an accurate flow meter. Include all calculations and assumptions;

B. For a wastewater treatment facility that will not be affected by future growth, calculate the design average flow for a re-rating using the wastewater treatment facility's average annual flow plus one (1) standard deviation; and

C. For a wastewater treatment facility that will be affected by future growth, base the design flow for a re-rating on future flow, calculated using the anticipated changes from the existing flow. Include all calculations and assumptions;

2. Organic loading evaluation—

A. Calculate the design organic loading based on the average daily organic loading.

(I) Provide the data used to determine the organic loading from the analyses of at least three (3) twenty-four (24)-hour composite samples of the influent wastewater per week, taken during days with representative flow, for a period of at least three (3) months. The data includes samples collected during both wet and dry weather conditions; and

(II) Include sample data of the following parameters, at a minimum, unless monitoring of the parameter is not a requirement of the NPDES permit: BOD₅, TSS, ammonia, total nitrogen, and total phosphorus;

B. For a wastewater treatment facility that will not be affected by future growth, base the design average organic loading for a re-rating on **subparagraph (3)(D)1.B. of this rule;**

C. For a wastewater treatment facility that will be affected by future growth, base the design average organic loading for a re-rating on **subparagraph (3)(D)1.C. of this rule; and**

D. Evaluate the size of each unit process to determine if they are appropriately sized to provide adequate treatment based on the re-rated design organic load;

3. Existing unit processes. Examine each unit process for their design and peak loadings as well as the overall wastewater treatment facility. Normally one (1) unit process will be most restrictive in terms of design capacity. Include solids processing, handling, and storage in this analysis as well;

4. Impact of the proposed change of the facility's ability to reliably and consistently comply with the NPDES permit effluent limitations and conditions;

5. The potential for treatment facility upset, bypass, or permit violations, including an evaluation of the environmental and public health consequences; and

6. Evaluate the system's historical and anticipated rate of growth and the impacts of re-rating the facility.

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- (4) **Engineering Report.** Engineering reports **shall** include the following, at a minimum:
- (A) **Cover Page.** Include a statement identifying the owner and continuing authority (refer to **10 CSR 20-6.010(3)(B)**), a contact person for each (including phone number and address), and signed, sealed, and dated by a Missouri registered professional engineer;
 - (B) **Problem Defined.** Include a description of the existing system and an evaluation of the conditions and problems needing correction;
 - (C) **Hydraulic and Organic Loads.** Establish the anticipated design average and design peak flows and organic loads for the existing and ultimate conditions. Include the basis of the projection reflect the existing or initial service area, and the anticipated future service area. More detail on flow and organic load information and data needed for new and existing collection systems are included in **section (3) of this rule**;
 - (D) **Impact on Existing Wastewater Facilities.** Evaluate the impact of the proposed project on downstream existing wastewater systems (including gravity sewers, alternative sewers, pumping stations, force mains, and treatment facilities);
 - (E) **Project Description.** Provide a written description of the project;
 - (F) **Location Drawings.** Provide drawings identifying the site of the project and anticipated location and alignment of proposed facilities;
 - (G) **Engineering Criteria.** Include engineering criteria to be used in design of the project;
 - (H) **Site Information.** Provide project site information, where applicable, including topography, soils, geologic conditions, depth to bedrock, groundwater level, floodway or floodplain considerations, distance to water supply structures, roads, residences, and other pertinent site information; and
 - (I) **Alternative Selection.** Discuss the reasons for selection of the proposed alternative, including any pumping station sites, feasibility, and how the project fits into a long term plan.
- (5) **Facility Plan.** Facility plans **shall** include the following, at a minimum, in addition to **section (4) of this rule**:
- (A) **Planning and Service Area.** Include a description or drawings of the planning area, existing and potential future service areas, the site of the project, and anticipated location of the proposed facilities;
 - (B) **Population Projection and Planning Period.** Base the present and predicted population on a twenty (20)-year planning period. Consider phased construction of wastewater facilities in rapid growth areas. Design sewers and other facilities with a design life in excess of twenty (20) years for the extended period;
 - (C) **Wastewater Treatment Facility Design Capacity.** The wastewater treatment facility design capacity is the design average flow at the design average BOD₅. Establish the anticipated design average and design peak flows and waste loads for the existing and ultimate planning period. Include the basis of the projection of initial and future flows and waste loads. Refer to **section (3) of this rule**;
 - (D) **Initial Alternative Development.** Discuss the process of selection of wastewater treatment alternatives for detailed evaluation. Include all wastewater management alternatives considered, including no action, and the basis for the engineering judgment for selection of the alternatives chosen for detailed evaluation;

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(E) Detailed Alternative Evaluation. Include the following for the alternatives to be evaluated in detail:

- 1. Collection system revisions. Evaluate the proposed revisions to the existing collection system including adequacy of portions not being changed by the project;**
- 2. Wet weather flows. Provide facilities to transport and treat wet weather flows in a manner that complies with federal, state, and local regulations;**
- 3. Evaluate the no-discharge option and include it as an alternative in the facility plan. Also refer to **10 CSR 20-6.010(4)(D)1**;**
- 4. Evaluate the regionalization option and include it as an alternative in the facility plan;**
- 5. Include the information outlined in **10 CSR 20-8.200(2)** when the project includes wastewater irrigation or subsurface soil dispersal;**
- 6. Site Evaluation. Consider the following criteria during site evaluation. Take appropriate measures to minimize adverse impacts when a site is critical with respect to the following items:**
 - A. Consider compatibility of the treatment process with the present and planned future land use, including noise, potential odors, air quality, and anticipated solids processing and disposal techniques. Refer to **10 CSR 20-8.140(2)(C)** for minimum separation distances;**
 - B. Identify zoning and other land use restrictions;**
 - C. Evaluate the accessibility and topography of the site;**
 - D. Identify areas for future facility expansion;**
 - E. For flood protection, refer to **10 CSR 20-8.140(2)(B)**;**
 - F. Include geologic information, depth to bedrock, karst features, or other geologic considerations of significance to the project;**
 - G. A geohydrologic evaluation conducted by the Department's Missouri Geological Survey is **required** in the following instances:**
 - (I) All new wastewater treatment facilities to identify stream determinations (gaining or losing);**
 - (II) All new outfalls or relocated outfalls;**
 - (III) All new or modified earthen basin structures. Earthen basin structures **shall** not be located in areas receiving a severe collapse potential rating. Earthen basin structures located in areas receiving a severe overall geologic limitation rating are reviewed on a case-by-case basis. Earthen basin structures located in areas receiving a moderate collapse potential rating with an appropriate engineering solution are reviewed on a case-by-case basis; and**
 - (IV) All new features (e.g. wastewater irrigation sites, subsurface soil dispersal sites, etc.);**
 - H. Protection of groundwater including public and private wells **shall** be provided. When the proposed wastewater facilities will be near a water source or other drinking water facility, as determined by the Missouri Geological Survey or by the Department's Public Drinking Water Branch, include an evaluation addressing the allowable distance between these wastewater facilities and the water source. Refer to **10 CSR 20-8.130(2)(D)** and **10 CSR 20-8.140(2)(C)**;**

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- I. Determine the soil type and suitability for construction and depth to normal and seasonal high groundwater;
 - J. Submit a soil morphology analysis conducted by a qualified soil scientist for all subsurface soil dispersal systems. Refer to **section (7) of this rule**;
 - K. Identify the location, depth, and discharge point of any field tile or curtain drain in the immediate area of the proposed site;
 - L. Include the present and known future effluent quality and monitoring requirements;
 - M. Provide a discussion of receiving waterbody access for the outfall line; and
 - N. Include a preliminary assessment of site availability;
7. Engineering criteria. Provide the engineering criteria and assumptions used in the design of the project. Provide the basis for unit operation and preliminary unit process sizing. Refer to **subsection (5)(H) of this rule** for additional information;
8. Location Drawings. Provide drawings identifying the site of the project and anticipated location and alignment of proposed facilities;
9. Flow diagram. Provide a preliminary flow diagram of treatment facility alternatives including all recycle flows;
10. Removal efficiencies. Provide estimated loadings to and removal efficiencies through each unit operation in addition to total removal efficiency and effluent quality (both concentrations and mass);
11. Emergency operation. Provide a discussion of emergency operation measures as outlined in **10 CSR 20-8.130(7)** and **10 CSR 20-8.140(6)(A)**;
12. New and innovative technology. See **section (6) of this rule**. Provide a contingency plan, in the event that such new technology fails to meet the expected performance;
13. Nutrient removal. Provide a discussion of nutrient removal capabilities including footprint available for expansion or treatment facility modifications necessary for nutrient removal for each alternative;
14. Solids. Include the solids handling and disposal alternatives considered and method selected. Assure compliance with requirements of **10 CSR 20-8.170** and any conditions in the NPDES permit;
15. Treatment during construction. Develop a plan for the method and level of treatment (including solids processing, storage, and disposal) to be achieved during construction and include it in the facility plan. Refer to **paragraph (9)(A)5. and subsection (10)(C) of this rule**;
16. Cost estimates. Present cost estimates for capital construction cost, annual operation and maintenance cost (including basis), and a twenty (20)-year present worth cost for each alternative;
17. Environmental review. Include any additional environmental information meeting the criteria in **10 CSR 20-4.050**, for projects receiving funding through the state grant and loan programs; and
18. Water quality reports. Submit all reviews, studies, or reports in accordance with **10 CSR 20-7, Water Quality**; and
- (F) Final Project Selection. Present the selected project from the alternatives considered under **paragraph (5)(E) of this rule**, including the financing considerations and

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recommendations for implementation of the plan. Provide a project implementation schedule identifying project milestones.

(6) New and Innovative Technology.

(A) Evaluation of Technology Performance. To determine new technologies of wastewater treatment processes and equipment or applications have a reasonable and substantial chance of success, the facility plan requesting Department approval **shall** include the following, at a minimum:

- 1. Monitoring observations, including test results and engineering evaluations demonstrating the efficiency of processes or equipment;**
- 2. Detailed description of the sampling protocol and test methods which are sufficiently sensitive analytical methods for detecting, identifying, and measuring the concentrations of pollutants;**
- 3. Testing, including appropriately-composited samples, under various ranges of strength and flow rates (including diurnal variations) and waste temperatures over a sufficient length of time to demonstrate expected performance under the range of climatic and other conditions which may be encountered in the area of the proposed installations. A control group may be needed to demonstrate effectiveness;**
- 4. Description of manufacturer's warranty and performance warranty including all exclusions or limitations on the warranty, when available;**
- 5. Complete design requirements, calculations, and all assumptions clearly documented and explained;**
- 6. Documentation of how the new process or equipment functions;**
- 7. A discussion of actual, full-scale operating experience or pilot test work. For full-scale operating experience, include the length of time that each installation has been in operation. For pilot test work, include a copy of the associated pilot test plan and final pilot test results report;**
- 8. Discussion of known or anticipated start-up issues and operational issues that have occurred or may occur during the first year of operation;**
- 9. A description of specific operator knowledge and skills needed to operate the proposed technology including an estimate of increased operator attention needed during start-up and the first year of operation; and**
- 10. Other appropriate information.**

(B) Pilot Test or Demonstration Plan. See **10 CSR 20-6.010(1)(B)8.** for more pilot test information. Proposals for pilot tests and demonstration projects **shall** include the following, at a minimum, in addition to the facility plan information in **section (5) of this rule:**

- 1. Goals, objectives, and benefits with an explanation as to why a pilot study or demonstration project is needed to obtain additional engineering data;**
- 2. Literature identifying key design parameters and related experience;**
- 3. A description of the proposal with schematic diagrams, pictures, drawings, or any other important information;**
- 4. Complete design requirements, calculations, and all assumptions clearly documented and explained;**
- 5. Identification of associated environmental impacts, both direct and indirect;**
- 6. Detailed description of the sampling protocol and test methods which are**

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sufficiently sensitive analytical methods for detecting, identifying, and measuring the concentrations of pollutants;

7. Complete schedule for testing and evaluation including start, completion, and submittal of the pilot test or demonstration results report; and

8. Other appropriate information.

(C) **Supervised Data.** All reports, proposals for testing including quality assurance/quality control, pilot test plans, and engineering evaluation of new processes or equipment **shall** be prepared, signed, sealed, and dated by a Missouri registered professional engineer.

(D) **Evaluation of Collected Data.** All raw testing data and the evaluation of the data and performance **shall** be submitted for Department review upon conclusion of the project demonstration. The evaluation **shall** identify and justify the removal of any excursions not representative of the new technology process or equipment from the data evaluation.

(7) **Soils Report.** **10 CSR 20-6.010(4)(D)6.** outlines when a soils report is applicable.

(A) **Soils.** All soils investigations and resulting reports **shall** be performed, signed, and dated by a qualified soil scientist as defined by **section 701.040.1.(2)(e), RSMo 2016.** Soil observation pits (i.e., backhoe or hand dug) excavated to a depth to reveal the major soil horizons **shall** be utilized.

(B) **Soils Report.** The soils report resulting from the investigation **shall** include the following information, at a minimum:

1. A copy of each soil profile description;
2. Description of all drainage features, rock outcrops, erosion and other natural features that may influence the soil treatment area;
3. Identify any limiting conditions;
4. Provide documentation of any geologic risk factors affecting the soil's ability to treat and disperse effluent including dense tills, clay pans, fragipans, etc;
5. Provide a scaled site drawing or include sufficient dimensions to identify all applicable site features that could impact the soil treatment area(s). Previously prepared or otherwise available drawings such as a survey prepared by a Missouri registered professional surveyor, an aerial photograph or digital orthophotograph prepared from a geographical information system, or other similar drawing may be used. The drawing should include the following, at a minimum:
 - A. The location of all soil observation pits with the extent of different soils clearly delineated;
 - B. Any existing or proposed dwellings and structures;
 - C. Any site disturbances such as excavated or fill areas, existing roadways, and other hardscapes and proposed hardscapes or related site disturbances;
 - D. Location of all public and private wells, abandoned wells, or geothermal systems, and surface water features that could either influence or be impacted by the proposed soil treatment area. Refer to **10 CSR 20-8.140(2)(C)** for minimum separation distances;
 - E. North orientation arrow;
 - F. Identification of areas with conditions that would prohibit, limit or adversely impact the siting of a soil treatment area including, but not limited to: sinkholes,

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**wetland vegetation, bedrock outcrops, areas with a slope greater than fifteen percent (15%), and existing or abandoned field or drainage tiles; and
G. Identification of known, proposed, and observed easements and right-of-ways;**

- 6. A copy of the United States Geological Survey topographic map with the proposed soil treatment area clearly delineated;**
- 7. A copy of the United States Department of Agriculture Natural Resources Conservation Services county soil survey map with the proposed soil treatment area clearly delineated; and**
- 8. Conclusion. Provide a discussion of the findings and conclusions including the following, at a minimum:**
 - A. Available area for the soil treatment area;**
 - B. Depth to limiting layers (e.g., water table, fragipan, bedrock, etc.);**
 - C. Proposed application (loading) rates should take into consideration the drainage and permeability of the soils and the distance to the limiting layer. Cite the source of the application rates for each soil horizon within the specific soil description;**
 - D. Flooding and ponding frequency;**
 - E. Any relevant characteristics (e.g., bedrock outcrops, sinkholes or karst features, etc.) on the specific site or in the surrounding area that may indicate vulnerability for surface water and groundwater contamination;**
 - F. Factors affecting the soils ability to treat and hydrologically control effluent; and**
 - G. Citation of all documentation used during the investigation and soils report preparation that led to the findings and conclusions.**

(C) Imported Soils. When a facility is importing soils for the subsurface soil dispersal systems, the following **shall be specified, at a minimum:**

- 1. Imported soils possessing physical characteristics that are uniform in texture, structure, and pore space. Ensure uniformity and consistency of the physical characteristics as close as possible to the original state after transport;**
- 2. A sandy to loamy material, with less than ten percent (10%) clay and less than fifteen percent (15%) organic debris present;**
- 3. Prior to placing any imported soil, ensure an organic layer is not created by removal of plant residue and roots from the site; and**
- 4. To prevent the formation of a platy structure—**
 - A. Do not compact imported soil;**
 - B. Place imported soil in small “lift” increments of four to six inches (4” – 6”) instead of one (1) thick layer; and**
 - C. Vertical separation for the subsurface soil dispersal site should consist of native soil with the fill being the cap with imported soils.**

(15)8) Summary of Design. A summary of design **shall *[accompany the plans and specifications and shall]* be prepared, signed, sealed, and dated by a Missouri registered professional engineer, accompany the plans and specifications, and include the following, at a minimum:**

- (A) Provide *[F]*flow and waste projections including design and peak hydraulic and organic loadings *[shall be provided]* for sewers, pump stations, and wastewater treatment facilities.**

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- Include** *[I]* information *[shall be submitted]* to verify adequate downstream capacity of sewers, pump stations, and wastewater treatment and *[sludge]* **solids** handling unit(s);
- (B) Type and size of individual process units including **the following**: unit dimensions; rates and velocities; detention times; concentrations; recycle; chemical additive control; physical control, flexibility, and flow metering;
- (C) Show process diagrams, including flow diagrams with **hydraulic and organic** capacities;
- (D) Expected removal rates and concentrations of permitted effluent parameters in the discharge from the wastewater treatment facility, including a separate tabulation for each unit to handle solid and liquid fractions;
- (E) Design calculations, tabulations, **and** assumptions*[, and deviations]* **clearly documented and explained** from **10 CSR 20-8.120 through 10 CSR 20-8.2[2]10** used in the design of **each unit process and the system(s) as a whole**;
- (F) **Include the appropriate pump curve with the system curve superimposed, as applicable**;
- [F]G*) Include unusual specifications, construction materials, and construction methods; maps, photographs, diagrams; and other support data needed to describe the system; *[and]*
- [G]H*) Unless *[required]* **stated** in **10 CSR 20-8.120 through 10 CSR 20-8.2[2]10**, specific design calculations for the architectural, structural, and mechanical components of a system do not have to be included with the design criteria*[.]*; **and**
- (I) **Provide the anticipated effluent quality.**

[6]9) Plans.

- (A) General. **Plans shall contain the following, at a minimum**:

[1. One (1) set of drawings shall be submitted to the department for review. In addition to the set of drawings, an electronic version of the plans can be submitted to assist in the review. Additional sets of drawings may be required by the department for final approval.]

[2]1. Plan title. **Include the following for [A]**all plans for wastewater facilities *[shall]*:

A. [b]Bear a suitable title showing the name of the *[municipality, sewer district, or institution; and]* **owner and continuing authority (refer to 10 CSR 20-6.010(3)(B))**; *[shall]*

B. [s]Show the scale in feet*[,]*;

C. Provide a graphical scale*[,]*;

D. Indicate the north point*[, date, and the name of the engineer, certificate number, and imprint of his/her registration seal with the engineer's signature.]*;

E. Signed, sealed, and dated by a Missouri registered professional engineer on each sheet;

F. Bear an appropriate title block according to 20 CSR 2030-2.050; **and**

G. Number each sheet.

[3]2. Plan format. Provide a plan that is—

A. [The plans shall be c]Clear and legible (suitable for *[microfilming or]* scanning)*[.]*;

B. [They shall be d]Drawn to a scale*[, which]* **that** will permit all necessary information to be plainly shown *[for review and suitable for the contracting and construction of the facilities.]*;

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[A. To allow for microfilming or scanning, plans must not be smaller than twenty-four inches by thirty-six inches (24" × 36") (61 cm x 91 cm) or larger than thirty-six inches by forty-eight inches (36" × 48") (91.4 cm × 122 cm).]

C. Indicates the [D]datum used [shall be indicated].;

D. Depicts [L]locations and logs of test borings, [when required, shall be shown on the plans] where applicable. Include [T]test boring logs [must be included] on the plans or in the specifications as an appendix[.]; and

E. Blueprints [shall not be submitted.] and hand drafted plans are not acceptable;

[4]3. Plan contents. Detail plans [shall] consist of—

A. [p]Plan views, elevations, sections, and supplementary views which, together with the specifications and general layouts, provide the working information for the contract and construction of the facilities[.];

B. [They shall also include d]Dimensions and relative elevations of structures, the location and outline form of equipment, location and size of piping, water levels, and ground elevations[.]; and

C. All known existing structures and utilities, both above and below ground, which might interfere with the proposed construction or require isolation setback, particularly water mains and water supply structures (i.e., wells, clear wells, basins, etc.), gas mains, storm drains, and telephone, cable, and power conduits. The location of all existing and proposed water supply structures located within five hundred feet (500') of the proposed or existing wastewater treatment facility should be shown;

4. Hydraulic profile. Include a hydraulic profile for all wastewater treatment facilities; and

5. Operation during construction. *[Project construction documents shall s]***Specify the procedure for operation during construction that complies with the plan [required by subparagraph (4)(C)8.J.] outlined in paragraph (5)(E)15. and subsection (7)10)(D)C of this rule.**

(B) Plans of Sewers.

1. General plan. *[A plan of existing and proposed sewers shall be submitted for projects involving new sewer systems and substantial additions to existing systems.]* This plan **shall** show the following:

A. Geographical features.

(I) Topography and elevations. **Clearly show [E]existing or proposed streets and all streams or water surfaces [shall be clearly shown].** Contour lines at suitable intervals should be included[.];

(II) Streams. **Depict [T]the direction of flow in all streams and high and low water elevations of all water surfaces [and overflows shall be shown.]; and**

(III) Boundaries. **Depict [T]the boundary lines of the [municipality or the sewer district] continuing authority and the area to be sewered [shall be shown]; and**

B. Sewers. *[The plan shall s]*Show the location, size, and direction of flow of **[all] relevant** existing and proposed sanitary and combined sewers draining to the treatment facility concerned.

2. Detail plans. Detail plans **shall** be submitted[.] **showing the following:**

A. Profiles [shall] hav[e]ing a horizontal scale of not more than one hundred feet (100') to the inch [(12 m to the cm)] and a vertical scale of not more than ten feet (10')

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- to the inch *[(1.2 m to the cm)]*. Plan views should be drawn to a corresponding horizontal scale and *[must be]* shown on the same sheet. *Plans and profiles shall show—*];
- [A]***B.** Location of streets and sewers;
- [B]***C.** Line of ground surface*[,]*; pipe size, **material, and type**; length between manholes*[,]*; invert and surface elevation at each manhole*[,]*; grade of sewer between each two (2) adjacent manholes*[, pipe material and type,]*; and *[where]* **any** special construction features *[are required]*. **Number** *[A]*all manholes *[shall be numbered]* on the plan and correspondingly number*[ed]* **them** on the profile;
- [C]***D.** Where there is any question of the sewer being sufficiently deep to serve any residence, **plot** the elevation and location of the basement floor *[shall be plotted]* on the profile of the sewer which is to serve the *[house]* **residence** in question. *The engineer shall state that all sewers are sufficiently deep to serve adjacent basements except where otherwise noted on the plans*];
- [D]***E.** Locations of all special features such as inverted siphons, concrete encasements, elevated sewers, etc.; **and**
- [E. All known existing structures and utilities, both above and below ground, which might interfere with the proposed construction or require isolation setback, particularly water mains and water supply structures (i.e., wells, clear wells, basins, etc.), gas mains, storm drains, and telephone, cable, and power conduits; and]*
- F. *[Special]* **Furnish** detail drawings*[,] made to a scale to clearly show the nature of the design, shall be furnished]* to show the following particulars:
- (I) All stream crossings with elevations of the stream bed and **ordinary high water mark**, normal, and low water levels; *[and]*
 - (II) Details of all special sewer joints and cross-sections; **and**
 - (III) *[d]***D**etails of all sewer appurtenances such as manholes, *[lampholes,]* inspection chambers, inverted siphons, regulators, tide gates, and elevated sewers.
- (C) Plans of Wastewater Pumping Stations.
1. Location plan. *[A plan shall be submitted for projects involving construction or revision of pumping stations.]* This plan **shall** show the following:
 - A. *[t]*The location and extent of the tributary area;
 - B. *[a]*Any *[municipal]* **continuing authority** boundaries with the tributary area; **and**
 - C. *[t]*The location of the pumping station and force main*[,]* and pertinent elevations.
 2. Detail plans. Detail plans **shall** *[be submitted]* show*[ing]* the following, where applicable:
 - A. Topography of the site;
 - B. Existing pumping station;
 - C. Proposed pumping station, including provisions for installation of future pumps;
 - D. *[Elevation of high water at the site and m]***M**aximum elevation of wastewater in the collection system upon occasion of power failure;
 - E. Maximum hydraulic gradient in downstream gravity sewers when all installed pumps are in operation; *[and]*
 - F. Test boring and groundwater elevations*[.]*;
 - G. **All pumping station appurtenances such as pumps, valves, level control switches, hatches, safety equipment, ventilation equipment, and hoisting equipment; and**

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- H. The one hundred (100)-year flood elevation or highest historical flood of record elevation and their boundaries. Refer to 10 CSR 20-8.140(2)(B).**
- (D) Plans of Wastewater Treatment *[Plants]* Facilities.
1. Location plan.
 - A. A **location** plan **shall** *[be submitted]* show^{*[ing]*} the wastewater treatment *[plant]* **facility** in relation to the remainder of the system.
 - B. Sufficient topographic features **shall** be included to indicate its location with relation to streams and the point of discharge of treated effluent.
 2. General layout. Layouts of the proposed wastewater treatment *[plant]* **facility shall** *[be submitted]* show^{*[ing]*}—
 - A. Topography of the site;
 - B. Size and location of *[plant]* **treatment facility** structures;
 - C. Schematic flow diagram(s) showing the flow through various *[plant]* units and showing utility systems serving the *[plant]* **facility** processes;
 - D. Piping, including any arrangement for *[bypassing individual units;]* **unit isolation (identify materials handled and direction of flow through pipes [shall be shown], including arrangements for independent operation);**
 - E. Hydraulic profiles showing the flow of wastewater, supernatant liquor, **recycle streams**, and *[sludge] solids*; and
 - F. Test borings and groundwater elevations *[shall be provided]*.
 3. Detail plans. Detail plans **shall** show the following, *[unless otherwise covered by the specifications or facility plan]* **where applicable:**
 - A. Location, dimensions, and elevations of all existing and proposed *[plant]* **treatment facilities and solids handling facilities;**
 - B. Elevations of high and low water level of the body of water to which the *[plant]* **facility** effluent is to be discharged;
 - C. Type, size, pertinent features, and operating capacity of all pumps, blowers, motors, and other mechanical devices;
 - D. Minimum, design average, and peak hourly hydraulic flow in **hydraulic profile with wastewater, supernatant liquor, and solids flow through the treatment facility; [and]**
 - E. **Existing and proposed solids storage volumes in plan and profile;**
 - [E]*F. Adequate description of any *[other]* features *[pertinent to the design]* **not otherwise covered by the specifications or facility plan[.]; and**
 - G. **The one hundred (100)-year flood elevation or highest historical flood of record elevation and their boundaries. Refer to 10 CSR 20-8.140(3)(B).**

*[7]***10** Specifications.

- (A) *[Complete]* **Specification shall** be prepared, signed, sealed, and dated *[technical specifications shall be submitted]* by a Missouri registered professional engineer for the construction of sewers, *[wastewater]* pumping stations, wastewater treatment *[plants]* **facilities**, and all other appurtenances, **and accompany the plans.** *[Technical specifications shall accompany the plans.]* **The initial page shall bear the owner and continuing authority name, a contact person for each (including phone number and address).**
- (B) The **technical** specifications accompanying construction drawings **shall** include **the following**, but not be limited to all construction information not shown on the drawings

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which is necessary to inform the builder, in detail, of the design requirements for the quality of materials, workmanship, and fabrication of the project[.]:

[(C) The specifications shall also include:]

1. *[t]*The type, size, strength, operating characteristics, and rating of equipment;
2. *[a]*Allowable infiltration;
3. *[t]*The complete requirements for all mechanical and electrical equipment[,] (including machinery, valves, piping, and jointing of pipe);
4. *[e]*Electrical apparatus, wiring, instrumentation, and meters;
5. *[l]*Laboratory fixtures and equipment;
6. *[o]*Operating tools;
7. *[c]*Construction materials;
8. *[s]*Special filter materials (such as stone, sand, gravel, or slag);
9. *[m]*Miscellaneous appurtenances;
10. *[c]*Chemicals when used;
11. *[i]*Instructions for testing materials and equipment as necessary to meet design standards; and
12. *[p]*Performance tests for the completed facilities and component units. It is suggested that these performance tests be conducted at design load conditions wherever practical.

[(D)C) Operation During Construction. Specifications shall contain a program for keeping existing wastewater treatment [plant] facility units in operation during construction [of plant additions]. Should it be necessary to take [plant] units out of operation, specifications shall include detailed construction requirements and schedules to [avoid unacceptable temporary water quality degradation in accordance with subparagraph (4)(C)8.J and] maintain compliance with water quality standards and the facility's NPDES permit. See paragraphs [(5)(A)5.] (5)(E)15. and (9)(A)5. of this rule.

[(8)11) Revisions to Approved Plans or Specifications.

(A) General. Any *[deviations]* **revisions** from approved plans or specifications affecting capacity, flow, system layout, operation of units, or point of discharge **shall** be approved by the *[d]*Department in writing, before such changes are made. *[Plans or specifications so revised should, therefore, be submitted well in advance of any construction work which will be affected by such changes, to permit sufficient time for review and approval. Structural revisions or other minor changes not affecting capacities, flows, or operation will be permitted during construction without approval.]*

(B) Addendum. Addenda **shall** be signed, sealed, and dated by a Missouri registered professional engineer.

(C) Change Order. Change orders **shall** be signed, sealed, and dated by a Missouri registered professional engineer. The owner, continuing authority, and contractor **shall** sign and date change orders as well.

(D) As-Built Plans. As-built plans clearly showing the alterations **shall** be submitted *[to the] upon [d]*Department **request** at the completion of the work.

AUTHORITY: section 644.026, RSMo 2000. Original rule filed Aug. 10, 1978, effective March 11, 1979. Amended: Filed Sept. 14, 2010, effective June 30, 2011.*

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**Original authority: 644.026, RSMo 1972, amended 1973, 1987, 1993, 1995, 2000.*