FISCAL NOTE

PUBLIC COST

I. RULE NUMBER

Rule Number and Name:	10 CSR 20-7.015 Effluent Regulations
Type of Rulemaking:	Amendment

II. SUMMARY OF FISCAL IMPACT

Affected Agency or Political Subdivision	Estimated Cost of Compliance in the Aggregate**
Publically Owned Treatment Works including Municipal and Publicly Owned Sewer Districts	$1,204,632
Missouri Department of Corrections	$1,404

III. Worksheet

New nutrient monitoring requirements for wastewater treatment facilities with flows greater than 100,000 gallons per day.

Costs of monitoring*
Total Phosphorus monitoring = $24 per sample
Total Nitrogen (Speciated as ammonia, total kjeldahl nitrogen and nitrites + nitrates) = $93 per sample

1. Publically owned treatment works with flows greater than 100,000 gallons per day but less than 1 million gallons per day will be required to conduct quarterly influent and effluent monitoring for both phosphorus and nitrogen. As these facilities are currently monitoring effluent quarterly, there is no additional cost for effluent sampling. A query of Department records identifies 268 such facilities.

   Influent sampling
   ($24 + $93)*4 samples/year*268 facilities = $125,424 annually.

2. Publically owned treatment works with flows of 1 million gallons per day and greater will be required to conduct monthly influent and effluent monitoring. These facilities are currently required to conduct quarterly effluent monitoring for these parameters so the total increase in effluent monitoring will be eight samples per year instead of 12. A query of Department records identifies 118 such facilities.

   Influent sampling
   ($24 + $93)*12 samples/year*118 facilities = $165,672 annually

   Effluent sampling
   ($24+$93)*8 samples/year*118 facilities – $110,448 annually

   Combined sampling cost
   $110,448 + $165,672 = $276,120 annually
   Combined sampling cost for all publically owned treatment facilities with flows greater than 100,000 gallons per day.
   $276,120 + $125,424 = $401,544 annually

3. Missouri Department of Corrections owns a wastewater treatment facility with flows greater than 100,000 gallons per day but less than 1 million gallons per day. This facility will be required to conduct quarterly influent monitoring.

   Influent sampling
   ($24 + $93)*4 samples/year = $468 annually

IV. Assumptions

* Costs utilized for these calculations were obtained from an analytical laboratory in Missouri that routinely analyses wastewater samples. These costs may vary around the state.

** The aggregate costs were calculated by multiplying the total annual costs identified in 2. and 3. above by a factor of three. This assumption was based on the potential for this rule to be amended at the next triannual review.

FISCAL NOTE

PRIVATE COST

I. RULE NUMBER

Rule Number and Name	10 CSR 20-7.015 Effluent Regulations
Type of Rulemaking	Amendment

II. SUMMARY OF FISCAL IMPACT

Estimate of the number of entities by class which would likely be affected by the adoption of the proposed rule:	Classification by types of the business entities which would likely be affected:	Estimate in the aggregate as to the cost of compliance with the rule by the affected entities:***
*49 (5 of these facilities have flows of 1 million gallons per day or more)	Entities that have domestic or sanitary sewer contributions. SIC Codes including but not limited to 4952, 8641, 6515, 6512, and 8661	$96,876
*114 (77 of these facilities have flows of 1 million gallons per day or more)	Stormwater and industrial process wastewater facilities with SIC codes including but not limited to 4911, 1629 and 4941	$216,216

III. Worksheet

Costs of monitoring**
Total Phosphorus monitoring – $24 per sample
Total Nitrogen (Speciated as ammonia, total kjeldahl nitrogen and nitrites + nitrates) – $93 per sample

1. Privately owned facilities with domestic or sanitary wastewater contributions and have flow greater than 100,000 gallons per day but less than 1 million gallons per day will be required to conduct quarterly influent and effluent monitoring for both phosphorus and nitrogen. As these facilities are currently monitoring effluent quarterly, there is no additional cost for effluent sampling. A query of Department records identifies 44 such facilities.

   Influent sampling
   ($24 + $93)*4 samples/year* 44 facilities = $20,592 annually.

2. Privately owned facilities with domestic or sanitary wastewater contributions and have flow of 1 million gallons per day and greater will be required to conduct monthly influent and effluent monitoring. These facilities are currently required to conduct quarterly effluent monitoring for these parameters so the total increase in effluent monitoring will be eight samples per year instead of 12. A query of Department records identifies 5 such facilities.

   Influent sampling
   ($24 + $93)*12 samples/year*5 facilities = $7,020 annually

Effluent sampling
($24+$93)*8 samples/year*5 facilities = $4,680 annually

Combined sampling cost
$7,020 + $4,680 = $11,700 annually

Combined sampling cost for all privately owned treatment facilities with domestic or sanitary sewer contributions and have flows greater than 100,000 gallons per day.
$20,592 + $11,700 = $32,292 annually

3. Privately owned facilities that discharge stormwater or industrial wastewater and have design flows greater than 100,000 gallons per day and less than 1 million gallons per day would be required to conduct quarterly influent and effluent monitoring for nutrients. Applicable facilities are currently monitoring effluent quarterly for nutrients. Therefore the Department does not expect any additional costs. Due to the nature of these facilities and associated activities, the Department does not expect influent monitoring to be practical and/or possible. Therefore there should be no additional costs to these facilities as it pertains to nutrient monitoring.

4. Privately owned facilities that discharge stormwater or industrial wastewater and have design flows of 1 million gallons per day or more would be required to conduct monthly influent and effluent testing for nutrients. As with the facilities identified in 3. above, the department does not anticipate influent monitoring for these facilities to be practical and/or possible. As a result there should be no new costs related to influent monitoring. As applicable facilities are currently conducting quarterly effluent monitoring for nutrients, the new requirement for monthly testing would result in eight samples per year instead of 12. A query of Department records illustrates there are 77 such facilities.

   Effluent sampling
   ($24 + $93)*8 samples/year*77 facilities = $72,072 annually

IV. Assumptions

* Facility number totals include all facilities whether or not they "typically discharge nitrogen or phosphorus". As a result, the overall costs are conservative in nature.

** Costs utilized for these calculations were obtained from an analytical laboratory in Missouri that routinely analyses wastewater samples. These costs may vary around the state but are expected to be relatively close.

*** The aggregate costs were calculated by multiplying the total annual costs identified in 2. and 4. above by a factor of three. This assumption was based on the potential for this rule to be amended at the next triannual review.

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

PROPOSED RESCISSION

10 CSR 20-8.020 Design of Small Sewage Works. This rule set out criteria as a guide in designing and constructing small sewage works. These criteria were not necessarily applicable to the design of works having daily flows in excess of 22,500 gallons per day. For works having larger flows, 10 CSR 20-8.110–10 CSR 20-8.220 reflect the minimum acceptable standards. This rule reflected the minimum requirements of the Missouri Department of Natural Resources for design, submission of plans, approval of plans and approval of completed small sewage works. These criteria were based on the best information presently available but they were subject to periodic review and revision as additional information and methods appear. Deviation from minimum requirements was allowed if sufficient documentation justifies the deviation. Addenda or supplements to this publication were furnished to consulting engineers and city engineers. Others wanting to receive addenda or supplements should contact the Missouri Clean Water Commission to be added to the mailing list.

PURPOSE: This rule is being rescinded to reduce duplication throughout Chapter 8. The requirements from this rule that are necessary to protect human and environmental health and safety will be incorporated into10 CSR 20-8.110 and 10 CSR 20-8.210.

AUTHORITY: section 644.026, RSMo Supp. 1988. Original rule filed July 17, 1961, effective July 27, 1961. For intervening history, please consult the Code of State Regulations. Rescinded: Filed June 15, 2018.

PUBLIC COST: This proposed rescission will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed rescission will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed rescission with the Department of Natural Resources, Lacey Hirschvogel, Water Protection Program, PO Box 176, Jefferson City, MO 65101. To be considered, comments must be received within thirty (30) days after publication of this notice in the ***Missouri Register****. A public hearing is scheduled for September 5, 2018, at the Department of Natural Resources, 1101 Riverside Drive, Jefferson City, MO 65101.*

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

PROPOSED AMENDMENT

10 CSR 20-8.110 Engineering—Reports, Plans, and Specifications. The Clean Water Commission is amending the chapter title and sections (1) through (5), (8) through (11), and adding new sections (6) and (7).

PURPOSE: This amendment will retain and add minimum design standards for engineering reports, plans, and specifications that are required to protect or improve public health, safety, and water quality.

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.] ***This rule provides the minimum criteria for the preparation of engineering reports and facility plans and specifications related to the design of wastewater systems. This rule is to be used with rules 10 CSR 20-8.110 through 10 CSR 20-8.210 for the planning and design of a wastewater treatment facility. It does not address all aspects of design, and the design engineer may refer to other appropriate reference materials so long as these minimum standards set forth in this rule are met.***

[(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 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 m^3) 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 m^3) per day or greater until such time as 10 CSR 20-8.020 is amended.]

(1) Applicability. Engineering reports and facility plans and specifications shall be prepared based on criteria contained in this rule, published standards, applicable federal and state requirements, standard textbooks, current technical literature and applicable safety standards. In the event 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. Requirements for these facilities are found in 10 CSR 20-8.300.

(B) This rule shall not apply to agrichemical facilities.

Requirements for these facilities are found in 10 CSR 20-8.500.

*[(3)]***(2)** General. **All documents submitted to the Missouri Department of Natural Resources (department) for the purpose of complying with this rule shall be prepared, signed, sealed, and dated by a Missouri registered professional engineer.**

[(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. No approval for construction can 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 submitted and found to be satisfactory by the 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.]

(A) Submittal. The design engineer must submit a project engineering report or facility plan to the department and receive department approval prior to submitting permit applications, plans, specifications, and fees.

(B) Engineering Reports or Facility Plans.

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

2. Facility plans must 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. Engineering report or facility plan approval does not authorize construction.

[(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 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.

(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 m^3) 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 m^3) 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.

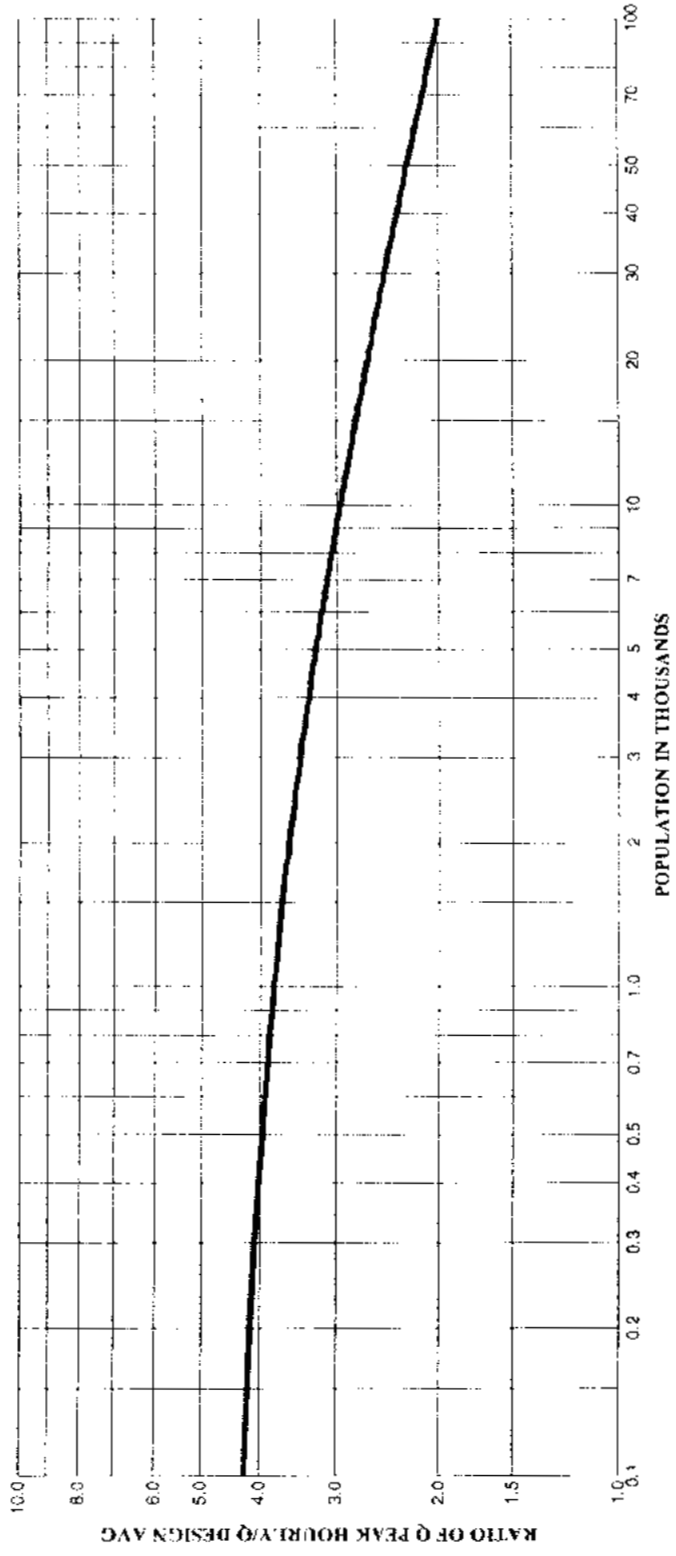

Figure 1. Ratio of peak hourly flow to design average flow.

where

Q peak hourly = Maximum Rate of Wastewater Flow (Peak Hourly Flow)
Q design avg = Design Average Daily Wastewater Flow

Equation: $Q\ \text{Peak Hourly}/Q\ \text{Design Avg} = \dfrac{18 + \sqrt{P}}{4 + \sqrt{P}}$

where

P = population in thousands

(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 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 (BOD_5) 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 ($TBOD_5$) is equivalent to BOD_5 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 ($CBOD_5$) is defined as BOD_5 less the nitrogenous oxygen demand of the wastewater.

(II) Design average BOD_5—The design average BOD_5 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 BOD_5 for facilities having critical seasonal high loading periods (e.g., recreational areas, campuses, and industrial facilities) shall be based on the daily average BOD_5 during the seasonal period.

(III) Design maximum day BOD_5—The design maximum day BOD_5 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 BOD_5—The design peak hourly BOD_5 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 BOD_5 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 BOD_5. 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;

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 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 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.

(5) Summary of Design. A summary of design shall accompany the plans and specifications and shall include the following:

(A) Flow and waste projections including design and peak hydraulic and organic loadings shall be provided for sewers, pump stations, and wastewater treatment facilities. Information shall be submitted to verify adequate downstream capacity of sewers, pump stations, and wastewater treatment and sludge handling unit(s);

(B) Type and size of individual process units including 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 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, assumptions, and deviations from 10 CSR 20-8.120 through 10 CSR 20-8.220 used in the design of the system(s);

(F) Include unusual specifications, construction materials, and construction methods; maps, photographs, diagrams; and other support data needed to describe the system; and

(G) Unless required in 10 CSR 20-8.120 through 10 CSR 20-8.220, specific design calculations for the architectural, structural, and mechanical components of a system do not have to be included with the design criteria.]

(3) Hydraulic and Organic Waste Load.

(A) Existing Systems shall—

1. Use actual flow data that accurately represent the average and peak flows to calculate projections for hydraulic capacity;

2. Include contributions from existing upstream combined sewers that will affect interceptor sewers and treatment facilities;

3. Use actual data that accurately represent organic waste load to calculate projections for organic capacity; and

4. Include documented hydraulic and organic waste load contributions of industrial sources in the calculations of projected capacity.

(B) New Collection and Wastewater Treatment Systems.

1. Hydraulic capacity for wastewater facilities and new collection systems.

A. Flow estimates for the design average flow and design peak hourly flow, including origin of the flow estimates and any assumptions, shall be identified.

B. 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.

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

Where:
Q Peak Hourly = design peak hourly flow
Q Design Avg = design average flow
P = Population in thousands

C. Where the new collection system is to serve existing development, the likelihood of inflow and infiltration (I/I) contributions from existing service lines shall be evaluated.

2. Organic Waste Load. Organic waste load estimates shall be identified for all contributing parameters such as the design average five (5)-day Biochemical Oxygen Demand (BOD_5).

(C) Drinking Water Use Records. Facilities proposing drinking water usage as the basis for design average flow must provide at least one (1)-year of drinking water use records in the following form:

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

2. 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. A wastewater treatment facility owner must request department review and approval when proposing to re-rate an existing wastewater treatment facility's current design hydraulic capacity or organic waste loading. An engineering re-rating analysis must demonstrate the wastewater treatment facility can reliably operate at the proposed re-rated loading rate. The re-rating analysis shall include the following:

1. Hydraulic Capacity. Evaluate the annual average flow, the maximum monthly average flow, the maximum daily flow, and the ratio of the peak flow to annual average flow using the last five (5) years' wastewater treatment facility. Include all calculations and assumptions.

A. Calculate the design average flow using the wastewater treatment facility's average annual flow plus one (1) standard deviation for a wastewater treatment facility that will not be affected by future growth; or

B. Calculate the design average flow using the anticipated changes from the existing flow for a wastewater treatment facility that will be affected by future growth.

2. Organic Waste Load. Evaluate the design organic waste loading based on the average daily organic load.

A. Include the data 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 during both wet and dry weather conditions;

B. Include sample data of the following parameters unless monitoring of the parameter is not a requirement of the National Pollutant Discharge Elimination System (NPDES) permit: BOD_5, Total Suspended Solids (TSS), ammonia, total nitrogen, and total phosphorus;

C. Include the influence of hydraulic capacity evaluation from subparagraph (3)(D)1.A and B. 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 waste load.

3. Existing unit processes. Evaluate each unit process for its design and peak capacity. Normally one (1) unit process will be most restrictive in terms of design capacity. Include solids processing, handling, and storage in this analysis.

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

5. Growth. Evaluate the system's anticipated rate of growth.

(4) Engineering Report. Engineering reports shall include the following:

(A) Cover Page. Include a statement identifying the owner and continuing authority (refer to 10 CSR 20-6.010(2)(A)), a contact person for each (including phone number and address), and engineer in accordance with section (2) of this rule;

(B) Problem Defined. Include a description of the existing system and an evaluation of the conditions and problems needing correction;

(C) Hydraulic Capacity and Organic Waste Load. Establish the anticipated design average and design peak flows and organic loads for the existing and ultimate conditions. Include the basis of the projection reflecting the existing or initial service area, and the anticipated future service area. More detail on flow and organic waste 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 design criteria for the proposed project;

(H) Site Information. Provide project site information, where

applicable, including topography, soils, geologic conditions, depth to bedrock, groundwater level, distance to water supply structures, roads, residences, and other pertinent site information;

(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; and

(J) For flood protection follow the provisions listed in 10 CSR 20-8.140(2)(B).

(5) Facility Plan. Facility plans shall include the following, in addition to the information in 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 BOD_5. Establish the anticipated design average and design peak flows and waste loads for the existing period in accordance with section (3) of this rule. Include the basis of the projection of initial and future flows and waste loads;

(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;

(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)(A)5;

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, follow the provisions listed in 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);

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 20-8.140(2)(C);

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;

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 20-8.140(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 the 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 consistant with the 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 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 if new technologies of wastewater treatment processes and equipment or applications have a reasonable and substantial chance of success, the facility plan prepared for department approval shall include the following:

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 that 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 that may be encountered in the area of the proposed installations. A control group may be necessary 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. Proposals for pilot tests and demonstration projects shall include the following 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 necessary 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 that are 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) Evaluation of Collected Data. All raw testing data and the evaluation of the data and performance must 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.

(A) Soils. Soil reports are required for all projects involving subsurface wastewater treatment and disposal. All soils investigations and resulting reports must be performed, signed, and dated by a qualified soil scientist as defined in section 701.040, RSMo. 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:

1. A copy of each soil profile description;

2. A description of all drainage features, rock outcrops, erosion, and other natural features that may influence the soil treatment area;

3. An evaluation of any identified limiting conditions or geologic risk factors affecting the soil's ability to treat and disperse effluent such as karst features, dense tills, clay pans, and fragipans;

4. Clear and legible scaled site plans, drawings, or maps identifying all applicable site features that could impact the soil treatment area(s). Previously prepared or otherwise available drawings or maps such as a survey prepared by a Missouri registered professional surveyor; an aerial photograph; a United States Geological Survey topographic map with the proposed soil treatment area clearly delineated; a United States Department of Agriculture Natural Resources Conservation Services county soil survey map with the proposed soil treatment area clearly delineated; or a digital orthophotograph prepared from a geographical information system may be used. Include the following on the drawings or maps:

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. For minimum separation distances, follow the provisions listed in 10 CSR 20-8.140(2)(C);

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, wetland vegetation, bedrock outcrops, areas with a slope greater than fifteen percent (15%), and existing or abandoned field or drainage tiles;

G. Identification of known existing, proposed, and observed easements and right-of-ways; and

5. A discussion of the findings and conclusions including the following:

A. Available area for the soil treatment area;

B. Depth to limiting layers (e.g., water table, fragipan, bedrock) and the source of this information;

C. Proposed application (loading) rates that take into consideration the drainage and permeability of the soils and the distance to the limiting layer.

D. The source of the application rates for each soil horizon within the specific soil description;

D. Frequency of flooding and ponding and the source of this information;

E. Relevant characteristics (e.g., bedrock outcrops, sinkholes or karst features) on the proposed site or in the surrounding area that may indicate vulnerability for surface water and groundwater contamination and the source of this information; and

F. Factors affecting the soils ability to treat and hydrologically control effluent and the source of this information.

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

1. Physical characteristics that are uniform in texture, structure, and pore space;

2. Transportation methods that ensures uniformity and consistency of the physical characteristics as close as possible to the original state upon delivery;

2. A sandy to loamy material, with less than ten percent (10%) clay and less than fifteen percent (15%) organic debris present;

3. Methods for removal of the organic layer;

4. No compaction of imported soil;

5. Placement in small "lift" increments of four to six inches (4"–6") instead of one (1) thick layer; and

6. Native soil is to be used for the vertical separation for the subsurface soil dispersal systems with the fill for the cap being imported soils.

(8) Summary of Design. A summary of design shall accompany the plans and specifications and include the following:

(A) Flow and waste projections including design and peak hydraulic and organic loadings for sewers, pump stations, and wastewater treatment facilities;

(B) Information to verify adequate downstream capacity of sewers, pump stations, and wastewater treatment and solids handling unit(s);

(C) 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;

(D) Process diagrams, including flow diagrams with hydraulic capacity and organic waste load;

(E) 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;

(F) Design calculations, tabulations, and assumptions clearly documented and explained from 10 CSR 20-8.120 through 10 CSR 20-8.210 used in the design of each unit process and the system(s) as a whole;

(G) The appropriate pump curve with the system curve superimposed, as applicable;

(H) Unusual specifications, construction materials, and construction methods; maps, photographs, diagrams; and other support data needed to describe the system;

(I) Architectural, structural, and mechanical component design calculations as specified in 10 CSR 20-8.120 through 10 CSR 20-8.210; and

(J) Anticipated effluent quality achieved.

*[(6)]***(9)** Plans.

(A) General. **All plans must 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. All plans for wastewater facilities shall bear a suitable title showing the name of the municipality, sewer district, or institution; and shall show the scale in feet, a graphical scale, the north point, date, and the name of the engineer, certificate number, and imprint of his/her registration seal with the engineer's signature.]

1. Plan components. Include the following components on all plan sheets:

A. A suitable title block showing the name of the project, owner, and continuing authority (refer to 10 CSR 20-6.010(2) and 20 CSR 2030-2.050);

B. Scale ratios for mechanical drawings;

C. Bar scales for aerial maps;

D. A north arrow;

E. Datum used; and

F. Sheet numbers.

*[3.]***2.** Plan format. *[The plans shall be clear and legible (suitable for microfilming or scanning). They shall be drawn to scale, which will permit all necessary information to be plainly shown for review and suitable for the contracting and construction of the facilities.]* **Provide clear and legible plans drawn to a scale that allows necessary information to be seen plainly. Blueprints and hand drafted plans are not acceptable.**

[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). Datum used shall be indicated. Locations and logs of test borings, when required, shall be shown on the plans. Test boring logs must be included on the plans or in the specifications as an appendix. Blueprints shall not be submitted.]

*[4.]***3.** Plan contents. **Provide** *[D]***d**etail**ed** plans *[shall consist of—]* **consisting** of **the following:**

A. *[p]***P**lan 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]***D**imensions and relative elevations of structures, the location and outline form of equipment, location and size of piping, water levels, and ground elevations*[.]***;**

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

D. Locations and logs of test borings, where applicable. Include test boring logs on the plans or in the specifications as an appendix.

4. Hydraulic profile for all wastewater treatment facilities; and

5. **Plan for** *[O]***o**peration during construction. *[Project construction documents shall s]***S**pecify 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)(D)]* **(10)(C)** of this rule.

(B) Plans of Sewers.

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

A. Geographical features.

(I) Topography and elevations. **Clearly show** *[E]***e**xisting or proposed streets and all streams or water surfaces *[shall be clearly shown]*. **Include** *[C]***c**ontour lines at suitable intervals *[should be included.]***;**

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

(III) Boundaries. **Depict** *[T]***t**he 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]***S**how 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') to the inch *[(1.2 m to the cm).]***;**

B. Plan views *[should be]* drawn to a corresponding horizontal scale and *[must be]* shown on the same sheet*[. Plans and profiles shall show—]***;**

*[A.]***C.** Location of streets and sewers;

*[B.]***D.** 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]***a**ll manholes *[shall be numbered]* on the plan and correspondingly number*[ed]* **them** on the profile;

*[C.]***E.** *[Where there is any question of the sewer being sufficiently deep to serve any residence, the elevation and location of the basement floor shall be plotted on the profile of the sewer which is to serve the house in question. The engineer shall state that all sewers are sufficiently deep to serve adjacent basements except where otherwise noted on the plans]* **Elevation and location of the basement floor on the profile of the sewer where there is any question of the sewer being sufficiently deep to serve any residence**;

*[D.]***F.** 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.]***G.** *[Special d]***D**etail drawings*[, made to a scale to clearly show the nature of the design, shall be furnished]* to show the following:

(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 plans. *[A plan shall be submitted for projects involving construction or revision of pumping stations. This plan shall]* **These plans must** show the following:

A. *[t]***T**he location and extent of the tributary area;

B. *[a]***A**ny *[municipal]* **continuing authority** boundaries with the tributary area;

C. *[t]***T**he location of the pumping station and force main; and

D. *[p]***P**ertinent 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

H. Flood protection map. For flood protection, follow the provisions listed in 10 CSR 20-8.140(2)(B).

(D) Plans of Wastewater Treatment *[Plants]* **Facilities**.

1. Location plans. **Location plans shall include the following:**

A. *[A plan shall be submitted showing t]***T**he wastewater treatment *[plant]* **facility** in relation to the remainder of the system*[.]***; and**

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. Flood protection map. For flood protection, follow the provisions listed in 10 CSR 20-8.140(2)(B).

*[(7)]***(10)** Specifications.

(A) *[Complete signed, sealed, and dated technical specifications shall be submitted for the construction of sewers, wastewater pumping stations, wastewater treatment plants, and all other appurtenances. Technical specifications shall accompany the plans.]* **Specifications shall accompany the plans**. **The initial page shall bear the owner and continuing authority name, and 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 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]***T**he type, size, strength, operating characteristics, and rating of equipment;

2. *[a]***A**llowable infiltration;

3. *[t]***T**he complete requirements for all mechanical and electrical equipment*[,]* **(**including machinery, valves, piping, and jointing of pipe**)**;

4. *[e]***E**lectrical apparatus, wiring, instrumentation, and meters;

5. *[l]***L**aboratory fixtures and equipment;

6. *[o]***O**perating tools;

7. *[c]***C**onstruction materials;

8. *[s]***S**pecial filter materials **(**such as stone, sand, gravel, or slag**)**;

9. *[m]***M**iscellaneous appurtenances;

10. *[c]***C**hemicals when used;

11. *[i]***I**nstructions for testing materials and equipment as necessary to meet design standards; and

12. *[p]***P**erformance 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 [(5)(A)5.]* **maintain compliance with effluent limitations and the facility's NPDES permit**. **See paragraphs (5)(E)15. and (9)(A)5.** of this rule.

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

(A) General. Any *[deviations from]* **revisions of** approved plans or specifications affecting capacity, flow, system layout, operation of units, or point of discharge shall be approved by the 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 must conform to all requirements in this rule.

(C) Change Order. The owner, continuing authority, and contractor must sign and date change orders.

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

*AUTHORITY: section 644.026, RSMo. [2000] **2016**. Original rule filed Aug. 10, 1978, effective March 11, 1979. Amended: Filed Sept. 14, 2010, effective June 30, 2011. Amended: Filed June 15, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Department of Natural Resources, Division of Environmental Quality, Water Protection Program, John Rustige, PO Box 176, Jefferson City, MO 65102. Comments may be sent with name and address through e-mail to john.rustige@dnr.mo.gov. Public comments must be received by August 23, 2018. The public hearing is scheduled for 10 AM, on August 15, 2018, at the Department of Natural Resources, Elm Street Conference Center, Bennett Spring Conference Room, 1730 East Elm Street, Jefferson City, Missouri 65101.

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

PROPOSED AMENDMENT

10 CSR 20-8.120 *[Design of]* **Gravity Sewers**. The Clean Water Commission is amending the title and purpose, sections (1) through (5), and deleting sections (6) through (10).

PURPOSE: This amendment will retain and add minimum design standards for gravity sewer that are required to protect or improve public health, safety, and water quality.

PURPOSE: [The following criteria have been prepared as a guide for the design of sewers. This rule is to be used with rules 10 CSR 20-8.110 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 and collection systems. 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 pertaining to sewers and appurtenances, design manuals such as Water Environment Federation's Manuals of Practice, and other sewer 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.] ***This rule specifies the minimum standards for the design of gravity sewers that are part of wastewater collection and treatment systems. This rule is to be used with rules 10 CSR 20-8.110 through 10 CSR 20-8.210. It does not address all aspects of design, and the design engineer may refer to other appropriate reference materials so long as these minimum standards set forth in this rule are met.***

PUBLISHER'S NOTE: The secretary of state has determined that the publication of the entire text of the material which is incorporated by reference as a portion of this rule would be unduly cumbersome or expensive. This material as incorporated by reference in this rule shall be maintained by the agency at its headquarters and shall be made available to the public for inspection and copying at no more than the actual cost of reproduction. This note applies only to the reference material. The entire text of the rule is printed here.

[(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 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.

(3) Approval of Sewers. The department will approve plans for new systems, extensions to new areas, or replacement sanitary sewers only when designed upon the separate basis, in which rain water from roofs, streets, and other areas and groundwater from foundation drains are excluded.

(4) Design Capacity and Design Flow.

(A) Sewer capacities shall be designed for the estimated ultimate tributary population, except in considering parts of the systems that can be readily increased in capacity. Similarly, consideration must be given to the maximum anticipated capacity of institutions, industrial parks, etc. An economic analysis of alternatives must be included in the engineering report or facility plan where future relief sewers are planned.

1. The following factors must be considered in determining the required capacities of sanitary sewers:

A. Design peak hourly flow;

B. Additional maximum wastewater or waste flow from industrial plants;

C. Inflow and infiltration (I/I);

D. Topography of area;

E. Location of wastewater treatment facilities;

F. Depth of excavation; and

G. Pumping requirements.

2. The basis of design for all sewer projects shall be included in the engineering report or facility plan. More detailed computations may be required by the department for critical projects.

(B) Sewer flows shall be based on the design peak hourly flow in accordance with 10 CSR 20-8.110(4)(C)4. and must be designed to prevent or eliminate sanitary sewer overflows (SSOs).]

(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. In the event 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. Requirements for these facilities are found in 10 CSR 20-8.300.

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

(2) Sanitary Sewers. Rain water from roofs, streets, and other areas and groundwater from foundation drains shall be excluded from all new sewers.

*[(5)]***(3)** Details of Design and Construction.

[(A) Minimum Size. Gravity sewers conveying raw wastewater shall be no less than eight inches (8") (20 cm) in diameter, except in circumstances where smaller diameter pipe can be justified.

(B) Depth. All sewers shall be sufficiently deep so as to receive wastewater from basements and shall be covered with at least thirty-six inches (36") (91 cm) of soil, other insulation, or material to prevent freezing and to protect them from superimposed loads.

(C) Buoyancy. Buoyancy of sewers shall be considered and flotation of the pipe shall be prevented with appropriate construction where high groundwater conditions are anticipated.

(D) Slope.

1. All sewers shall be designed and constructed to give mean velocities, when flowing full, of not less than two feet (2') per second (0.6 m/s). The following are the minimum slopes which should be provided for sewers forty-two inches (42") (107 cm) or less; however, slopes greater than these may be desirable for construction, to control sewer gases, or to maintain self-cleansing velocities at all rates of flow within the design limits:

Nominal Sewer Size	*Minimum Slope in Feet Per 100 Feet (m/100 m)*
8 inch (20 cm)	*0.40*
10 inch (25 cm)	*0.28*
12 inch (30 cm)	*0.22*
14 inch (36 cm)	*0.17*
15 inch (38 cm)	*0.15*
16 inch (41 cm)	*0.14*
18 inch (46 cm)	*0.12*
21 inch (53 cm)	*0.10*
24 inch (61 cm)	*0.08*
27 inch (69 cm)	*0.067*
30 inch (76 cm)	*0.058*
33 inch (84 cm)	*0.052*
36 inch (91 cm)	*0.046*
39 inch (99 cm)	*0.041*
42 inch (107 cm)	*0.037*

A. Sewer sizes not included in the above table should be designed and constructed to give mean velocities, when flowing full, of not less than three feet (3') per second (0.9 m/s), based on Manning's formula using an "n" value of 0.013.

2. Minimum flow depths. Slopes which are slightly less than the recommended minimum slopes may be permitted. Such decreased slopes may be considered where the depth of flow will be one-third (1/3) of the diameter or greater for design average flow. Whenever decreased slopes are selected, the design engineer must furnish with his/her engineering report or facility plan computations of the anticipated flow velocities of average daily and peak hourly flow rates. The operating authority of the sewer system will give written assurance to the department that any additional sewer maintenance required by reduced slopes will be provided.

3. Minimize solids deposition. The pipe diameter and slope shall be selected to obtain the greatest practical velocities to minimize settling problems. Oversize sewers will not be approved to justify using flatter slopes. If the proposed slope is less than the minimum slope of the smallest pipe, which can accommodate the design peak hourly flow, the actual depths and velocities at minimum, average, and design maximum day and peak hourly flow for each design section of the sewer shall be calculated by the design engineer and

be included with the plans.

4. Slope between manholes. Sewers shall be laid with uniform slope between manholes.

5. High velocity protection. Where velocities greater than fifteen feet (15') per second (4.6 m/s) are attained, special provision shall be made to protect against displacement by erosion and impact.

6. Steep slope protection. Sewers on twenty percent (20%) slope or greater shall be anchored securely with concrete anchors or equal, spaced as follows:

A. Not over thirty-six feet (36') (11 m) center-to-center on grades twenty percent (20%) and up to thirty-five percent (35%);

B. Not over twenty-four feet (24') (7.3 m) center-to-center on grades thirty-five percent (35%) and up to fifty percent (50%); and

C. Not over sixteen feet (16') (4.9 m) center-to-center on grades fifty percent (50%) and over.

(E) Alignment.

1. Sewers twenty-four inches (24") (61 cm) or less shall be laid with straight alignment between manholes. Straight alignment shall be checked by either using a laser beam or lamping.

2. Curvilinear alignment of sewers larger than twenty-four inches (24") (61 cm) may be considered on a case-by-case basis provided compression joints are specified and ASTM or specific pipe manufacturers' maximum allowable pipe joint deflection limits are not exceeded. Curvilinear sewers shall be limited to simple curves which start and end at manholes. When curvilinear sewers are proposed, the recommended minimum slopes indicated in paragraph (5)(D)1. of this rule must be increased accordingly to provide a minimum velocity of two feet (2') per second (0.6 m/s) when flowing full.

(F) Changes in Pipe Size.

1. When a smaller sewer joins a larger one, a manhole is required according to subparagraph (6)(A)1.B. of this rule. The invert of the larger sewer should be lowered sufficiently to maintain the same energy gradient. An approximate method for securing these results is to place the 0.8 depth point of both sewers at the same elevation.

2. Sewer extensions should be designed for projected flows. When the diameter of the receiving sewer is less than the diameter of the proposed extension at a manhole, the manhole shall be constructed with special consideration of an appropriate flow channel to minimize turbulence. The department may require a schedule for construction of future downstream sewer relief.

(G) Materials. Any generally accepted material for sewers will be given consideration, but the material selected should be adapted to local conditions, such as character of industrial wastes, possibility of septicity, soil characteristics, exceptionally heavy external loadings, abrasion, corrosion, and similar problems.

1. All sewer pipe and joint materials shall conform to the appropriate ASTM specifications.

2. Suitable couplings complying with ASTM specifications shall be used for joining dissimilar materials. The leakage limitations on these joints shall be in accordance with paragraph (5)(I)4. or (5)(I)5. of this rule.

3. All sewers shall be designed to prevent damage from superimposed live, dead, and frost-induced loads. Proper allowance for loads on the sewer shall be made because of soil and potential groundwater conditions, as well as the width and depth of the trench. Where necessary, special bedding, haunching, initial backfill, concrete cradle, or other special construction shall be used to withstand anticipated potential superimposed loading or loss of trench wall stability. See ASTM D2321 or ASTM C12 when appropriate.

4. For new pipe or joint materials for which ASTM standards have not been established, the design engineer shall provide complete material and installation specifications developed on the basis of criteria adequately documented and certified in writing by the pipe manufacturer to be satisfactory for the specific detailed plans for approval by the department.]

*[(H)]***(A)** Installation. **The applicant must comply with the appropriate manufacturer's recommendations and installation procedures.**

[1. Standards. Installation specifications shall contain appropriate requirements based on the criteria, standards, and requirements established by industry in its technical publications. Requirements shall be set forth in the specifications for the pipe and methods of bedding and backfilling thereof so as not to damage the pipe or its joints, impede cleaning operations, and future tapping, nor create excessive side fill pressures and ovalation of the pipe, nor seriously impair flow capacity.

2. Trenching.

A. The width of the trench shall be ample to allow the pipe to be laid and jointed properly and to allow the bedding and haunching to be placed and compacted to adequately support the pipe. The trench sides shall be kept as nearly vertical as possible. When wider trenches are specified, appropriate bedding class and pipe strength shall be used.

B. In unsupported and unstable soil, the size and stiffness of the pipe, stiffness of the embedment, insitu soil, and depth of cover shall be considered in determining the minimum trench width necessary to adequately support the pipe.

C. Ledge rock, boulders, and large stones shall be removed to provide a minimum clearance of four inches (4") (10 cm) below and on each side of all pipe(s).

D. Dewatering. All water entering the excavations or other parts of the work shall be removed until all the work has been completed. No sanitary sewer that ultimately arrives at existing pumping stations or wastewater treatment facilities shall be used for the disposal of trench water.

3. Bedding, haunching, and initial backfill.

A. Rigid pipe. Bedding Classes A, B, C, or crushed stone, as described in ASTM C12, shall be used and carefully compacted for all rigid pipe provided the proper strength pipe is used with the specified bedding to support the anticipated load, based on the type of soil encountered and potential groundwater conditions.

B. Ductile iron pipe. Embedment materials for bedding and initial backfill, as described in ASTM A746, for Type 1 through Type 5 laying conditions, shall be used for ductile iron pipe provided the proper strength pipe is used with the specified bedding to support the anticipated load based on the type of soil encountered and potential groundwater conditions.

C. Plastic pipe. Embedment materials for bedding, haunching, and initial backfill, Classes I, II, or III, as described in ASTM D2321, shall be used and carefully compacted for all flexible pipe provided the proper strength pipe is used with the specified bedding to support the anticipated load, based on the type of soil encountered and potential groundwater conditions.

D. Composite pipe. Except as described in ASTM D2680, the bedding, haunching, and initial backfill requirements for composite pipe shall be the same as for plastic pipe.

4. Final backfill.

A. Final backfill shall be of a suitable material removed from excavation except where other material is specified. Debris, frozen material, large clods, stones, organic matter,

or other unstable materials shall not be used for final backfill within two feet (2') (0.6 m) of the top of the pipe.

B. Final backfill shall be placed in such a manner so as not to disturb the alignment of the pipe.]

*[5.]***(B)** Deflection test. **No pipe shall exceed a deflection of five percent (5%) of the inside diameter.**

[A. Deflection tests shall be performed on all flexible pipe. The test shall be conducted after the final backfill has been in place at least thirty (30) days to permit stabilization of the soil-pipe system.

B. No pipe shall extend a deflection of five percent (5%). If the deflection exceeds five percent (5%), the pipe shall be excavated. Replacement or correction shall be accomplished in accordance with requirements in the department-approved specifications.

C. The rigid ball or mandrel used for the deflection test shall have a diameter not less than ninety-five percent (95%) of the base inside diameter or average inside diameter of the pipe depending on which is specified in the ASTM specification, including the appendix, to which the pipe is manufactured. The test shall be performed without mechanical pulling devices. A mandrel must have nine (9) or more odd number of flutes or points.]

[6. Video inspection. Video inspection of all new and rehabilitated sewers after installation is recommended.]

*[(I)]***(C)** Joints and Infiltration.

[1. Joints. The installation of joints and the materials used shall be included in the specifications. Sewer joints shall be designed to minimize infiltration and to prevent the entrance of roots throughout the life of the system.]

*[2.]***1.** Service connections. Service connections to the sewer main shall be watertight and **can**not protrude into the sewer. *[If a saddle-type connection is used, it shall be a device designed to join with the types of pipe which are to be connected. All materials used to make service connections shall be compatible with each other and with the pipe materials to be joined and shall be corrosion proof.]*

*[3.]***2.** Leakage tests. Leakage tests shall be specified **for gravity sewers except polyvinyl chloride (PVC) pipe with a diameter of twenty-seven inches (27") or less**. *[This may include appropriate water or low pressure air testing. The testing selected should take into consideration the range in groundwater elevations during the test and anticipated during the design life of the sewer.]*

*[4.]***A.** Water (hydrostatic) test. The leakage exfiltration or infiltration shall not exceed one hundred (100) gallons per inch of pipe diameter per mile per day *[(0.38 m^3/cm of pipe diameter/km/day)]* for any section between manholes of the system. An exfiltration or infiltration test shall be performed with a minimum positive head of two feet (2') *[(0.6 m)]*. **The exfiltration or infiltration test shall conform to the test procedure described in ASTM C969 – 17 *Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines*, as approved and published April 1, 2017, for precast concrete pipe. This standard is hereby incorporated by reference into this rule, as published by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. This rule does not incorporate any subsequent amendments or additions.**

*[5.]***B.** Air test. The air test shall, *[as a minimum]* conform to the test procedure described in *[ASTM C828 for clay pipe, ASTM C924 for concrete pipe twenty-four inches (24") or less in diameter,]* ASTM C1103 **– 14 *Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines*, as approved and published November 1, 2014,** for concrete pipe twenty-seven inches (27") or greater in diameter, and ASTM F1417 **– 11a(2015) *Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air*, as approved and published August 1, 2015,** for plastic, composite, and ductile iron pipe. *[All other materials shall have test procedures approved by the department.]* **These standards are hereby incorporated by reference into this rule, as published by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. This rule does not incorporate any subsequent amendments or additions.**

[(J) Alternative Installation Methods (Trenchless Technologies). Trenchless technologies shall be evaluated by the department on a case-by-case basis.]

(D) Bore or Tunnel. Where casing pipe is utilized it shall be constructed of steel with welded joints conforming to AWWA C200-17 *Steel Water Pipe, 6 In. (150 mm) and Larger*, as approved and published August 1, 2017, or ductile iron pipe with mechanical joints. This standard is hereby incorporated by reference into this rule, as published by American Water Works Association (AWWA), 6666 West Quincy Avenue, Denver, CO 80235-3098. This rule does not incorporate any subsequent amendments or additions;

*[(6)]***(4)** Manholes.

(A) Location.

[1.] Manholes shall be installed—

*[A.]***1.** At the end of each line;

*[B.]***2.** At all changes in grade, size, or alignment; **and**

*[C.]***3.** At all sewer pipe intersections*[;]***.**

[D. At distances not greater than four hundred feet (400') (120 m) for sewers fifteen inches (15") (38 cm) or less; and

E. At distances not greater than five hundred feet (500') (150 m) for sewers sixteen inches to thirty inches (16"–30") (46 cm–76 cm).

2. Spacing of manholes greater than five hundred feet (500') (150 m) may be approved by the department in cases where adequate cleaning equipment can justify such spacing.

3. Greater spacing may be permitted in larger sewers.

4. Cleanouts may be used only for special conditions and shall not be substituted for manholes nor installed at the end of laterals greater than one hundred fifty feet (150') (46 m) in length.]

(B) Drop Type. **When using precast manholes, drop connections must not enter the manhole at a joint.**

[1. A drop pipe shall be provided for a sewer entering a manhole at an elevation of twenty-four inches (24") (61 cm) or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than twenty-four inches (24") (61 cm), the invert shall be filleted to prevent solids deposition.

2. Drop manholes should be constructed with outside drop connection. Inside drop connections can be used when the manhole diameter is sufficient to secure the drop pipe to the interior wall of the manhole and provide adequate access for cleaning.

3. When using precast manholes, drop connections must not enter the manhole at a joint.

4. Due to the unequal earth pressures that would result from the backfilling operation in the vicinity of the manhole, the entire outside drop connection shall be encased in concrete.]

(C) Diameter. *[The minimum diameter of manholes shall be forty-two inches (42") (107 cm) on eight-inch (8") (20 cm) diameter gravity sewer lines and forty-eight inches (48") (122 cm) on all sewer lines larger than eight inches (8") (20 cm) in diameter. Larger diameter manholes are necessary for large diameter sewers in order to maintain structural integrity. A minimum access diameter of twenty-two inches (22") (56 cm) shall be provided.]* **Cleanouts shall be a minimum of**

eight inches (8") for pipes eight inches (8") in diameter or larger and equal to the diameter for pipes less than eight inches (8").

[(D) Flow Channel.

1. The flow channel straight through a manhole should be made to conform as closely as possible in shape and slope to that of the connecting sewers, without obstructing maintenance, inspection, or flow in the sewers.

2. When curved flow channels are specified in manholes, including branch inlets, minimum slopes indicated in paragraph (5)(D)1. of this rule should be increased to maintain acceptable velocities.]

*[(E)]***(D)** Bench. *[A bench shall be provided on each side of any manhole channel when the pipe diameter(s) are less than the manhole diameter. The bench should be sloped no less than a one-half inch per foot (0.5 in/ft) (12.7 mm/m).]* No **sewer, service connection, or drop manhole** pipe shall discharge onto the surface of the bench.

*[(F)]***(E)** Watertightness.

[1.] Manholes shall be watertight*[. Manholes shall be of the precast concrete or poured-in-place concrete type. Precast manholes shall conform to the design and test methods specified in ASTM C478 and C497]***, constructed, and installed in accordance with the manufacturer's recommendations and procedures**.

[2. Manhole lift holes, grade adjustment rings, precast section joints, and any additional areas potentially subject to infiltration shall be sealed watertight.

3. Inlet and outlet pipes shall be joined to the manhole with a gasketed flexible watertight connection or any watertight connection arrangement that allows differential settlement of the pipe and manhole wall to take place.

4. Watertight manhole covers are to be used wherever the manhole tops may be flooded by street runoff or high water. Bolt-down cover assemblies may be needed on manholes subject to displacement by sewer surcharging. Locked manhole covers may be desirable in isolated easement locations or where vandalism may be a problem.]

*[(G)]***(F)** Inspection and Testing. *[The specifications shall include a requirement for inspection and testing for watertightness or damage prior to placing into service.]*

1. Vacuum testing, if specified for concrete sewer manholes, shall conform to the test procedures in ASTM C1244 **– 11(2017)** ***Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill*****, as approved and published April 1, 2017,** or the manufacturer's recommendation. **This standard is hereby incorporated by reference into this rule, as published by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. This rule does not incorporate any subsequent amendments or additions.**

2. Exfiltration testing, if specified for concrete sewer manholes, shall conform to the test procedures in ASTM C969 **– 17** ***Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines*****, as approved and published April 1, 2017**. **This standard is hereby incorporated by reference into this rule, as published by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. This rule does not incorporate any subsequent amendments or additions**.

[(H) Corrosion Protection for Manholes. Where corrosive conditions due to septicity or other causes are anticipated, corrosion protection on the interior of the manholes shall be provided.

(I) Electrical. Electrical equipment installed or used in manholes shall conform to 10 CSR 20-8.130(4)(C)5.

(7) Inverted Siphons. Inverted siphons shall have not less than two (2) barrels, with a minimum pipe size of six inches (6") (15 cm). They shall be provided with necessary appurtenances for maintenance, convenient flushing, and cleaning equipment. The inlet and discharge structures shall have adequate clearances for cleaning equipment, inspection, and flushing. Design shall provide sufficient head and appropriate pipe sizes to secure velocities of at least three feet (3') per second (0.9 m/s) for design average flows. The inlet and outlet details shall be arranged so that the design average flow is diverted to one (1) barrel and so that either barrel may be cut out-of-service for cleaning. The vertical alignment should permit cleaning and maintenance.

(8) Sewers in Relation to Streams.

(A) Location of Sewers in Streams.

1. Cover depth. The top of all sewers entering or crossing streams shall be at a sufficient depth below the natural bottom of the stream bed to protect the sewer line. In general, the following cover requirements must be met:

A. One foot (1') (0.3 m) of cover is required where the sewer is located in rock;

B. Three feet (3') (0.9 m) of cover is required in other material. In major streams, more than three feet (3') (0.9 m) of cover may be required;

C. In paved stream channels, the top of the sewer line should be placed below the bottom of the channel pavement; and

D. Less cover will be approved only if the proposed sewer crossing will not interfere with future modifications to the stream channel. Justification for requesting less cover shall be provided to the department.

2. Horizontal location. Sewers along streams shall be located sufficiently outside the stream bed to prevent pollution by siltation during construction and to minimize possible exposure due to erosion.

3. Structures. The sewer outfalls, headwalls, manholes, gateboxes, or other structures shall be located so they do not interfere with the free discharge of flood flows of the stream.

4. Alignment. Sewers crossing streams should be designed to cross the stream as nearly perpendicular to the stream flow as possible and shall be free from change in grade.

5. Sewer systems shall be designed to minimize the number of stream crossings.

(B) Construction.

1. Materials. Sewers entering or crossing streams shall be constructed of ductile-iron pipe with mechanical joints; otherwise, they shall be constructed so they will remain watertight and free from changes in alignment or grade. Material used to backfill the trench shall be stone, coarse aggregate, washed gravel, or other materials which will not readily erode, cause siltation, damage pipe during placement, or corrode the pipe.

2. Siltation and erosion. Construction methods that will minimize siltation and erosion shall be employed. The design engineer shall include in the project specifications the method(s) to be employed in the construction of sewers in or near streams. Such methods shall provide adequate control of siltation and erosion by limiting unnecessary excavation, disturbing or uprooting trees and vegetation, dumping of soil or debris, or pumping silt-laden water into the stream. Specifications shall require that clean-up, grading, seeding, planting, or restoration of all work areas shall begin immediately. Exposed areas shall not remain unprotected for more than seven (7) days.

(9) Aerial Crossings.

(A) Support shall be provided for all joints in pipes utilized

for aerial crossings. The supports shall be designed to prevent frost heave, overturning, and settlement.

(B) Precautions against freezing, such as insulation and increased slope, shall be provided. Expansion jointing shall be provided between above-ground and below-ground sewers. Where buried sewers change to aerial sewers, special construction techniques shall be used to minimize frost heaving.

(C) For aerial stream crossings, the impact of flood waters and debris shall be considered. The bottom of the pipe should be placed no lower than the elevation of the fifty (50)-year flood.

(D) Aerial crossings shall be constructed of ductile-iron pipe with mechanical joints; otherwise, they shall be constructed so that they will remain watertight and free from changes in alignment or grade.]

*[(10)]***(5)** Protection of Water Supplies.

(A) Cross Connections *[Prohibited]*. There shall be no physical connections between a public or private potable water supply system and a sewer*[,]* or appurtenance *[thereto which]* **that** would permit the passage of any wastewater or polluted water into the potable supply. *[No water pipe shall pass through or come in contact with any part of a sewer manhole.]*

(B) Relation to Water Works Structures. **Sewers shall be laid at least fifty feet (50') in a horizontal direction from any existing or proposed public water supply well or other water supply sources or structures. Sewers must also comply with 10 CSR 23-3.010.**

[1. While no general statement can be made to cover all conditions, it is recognized that sewers shall meet the requirements of 10 CSR 23-3.010 with respect to minimum distances from public water supply wells or other water supply sources and structures.

2. All existing water works units, such as basins, wells, or other treatment units, within two hundred feet (200') (60 m) of the proposed sewer shall be shown on the engineering plans.

(C) Relation to Water Mains

1. Horizontal and vertical separation.

A. Sewer mains shall be laid at least ten feet (10') (3.0 m) horizontally from any existing or proposed water main. The distances shall be measured edge-to-edge. In cases where it is not practical to maintain a ten-foot (10') (3.0 m) separation, the department may allow deviation on a case-by-case basis, if supported by data from the design engineer. Such a deviation may allow installation of the sewer closer to a water main, provided that the water main is in a separate trench or on an undisturbed earth shelf located on one (1) side of the sewer and at an elevation so the bottom of the water main is at least eighteen inches (18") (46 cm) above the top of the sewer.

B. If it is impossible to obtain proper horizontal and vertical separation as described above for sewers, the sewer must be constructed of slip-on or mechanical joint pipe or continuously encased and be pressure tested to one hundred fifty pounds per square inch (150 psi) (1,034 kPa) to assure watertightness.

C. Manholes should be located at least ten feet (10') (3.0 m) horizontally from any existing or proposed water main.

2. Crossings.

A. Sewers crossing water mains shall be laid to provide a minimum vertical distance of eighteen inches (18") (46 cm) between the outside of the water main and the outside of the sewer. This shall be the case where the water main is either above or below the sewer. The crossing shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints. Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer to maintain line and grade.

B. When it is impossible to obtain proper vertical separation as stipulated above, one (1) of the following methods must be specified:

(I) The sewer shall be designed and constructed equal to water pipe and shall be pressure tested to assure watertightness prior to backfilling; or

(II) Either the water main or sewer line\may be continuously encased or enclosed in a watertight carrier pipe which extends ten feet (10') (3.0 m) on both sides of the crossing, measured perpendicular to the water main. The carrier pipe shall be of materials approved by the department for use in water main construction.]

*AUTHORITY: section 644.026, RSMo [2000] **2016**. Original rule filed Aug. 10, 1978, effective March 11, 1979. Amended: Filed May 17, 1994, effective Dec. 30, 1994. Amended: Filed June 28, 2011, effective Feb. 29, 2012. Amended: Filed June 15, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Department of Natural Resources, Division of Environmental Quality, Water Protection Program, John Rustige, PO Box 176, Jefferson City, MO 65102. Comments may be sent with name and address through e-mail to john.rustige@dnr.mo.gov. Public comments must be received by August 23, 2018. The public hearing is scheduled for 10 AM, on August 12, 2018, at the Department of Natural Resources, Elm Street Conference Center, Bennett Spring Conference Room, 1730 East Elm Street, Jefferson City, Missouri 65101.

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

PROPOSED RULE

10 CSR 20-8.125 Alternative Sewer Systems

PURPOSE: This rule specifies the minimum standards for the design of alternative sewer systems that are part of wastewater collection and treatment systems. This rule is to be used with rules 10 CSR 20-8.110 through 10 CSR 20-8.210. It does not address all aspects of design, and the design engineer may refer to other appropriate reference materials so long as these minimum standards set forth in this rule are met.

(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. In the event 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. Requirements for these facilities are found in 10 CSR 20-8.300.

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

(2) Approval of Sewers. For sewer approval, follow the provisions listed in 10 CSR 20-8.120(2).

(3) Supplement to the Engineering Report. Alternative sewer systems shall not to be used in lieu of conventional gravity sewers, but may be acceptable when it can be shown in the engineering report that it is not feasible to provide conventional gravity sewers. For more information, follow the provisions in 10 CSR 20-8.110(4).

(4) General.

(A) Continuing Authority. The continuing authority must be responsible for the operation and maintenance and modernization of an alternative sewer system collection system. See 10 CSR 20-6.010(2) for acceptable continuing authorities.

(B) Flooding. For flood protection, follow the provisions in 10 CSR 20-8.140(2)(B).

(C) Accessibility. For pumping station structure and septic tank accessibility, follow the provisions listed in 10 CSR 20-8.140(2)(D).

(D) Security. For fencing criteria, follow the provisions in 10 CSR 20-8.140(7)(A).

(E) Potable Water Sources. For the minimum separation distances from potable water sources, follow the provisions in 10 CSR 20-8.130(2)(D).

(F) Protection of Water Supplies. For the separation and crossings of water supplies, follow the provisions in 10 CSR 20-8.120(5).

(5) Pressure Sewers.

(A) Sewer Design.

1. Velocity. Design shall be based on the most probable number of pumping units expected to operate simultaneously or on some other acceptable method of computing the peak pumpage rate.

A. A cleansing velocity of at least two feet per second (2 ft/s) at least once and preferably several times per day shall be achieved.

2. Minimum size. The minimum diameter sewer main pipe shall not be less than one and a half inches (1.5").

3. Installation. For sewer installation, follow the provisions in 10 CSR 20-8.120(3).

4. Hydrostatic pressure test. The applicant must comply with the manufacturer's recommended testing procedures.

(B) Sewer Appurtenances. Appurtenances shall be compatible with the piping system and full bore with smooth interior surfaces to eliminate obstruction and keep friction loss to a minimum.

1. Isolation valves shall be—

A. Comprised of resilient seated gate valve or ball valve with a position indicator;

B. Constructed from corrosion resistant materials; and

C. Enclosed in a watertight and lockable valve box.

2. Isolation valves shall be installed on—

A. The upstream side of major pipe intersections;

B. Both sides of stream, bridge, and railroad crossings, and unstable soil; and

C. The terminal end of the system to facilitate future extensions.

3. Proper support (e.g., crushed stone, concrete pads, or a well compacted trench bottom) shall be provided for valves so the weight of the valve not carried by the pipe.

(C) Service Line Connection. The minimum diameter service line pipe shall be one and one quarter inches (1.25").

(D) Grinder Pump Stations.

1. Number of pumps.

A. Simplex grinder pump station shall—

(I) Not serve multiple equivalent dwelling units (EDU) if owned, operated, and maintained by individual homeowners; and

(III) Not serve commercial facilities.

B. Multiple unit grinder pump stations must be owned, operated, and maintained by an approved continuing authority. See subsection (4)(A) of this rule for more continuing authority information.

2. Grinder pump vaults shall be watertight.

3. Storage volume. A grinder pump vault shall have a storage volume of at least seventy (70) gallons.

4. Valves. The following valves must be provided in the grinder pump vaults:

A. A shutoff valve accessible from the ground surface;

B. A check valve to prevent backflow; and

C. An anti-siphon valve, where siphoning could occur.

5. Grinder pump construction. For design of pumps and motors, follow the provisions in 10 CSR 20-8.130(5).

6. Controls. For water level control design, follow the provisions in 10 CSR 20-8.130(5).

7. Electrical equipment. For electrical equipment, follow the provisions in 10 CSR 20-8.130(3)(C).

8. Emergency operations. When the continuing authority operates and maintains the grinder pump stations, provisions must be made for periods of mechanical or power failure.

(6) Septic Tank Effluent Pumped (STEP) Sewers.

(A) Sewer Design. Follow the provisions in subsection (5)(A) of this rule.

(B) Sewer Appurtenances. Follow the provisions in subsection (5)(B) of this rule.

(C) Service Line Connection. Follow the provisions in subsection (5)(C) of this rule.

(D) Septic Tank Design. Follow the provisions in 10 CSR 20-8.180(2). Additionally, septic tank design shall:

1. Provide at least one (1) septic tank to serve each EDU;

2. Provide at least one thousand (1,000) gallons capacity; and

3. Provide twenty percent (20%) of the septic tank volume for freeboard and ventilation.

(E) Existing Septic Tanks. When existing on-site septic tanks are proposed for reuse in an alternative sewer system, they must be inspected and verified watertight prior to acceptance. Follow the provisions in subsection (6)(D) of this rule for the minimum design of acceptable existing septic tanks proposed for reuse.

(F) Pump Vault Design.

1. Number of pumps. Duplex pumps shall be provided where the design flow from the EDUs, or other, is one thousand five hundred (1,500) gallons per day or greater.

2. Pump removal. Follow the provisions in 10 CSR 20-8.130(5)(A).

3. Valves. Follow the provisions in paragraph (5)(D)4. of this rule.

4. Controls. For water level control design, follow the provisions in 10 CSR 20-8.130(3)(C).

5. Electrical equipment. Follow the provisions in 10 CSR 20-8.130(3)(B)2.

6. Emergency operations. Provisions must be made for periods of mechanical or power failure.

(7) Septic Tank Effluent Gravity (STEG) Sewers.

(A) Sewer Design.

1. Minimum size. The minimum diameter sewer main pipe shall not be less than four inches (4").

2. Installation. Follow the provisions in 10 CSR 20-8.120(3)(A).

3. Leakage tests. Follow the provisions in 10 CSR 20-8.120(3)(B).

(B) Sewer Appurtenances. Follow the provisions in subsection (5)(B) of this rule. When manholes are utilized at major junctions of sewer mains, follow the provisions in 10 CSR 20-8.120(4).

(C) Service Line Connection. Follow the provisions in subsection (5)(C) of this rule.

1. The diameter of service line pipe shall not be less than four inches (4").

(D) Septic Tank Design. Follow the provisions in subsections (6)(D) through (6)(E) of this rule.

(8) Combination of Sewers. A pressure sewer system discharging to a downstream STEP or STEG sewer system shall not be permitted, as effluent sewers are not designed to carry settleable solids and grease.

AUTHORITY: section 644.026, RSMo 2016. Original rule filed June 15, 2018.

PUBLIC COST: This proposed rule will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed rule will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed rule with the Department of Natural Resources, Division of Environmental Quality, Water Protection Program, John Rustige, PO Box 176, Jefferson City, MO 65102. Comments may be sent with name and address through email to john.rustige@dnr.mo.gov. Public comments must be received by August 23, 2018. The public hearing is scheduled for 10 AM, on August 15, 2018, at the Department of Natural Resources, Elm Street Conference Center, Bennett Spring Conference Room, 1730 East Elm Street, Jefferson City, Missouri 65101.

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

PROPOSED AMENDMENT

10 CSR 20-8.130 *[Sewage]* **Pumping Stations**. The Clean Water Commission is amending sections (1) through (7), and removing sections (8) though (11).

PURPOSE: This amendment will retain and add minimum design standards for pumping stations that are required to protect or improve public health, safety, and water quality.

PURPOSE: [The following criteria have been prepared as a guide for the design of sewage pumping stations. This rule is to be used with rules 10 CSR 20-8.110–10 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 as regards adequacy of design, submission of plans, approval of plans and approval of completed sewage works. Deviation from these minimum requirements will be allowed where sufficient documentation is presented to justify the deviation. These criteria are taken largely from Great Lakes-Upper Mississippi River Board of State Sanitary Engineers Recommended Standards for Sewage Works 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. Addenda or supplements to this publication will be furnished to consulting engineers and city engineers. If others desire to receive addenda or supplements, please advise the Clean Water Commission so that names can be added to the mailing list.] ***This rule specifies the minimum standards for the design of pumping stations that are part of wastewater collection and treatment systems. This rule is to be used with rules 10 CSR 20-8.110 through 10 CSR 20-8.210. It does not address all aspects of design, and the design engineer may refer to other appropriate reference materials so long as these minimum standards set forth in this rule are met.***

[(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 agency is concerned, unless justification is presented for deviation from the requirements. Other terms, such as should, recommend, preferred and the like, indicate discretionary requirements on the part of the agency and deviations are subject to individual consideration.

(2) Exceptions. This rule shall not apply to facilities designed for twenty-two thousand five hundred (22,500) gallons per day (85.4m^3) or less, see 10 CSR 20-8.020 for the requirements for those facilities.

(3) General.

(A) Flooding. Sewage pumping station structures and electrical and mechanical equipment shall be protected from physical damage by the one hundred (100)-year flood. Sewage pumping stations should remain fully operational and accessible during the twenty-five (25)-year flood.

(B) Accessibility. The pumping station shall be readily accessible by maintenance vehicles during all weather conditions. The facility should be located off the traffic way of streets and alleys.

(C) Grit. Where it is necessary to pump sewage prior to grit removal, the design of the wet well and pump station piping shall receive special consideration to avoid operational problems from the accumulation of grit.]

(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. In the event 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. Requirements for these facilities are found in 10 CSR 20-8.300.

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

(2) General.

(A) Flood Protection. For flood protection follow the provisions in 10 CSR 20-8.140(2)(B).

(B) Access Road. For access roads to pump station sites follow the provisions in 10 CSR 20-8.140(2)(D).

(C) Safety. For safety follow the applicable portions of 10 CSR 20-8.140(8).

(D) Potable Water Sources. The distance between wastewater pumping stations and all potable water sources shall be at least fifty feet (50') in accordance with 10 CSR 23-3.010(2)(A)5.

(E) Housed Wet Wells. Design housed wet well ventilation in accordance with 10 CSR 20-8.140(8)(J).

*[(4)]***(3)** Design.

[(A) Type. Sewage pumping stations should be of the wet/dry well type. Other types as set forth under sections (5) and (6) of this rule may be approved where circumstances justify their use.]

*[(B)]***(A)** Structures.

1. Separation. Dry wells, including their superstructure, shall be completely separated from the wet well **with gas tight common walls**.

[2. Equipment removal. Provision shall be made to facilitate removing pumps, motors and other mechanical and electrical equipment.]

*[3.]***2.** Access. Suitable and safe means of access *[shall be provided]* to dry wells and to wet wells *[containing either bar screens or mechanical equipment requiring inspection or*

maintenance. For built-in-place pump stations, a stairway with rest landings shall be provided at vertical intervals not to exceed twelve feet (12') (3.7m). For factory-built pump stations over fifteen feet (15') (4.6m) deep, a rigidly fixed landing shall be provided at vertical intervals not to exceed ten feet (10') (3.0m). Where a landing is used, a suitable and rigidly fixed barrier shall be provided to prevent an individual from falling past the intermediate landing to a lower level. Where approved by the agency, a manlift or elevator may be used in lieu of landings in a factory-built station, provided emergency access is included in the design. Reference should be made to local, state and federal safety codes and, if they are more stringent, they shall govern (also see 10 CSR 20-8.140(8)(F))] **shall be provided to persons wearing self-contained breathing apparatus**.

[4. Construction materials. Due consideration shall be given to the selection of materials because of the presence of hydrogen sulfide and other corrosive gases, greases, oils and other constituents frequently present in sewage.]

*[(C)]***(B)** Pumps *[and Pneumatic Ejectors]*.

1. Multiple units. *[At least two (2) pumps or pneumatic ejectors shall be provided. A minimum of three (3) pumps should be provided for stations handling flows greater than one (1) mgd (3800m^3/d). If only two (2) units are provided, they should have the same capacity. Each shall be capable of handling flows in excess of the expected maximum flow. Where three (3) or more units are provided, they should be designed to fit actual flow conditions and must be of a capacity that with any one (1) unit out-of-service the remaining units will have capacity to handle maximum sewage flows.]* **Multiple pumps shall be provided except for design average flows of less than fifteen hundred (1,500) gallons per day.**

[2. Protection against clogging. Pumps handling combined sewage shall be preceded by readily accessible bar racks to protect the pumps from clogging or damage. Bar racks should have clear openings not exceeding two and one-half inches (2 1/2") (6.4 cm). Where a bar rack is provided, a mechanical hoist shall also be provided. Where the size of the installation warrants, mechanically cleaned and/or duplicate bar racks shall be provided. Pumps handling separate sanitary sewage from thirty inches (30") (76 cm) or larger diameter sewers shall be protected by bar racks meeting these requirements. Appropriate protection from clogging shall also be considered for small pumping stations.

3. Pump openings. Except where grinder pumps are used, pumps shall be capable of passing spheres of at least three inches (3") (7.6 cm) in diameter and pump suction and discharge piping shall be at least four inches (4") (10.2 cm) in diameter.

4. Priming. The pump shall be so placed that under normal operating conditions it will operate under a positive suction head, except as specified in section (5) of this rule.]

*[5.]***2.** Electrical equipment. *[Electrical systems and components (for example, motors, lights, cables, conduits, switchboxes, control circuits, etc.) in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present, including raw sewage wet wells, shall be suitable for hazardous locations(National Electrical Code , Class I, Group D, Division 1, location). In addition,]* **Electrical equipment shall be provided with the following requirements:**

A. Electrical equipment must comply with 10 CSR 20-8.140(7)(B);

B. Utilize corrosive resistant equipment located in the wet well *[shall be suitable for use under corrosive conditions. Each flexible cable shall be provided with]***;**

C. **Provide a** watertight seal and separate strain relief*[.]* **for all flexible cable;**

D. Install *[A]***a** fused disconnect switch located above ground *[shall be provided]* **for the main power feed** for all pumping stations.

E. When *[the]* **such** equipment is exposed to weather, it shall *[meet]* **comply with** the requirements of weather proof equipment *[(NEMA 3R).]***; enclosure NEMA 4; NEMA 4X where necessary; and NEMA Standard 250-2014, published December 15, 2014. This standard is hereby incorporated by reference into this rule, as published by National Electrical Manufacturers Association, 1300 North 17th Street, Arlington, VA 22209;**

F. Install lightning and surge protection systems;

G. Install a one hundred ten volt (110 V) power receptacle inside the control panel located outdoors to facilitate maintenance; and

H. Provide Ground Fault Circuit Interruption (GFCI) protection for all outdoor receptacles.

[6. Intake. Each pump should have an additional individual intake. Wet well design should be such as to avoid turbulence near the intake. Intake piping should be as straight and short as possible.

7. Dry well de-watering. A separate sump pump equipped with dual check valves shall be provided in the dry wells to remove leakage or drainage with the discharge located as high as possible. A connection to the pump suction is also recommended as an auxiliary feature. Water ejectors connected to a potable water supply will not be approved. All floor and walkway surfaces should have an adequate slope to a point of drainage. Pump seal water shall be piped to the sump.

8. Pumping rates. The pumps and controls of main pumping stations and especially pumping stations pumping to the treatment works or operated as part of the treatment works should be selected to operate at varying delivery rates to permit discharging sewage at approximately its rate of delivery to the pump station. Design pumping rates should be established in accordance with 10 CSR 20-8.120(5) or 10 CSR 20-8.140(5)(C)1. as appropriate.]

*[(D)]***(C)** Controls. **Water level controls must be accessible without entering the wet well.**

[1. Type. Control systems shall be of the air bubbler type, the encapsulated float type or the flow measuring type. Float tube control systems on existing stations being upgraded may be approved. The electrical equipment shall be suitable for hazardous locations (National Electrical Code, Class I, Group D, Division 1 location).

2. Location. The control system shall be located away from the turbulence of incoming flow and pump suction.

3. Alternation. In small stations, provisions should be made to automatically alternate the pumps in use.]

*[(E)]***(D)** Valves. **Valves shall not be located in the wet well unless integral to a pump or its housing**.

[1. Suitable shutoff valves shall be placed on the suction line of each pump except on submersible and vacuum primed pumps.

2. Suitable shutoff and check valves shall be placed on the discharge line of each pump. The check valve shall be located between the shutoff valve and the pump. Check valves shall be suitable for the material being handled. Check valves shall not be placed on the vertical portion of discharge piping. Valves shall be capable of withstanding normal pressure and water hammer. Where limited pump backspin will not damage the pump and low discharge head conditions exist, short individual force mains for each pump may be considered in lieu of discharge valves.

3. Valves shall not be located in the wet well.]

*[(F)]***(E)** Wet Wells. **Covered wet wells shall have provisions for air displacement to the atmosphere, such as an inverted and**

screened "j" tube or other means.

[1. Divided wells. Consideration should be given to dividing the wet well into multiple sections, properly interconnected, to facilitate repairs and cleaning.

2. Size. The wet well size and control setting shall be appropriate to avoid heat buildup in the pump motor due to frequent starting and to avoid septic conditions due to excessive detention time.

3. Floor slope. The wet well floor shall have a minimum slope of one to one (1:1) to the hopper bottom. The horizontal area of the hopper bottom shall not be greater than necessary for proper installation and function of the inlet.

(G) Ventilation. Adequate ventilation shall be provided for all pump stations. Where the pump pit is below the ground surface, mechanical ventilation is required, so arranged as to independently ventilate the dry well and the wet well if screens or mechanical equipment requiring maintenance or inspection are located in the wet well. There shall be no interconnection between the wet well and dry well ventilation systems. In pits over fifteen feet (15') (4.6m) deep, multiple inlets and outlets are desirable. Dampers should not be used on exhaust or fresh air ducts and fine screens or other obstructions in air ducts should be avoided to prevent clogging. Switches for operation of ventilation equipment should be marked and located conveniently. All intermittently operated ventilating equipment shall be interconnected with the respective pit lighting system. Consideration should be given also to automatic controls where intermittent operation is used. The fan wheel should be fabricated from nonsparking material. Consideration should be given to installation of automatic heating and/or dehumidification equipment.

1. Wet wells. Ventilation may be either continuous or intermittent. Ventilation, if continuous, shall provide at least twelve (12) complete air changes per hour, if intermittent, at least thirty (30) complete air changes per hour. Air shall be forced into the wet well rather than exhausted from the wet well.

2. Dry wells. Ventilation may be either continuous or intermittent. Ventilation, if continuous, shall provide at least six (6) complete air changes per hour, if intermittent, at least thirty (30) complete air changes per hour.

(H) Flow Measurement. Suitable devices for measuring sewage flow should be considered at all pumping stations.]

(F) Ventilation. Interconnection between the wet well and dry well ventilation systems is not acceptable. For ventilation follow the provisions in 10 CSR 20-8.140(8)(J).

*[(I)]***(G)** Water Supply. There shall be no physical connection between any potable water supply and a *[sewage]* **wastewater** pumping station**,** which under any conditions**,** might cause contamination of the potable water supply. If a potable water supply is brought to the station, *[it should]* comply with conditions stipulated under 10 CSR 20-8.140*[(8)(B)]***(7)(D)**.

*[(5)]***(4)** Suction Lift Pumps. *[Suction lift pumps shall be of the self priming or vacuum priming type and shall meet the applicable requirements under section (4) of this rule. Suction lift pump stations using dynamic suction lifts exceeding the limits outlined in the following subsections may be approved by the agency upon submission of factory certification of pump performance and detail calculations indicating satisfactory performance under the proposed operating conditions. Detail calculations must include static suction lift as measured from "lead pump off" elevation to center line of pump suction, friction and other hydraulic losses of the suction piping, vapor pressure of the liquid, altitude correction, required net positive suction head and a safety factor of at least six feet (6') (1.8m). The pump equipment compartment shall be above grade or offset and shall be effectively isolated from the wet well to prevent the humid and corrosive sewer atmosphere from entering the equipment compartment. Wet well access shall not be through the equipment compartment. Valving shall not be located in the wet well.]*

(A) Self-Priming Pumps. *[Self-priming pumps shall be capable of rapid priming and repriming at the "lead pump on" elevation. This self-priming and repriming shall be accomplished automatically under design operating conditions. Suction piping should not exceed the size of the pump suction and shall not exceed twenty-five feet (25') (7.6m) in total length. Priming lift at the ''lead pump on'' elevation shall include a safety factor of at least four feet (4') (1.2m) from the maximum allowable priming lift for the specific equipment at design operating conditions.]* The combined total of dynamic suction lift at the "pump off" elevation and required net positive suction head at design operating conditions shall not exceed twenty-two feet (22') *[(6.7m)]*.

(B) Vacuum Priming Pumps. Vacuum priming pump stations shall be equipped with dual vacuum pumps capable of automatically and completely removing air from the suction lift pump. *[The vacuum pumps shall be adequately protected from damage due to sewage. The combined total of dynamic suction lift at the "pump off" elevation and required net positive suction head at design operating conditions shall not exceed twenty-two feet (22") (6.7m).]*

(C) Wet Well Access. Wet well access shall not be through the equipment compartment. Provide access in accordance with paragraph (3)(A)2. of this rule.

*[(6)]***(5)** Submersible Pump Stations. Submersible pump stations shall meet the applicable requirements under section *[(4)]* **(3)** of this rule, except as modified in this section.

[(A) Construction. Submersible pumps and motors shall be designed specifically for raw sewage use, including totally submerged operation during a portion of each pumping cycle. An effective method to detect shaft seal failure or potential seal failure shall be provided and the motor shall be of squirrel-cage type design without brushes or other arc-producing mechanisms.]

*[(B)]***(A)** Pump Removal. Submersible pumps shall be readily removable and replaceable without **personnel entering,** de*[-]*watering**,** *[the wet well]* or disconnecting any piping in the wet well.

[(C) Electrical.

1. Power supply and control. Electrical supply and control circuits shall be designed to allow disconnection at a junction box located or accessible from outside the wet well. Terminals and connectors shall be protected from corrosion by location outside of the wet well or by watertight seals.

2. Controls. The motor control center shall be located outside the wet well and be protected by a conduit seal to prevent the atmosphere in the wet well from gaining access to the control center. The seal shall be located so that the motor may be removed and electrically disconnected without disturbing the seal.

3. Power cord. Pump motor power cords shall be designed for flexibility and serviceability under conditions of extra hard usage and shall meet the requirements of the Mine Safety and Health Administration for trailing cables. Ground fault interruption protection shall be used to de-energize the circuit in the event of any failure in the electrical integrity of the cable. Power cord terminal fittings shall be corrosion resistant and be constructed in a manner to prevent the entry of moisture into the cable, shall be provided with strain relief appurtenances and shall be designed to facilitate field connecting.]

*[(D)]***(B) Valve Chamber and** Valves. Valves required under subsection *[(4)(E)]* **(3)(D)** of this rule shall be located in a separate valve

[pit] **chamber**. *[Accumulated water shall be drained to the wet well or to the soil. If the valve pit is drained to the wet well, an effective method shall be provided to prevent sewage from entering the pit during surcharged wet well conditions.]*

1. Access. A minimum access hatch dimensions of twenty-four inches by thirty-six inches (24" x 36") shall be provided. For access, follow the provisions in paragraph (3)(A)2. of this rule.

2. Portable pump connection. A portable pump connection on the discharge line with rapid connection capabilities shall be provided.

*[(7)]***(6)** Alarm Systems. Alarm systems **with an uninterrupted power source** shall be provided for pumping stations. *[The alarm shall be activated in cases of power failure, pump failure, use of the lag pump, unauthorized entry or any cause of pump station malfunction. Pumping station alarms shall be telemetered, including identification of the alarm condition, to a municipal facility that is manned twenty-four (24) hours a day. If such a facility is not available and twenty-four (24)-hour holding capacity is not provided, the alarm shall be telemetered to city offices during normal working hours and to the home of the person(s) responsible in charge of the lift station during off-duty hours. Audiovisual alarm systems with a self-contained power supply may be acceptable in some cases in lieu of the telemetering system outlined in this section, depending upon location, station holding capacity and inspection frequency.]*

[(8) Emergency Operation. Pumping stations and collection systems shall be designed to prevent or minimize bypassing of raw sewage. For use during possible periods of extensive power outages, mandatory power reductions or uncontrolled storm events, consideration should be given to providing a controlled, high-level wet well overflow to supplement alarm systems and emergency power generation in order to prevent backup of sewage into basements, or other discharges which may cause severe adverse impacts on public interests, including public health and property damage. Where a controlled diversion is utilized, consideration shall also be given to the installation of storage-detention tanks or basins, which will be made to drain to the station wet well. Where overflows affect public water supplies, shellfish production or waters used for culinary or food processing purposes, a storage-detention basin or tank, shall be provided having two (2)-hour detention capacity at the anticipated overflow rate.

(A) Overflow Prevention Methods. A satisfactory method shall be provided to prevent or minimize overflows. The following methods should be evaluated on an individual basis. The choice should be based on least cost and least operational problems of the methods providing an acceptable degree of reliability. The methods are—

1. Storage capacity including trunk sewers for retention of wet weather flows. Storage basins must be designed to drain back into the wet well or collection system after the flow recedes;

2. An in-place or portable pump, driven by an internal combustion engine meeting the requirements of subsection (8)(B) of this rule, capable of pumping from the wet well to the discharge side of the station; and

3. Two (2) independent public utility sources or engine-driven generating equipment meeting the requirements of subsection (8)(B) of this rule.

(B) Equipment Requirements.

1. General. The following general requirements shall apply to all internal combustion engines used to drive auxiliary pumps, service pumps through special drives or electrical generating equipment.

A. Engine protection. The engine must be protected from operating conditions that would result in damage to equipment. Unless continuous manual supervision is planned, protective equipment shall be capable of shutting down the engine and activating an alarm on-site and as provided in section (7) of this rule. Protective equipment shall monitor for conditions of low oil pressure and overheating, except oil pressure monitoring will not be required for engines with splash lubrication.

B. Size. The engine shall have adequate rated power to start and continuously operate all connected loads.

C. Fuel type. Reliability and ease of starting, especially during cold weather conditions should be considered in the selection of the type of fuel.

D. Engine ventilation. The engine shall be located above grade with adequate ventilation of fuel vapors and exhaust gases.

E. Routine start-up. All emergency equipment shall be provided with instructions indicating the need for regular starting and running of the units at full loads.

F. Protection of equipment. Emergency equipment shall be protected from damage at the restoration of regular electrical power.

2. Engine-driven pumping equipment. Where permanently installed or portable engine-driven pumps are used, the following requirements in addition to general requirements shall apply:

A. Pumping capacity. Engine-driven pump(s) shall meet the design pumping requirements unless storage capacity is available for flows in excess of pump capacity. Pumps shall be designed for anticipated operating conditions, including suction lift if applicable;

B. Operation. The engine and pump shall be equipped to provide automatic start-up and operation of pumping equipment. Provisions shall also be made for manual start-up. Where manual start-up and operation is justified, storage capacity and alarm system must meet the requirements of subparagraph (8)(B)2.C. of this rule; and

C. Portable pumping systems. Where part or all of the engine-driven pumping equipment is portable, sufficient storage capacity to allow time for detection of pump station failure and transportation and hookup of the portable equipment shall be provided. A riser from the force main with quick-connect coupling and appropriate valving shall be provided to hookup portable pumps.

3. Engine-driven generating equipment. Where permanently installed or portable engine-driven generating equipment is used, the following requirements in addition to general requirements shall apply:

A. Generating capacity. Generating unit size shall be adequate to provide power for pump motor starting current and for lighting, ventilation and other auxiliary equipment necessary for safety and proper operation of the lift station. The operation of only one (1) pump during periods of auxiliary power supply must be justified. Justification may be made on the basis of maximum anticipated flows relative to single pump capacity, anticipated length of power outage and storage capacity. Special sequencing controls shall be provided to start pump motors unless the generating equipment has capacity to start all pumps simultaneously with auxiliary equipment operating;

B. Operation. Provisions shall be made for automatic and manual start-up and load transfer. The generator must be protected from operating conditions that would result in damage to equipment. Provisions should be considered to allow the engine to start and stabilize at operating speed before assuming the load. Where manual start-up and transfer is justified, storage capacity and alarm system must meet

the requirements of subparagraph (8)(B)3.C. of this rule; and

C. Portable generating equipment. Where portable generating equipment or manual transfer is provided, sufficient storage capacity to allow time for detection of pump station failure and transportation and connection of generating equipment shall be provided. The use of special electrical connections and double throw switches are recommended for connecting portable generating equipment.

(9) Grinder Pumps in Pressure Sewer Systems. A pressure sewer system is defined as two (2) or more grinder pump units at different locations discharging into a common force main. Grinder pump units and pressure systems are not to be used in lieu of conventional gravity collection systems; however, grinder pumps may be used where it is not feasible to provide conventional gravity sewer service, such as where the topography makes it difficult for the users to be served by a conventional system, groundwater conditions make construction and maintenance of a conventional system difficult or excessive rock excavation makes a conventional system impractical. The operating authority shall be responsible for the entire system which shall include the force mains, grinder pump units and appurtenances.

(A) Pump Openings. The grinder unit must be capable of reducing any material which enters the grinder unit to a size that the materials will pass through the pump unit and force main without plugging or clogging. No screens or other devices requiring regular maintenance may be used to keep trashy or stringy material out of the grinder pump or force main. This requirement shall be in lieu of the requirements in paragraph (4)(C)3. of this rule.

(B) Storage Capacity. The minimum storage capacity of the grinder pump unit shall be fifty (50) gallons (189 l). The unit shall be capable of accommodating normal peak flows for periods of eight to twelve (8–12) hours.

(C) Alarm System. For grinder pump units serving a single home, an audiovisual alarm capable of alerting the resident and operating personnel in the area may be used in lieu of the alarm system specified in section (7) of this rule.

(D) Valves. A gate valve must be provided on the service line near the common force main.

(E) Force Main Velocity. The velocity shall meet the requirements of subsection (11)(A) of this rule based on the most probable number of pump units expected to operate simultaneously or on some other acceptable method of computing the peak pumpage rate.

(F) Cleaning. Consideration should be given to providing a suitable method of cleaning the force main whenever the velocity in the force main may be less than two feet (2′) per second (0.61m/s) before ultimate development is reached.

(G) Electrical. Units must be serviceable and replaceable under wet conditions without electrical hazard to repair personnel. Electrical equipment shall be suitable for hazardous locations (National Electrical Code, Class I, Group D, Division 1 location).

(H) Standby Units. One (1) standby unit for each fifty (50) units or fraction thereof must be provided for each model installed.

(I) Service Interruptions. Provisions shall be made to avoid interruption of service due to mechanical or power failure by providing standby power, storage capacity or interconnection with another disposal system.

(10) Instructions and Equipment. Sewage pumping stations and their operators should be supplied with a complete set of operational instructions, including emergency procedures, maintenance schedules, special tools and spare parts as may be necessary.

(11) Force Mains.

(A) Velocity. At design average flow a velocity of at least two feet (2′) per second (0.61m/s) shall be maintained.

(B) Air Relief Valve. An air relief valve shall be placed at high points in the force main to prevent air locking. When accumulation of air or decomposition gases are likely, an automatic air relief valve suitable for use on sewage force mains shall be used.

(C) Termination. Force mains should enter the gravity sewer system at a point not more than two feet (2′) (30 cm) above the flow line of the receiving manhole.

(D) Design Pressure. The force main and fittings including reaction blocking shall be designed to withstand normal pressure and pressure surges (water hammer).

(E) Special Construction. Force main construction near streams or used for aerial crossings shall meet applicable requirements of 10 CSR 20-8.120(9) and (10).

(F) Design Friction Losses. Friction losses through force mains shall be based on the Hazen and Williams formula or other acceptable method. When the Hazen and Williams formula is used, the following values for "C" shall be used for design; unlined iron or steel—one hundred (100) and all other—one hundred twenty (120). When initially installed, force mains will have a significantly higher "C" factor. The higher "C" factor should be considered only in calculating maximum power requirements.

(G) Separation from Water Mains. There shall be at least a ten-foot (10′) (3.0 m) horizontal separation between water mains and sanitary sewer force mains. Force mains crossing water mains shall be laid to provide a minimum vertical distance of eighteen inches (18") (46 cm) between the outside of the force main and the outside of the water main. This shall be the case where the water main is either above or below the force main. At crossings, one (1) full length of water pipe shall be located so both joints will be as far from the force main as possible. Special structural support for the water main and force main may be required.

(H) Identification of Force Mains. Where force mains are constructed of material which might cause the force main to be confused with potable water mains, the force main should be appropriately identified.]

(7) Force Mains.

(A) Design. Force main system shall be designed to withstand all pressures (including water hammer and associated cyclic reversal of stresses), and maintain a velocity of at least two feet (2') per second.

(B) Installation. For installation follow the provisions in 10 CSR 20-8.120(3)(A).

(C) Protection of Water Supplies. For separation between water mains and sanitary sewer force mains follow the provisions in 10 CSR 20-8.120(5).

(D) Locator wire. For locator wire follow the provisions in 10 CSR 20-8.125(5)(A)5.

*AUTHORITY: section 644.026, RSMo [Supp. 1988] **2016**. Original rule filed Aug. 10, 1978, effective March 11, 1979. Amended: Filed June 15, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition

to this proposed amendment with the Department of Natural Resources, Division of Environmental Quality, Water Protection Program, John Rustige, PO Box 176, Jefferson City, MO 65102. Comments may be sent with name and address through email to john.rustige@dnr.mo.gov. Public comments must be received by August 23, 2018. The public hearing is scheduled for 10 AM, on August 15, 2018, at the Department of Natural Resources, Elm Street Conference Center, Bennett Spring Conference Room, 1730 East Elm Street, Jefferson City, Missouri 65101.

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

PROPOSED AMENDMENT

10 CSR 20-8.140 *[Sewage]* ***Wastewater*** **Treatment** *[Works]* ***Facilities***. The Clean Water Commission is changing sections (1) through (8) and added section (9).

PURPOSE: This amendment will retain and add minimum design standards for wastewater treatment facilities that are required to protect or improve public health, safety, and water quality.

PURPOSE: [The following criteria have been prepared as a guide for the general design requirements for sewage treatment works. This rule is to be used with rules 10 CSR 20-8.110–10 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 as regards adequacy of design, submission of plans, approval of plans and approval of completed sewage works. Deviation from these minimum requirements will be allowed where sufficient documentation is presented to justify the deviation. These criteria are taken largely from Great Lakes-Upper Mississippi River Board of State Sanitary Engineers Recommended Standards for Sewage Works 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. Addenda or supplements to this publication will be furnished to consulting engineers and city engineers. If others desire to receive addenda or supplements, please advise the Clean Water Commission so that names can be added to the mailing list.] ***This rule contains the minimum standards for the design of systems that are part of wastewater collection and treatment systems. This rule is to be used with rules 10 CSR 20-8.110 through 10 CSR 20-8.210. It does not address all possible aspects of design, and the design engineer may refer to other appropriate reference materials so long as these minimum standards set forth in this rule are met.***

PUBLISHER'S NOTE: The secretary of state has determined that the publication of the entire text of the material which is incorporated by reference as a portion of this rule would be unduly cumbersome or expensive. This material as incorporated by reference in this rule shall be maintained by the agency at its headquarters and shall be made available to the public for inspection and copying at no more than the actual cost of reproduction. This note applies only to the reference material. The entire text of the rule is printed here.

[(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 agency is concerned, unless justification is presented for deviation from the requirements. Other terms, such as should, recommend, preferred and the like, indicate discretionary requirements on the part of the agency and deviations are subject to individual consideration.

(2) Exceptions. This rule shall not apply to facilities designed for twenty-two thousand five hundred gallons per day (22,500 gpd) (85.4 m^3) or less (see 10 CSR 20-8.020 for the requirements for those facilities).

(3) Plant Location. The following items shall be considered when selecting a plant site: proximity to residential areas; direction of prevailing winds; accessibility by all-weather roads; area available for expansion; local zoning requirements; local soil characteristics, geology, hydrology and topography available to minimize pumping; access to receiving stream; downstream uses of the receiving stream and compatibility of treatment process with the present and planned future land use, including noise, potential odors, air quality and anticipated sludge processing and disposal techniques. Where a site must be used which is critical with respect to these items, appropriate measures shall be taken to minimize adverse impacts.

(A) Flood Protection. The treatment works structures, electrical and mechanical equipment shall be protected from physical damage by the one hundred (100)-year flood. Treatment works should remain fully operational and accessible during the twenty-five (25)-year flood. This applies to new construction and to existing facilities undergoing major modification.]

(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. In the event 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. Requirements for these facilities are found in 10 CSR 20-8.300.

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

(2) General.

(A) Location. Criteria to be considered when selecting a site are listed in 10 CSR 20-8.110(5)(E)6.

(B) Flood Protection. Flood protection shall apply to new construction and to existing facilities undergoing major modification. The wastewater facility structures, electrical equipment, and mechanical equipment shall be protected from physical damage by not less than the one hundred- (100-) year flood elevation.

(C) Minimum Separation Distances.

1. Potable water sources. Unless another distance is determined by the Missouri Geological Survey or by the department's Public Drinking Water Branch, the minimum distance between wastewater treatment facilities and all potable water sources shall be at least three hundred feet (300').

2. Residences. No treatment unit shall be located closer than the minimum distance provided in Table 140-1 below.

Table 140-1. Minimum Separation Distance.

Type of Facility	Separation Distance
Lagoons	200' to a neighboring residence and 50' to property line
Open recirculating media filters following primary treatment	200' to a neighboring residence
All other discharging facilities	50' to a neighboring residence

(D) Accessibility. Facilities shall be readily accessible by authorized personnel from a public right–of-way during all weather conditions.

*[(4)]***(3)** Quality of Effluent. The *[required]* degree of wastewater treatment shall be based on 10 CSR 20-7.015, Effluent Regulations**,** *[and]* 10 CSR 20-7.031, Water Quality Standards**, and/or appropriate federal regulations including the provisions of the operating permit**.

(4) Pump and Haul.

(A) General.

1. Accessibility. Conform to subsection (2)(D) of this rule.

2. Security. Follow the provisions in subsection (7)(A) of this rule for fencing.

3. Protection of water supplies. Provide the separation and crossing of water supplies in accordance with subsection (2)(C) of this rule and 10 CSR 20-8.120(5).

(B) Septic Tank Design. Conform to 10 CSR 20-8.180(2) for septic tank design.

(C) Earthen Basin Design. Follow the provisions in 10 CSR 20-8.200 for earthen basin design.

(D) Alarm system. The alarm shall be activated in cases of high water levels. Follow the provisions in subsection (6)(C) of this rule for alarm systems.

[(5) Design.

(A) Type of Treatment. As a minimum, the following items shall be considered in the selection of the type of treatment: present and future effluent requirements; location of and local topography of the plant site; space available for future plant construction; the effects of industrial wastes likely to be encountered; ultimate disposal of sludge; system capital costs; system operating and maintenance costs, including basic energy requirements; process complexity governing operating personnel requirements; and environmental impact on present and future adjacent land use.

(B) Required Engineering Data for New Process Evaluation. The policy of the agency is to encourage rather than obstruct the development of any methods or equipment for treatment of wastewater. The lack of inclusion in these standards of some types of wastewater treatment processes or equipment should not be construed as precluding their use. The agency may approve other types of wastewater treatment processes and equipment under the following conditions: the operational reliability and effectiveness of the process or device shall have been demonstrated with a suitably-sized prototype unit operating at its design load conditions, to the extent required by the agency; the agency may require monitoring observations, including test results and engineering evaluations, demonstrating the efficiency of the processes, detailed description of the test methods; testing, including appropriately-composited samples, under various ranges of strength and flow rates (including diurnal) and waste temperature over a sufficient length of time to demonstrate performance under climatic and other conditions which may be encountered in the area of the proposed installations and other appropriate information; the agency may require that appropriate testing be conducted and evaluations be made under the supervision of a competent process engineer other than those employed by the manufacturer or developer.

(C) Design Loads.

1. Hydraulic design.

A. New systems.

(I) Undeveloped areas. The design for sewage treatment plants to serve new sewerage systems being built in currently undeveloped areas shall be based on an average daily flow of one hundred (100) gallons per capita (378 l/cap), unless water use data or other justification upon which to better estimate flow is provided.

(II) Existing developed areas. Consideration shall be given in the designs for sewage treatment plants to serve a new sewerage system for a municipality or sewer district for higher flow rates if a large percentage of older buildings are likely to contribute significant infiltration/inflow to the new sanitary sewer system through basement floor drains.

B. Existing systems. Where there is an existing system, the volume and strength of existing flows shall be determined. The determination shall include both dry weather and wet weather conditions. Samples shall be taken and composited so as to be accurately representative of the strength of the wastewater. At least one (1) year's flow data should be taken as the basis for the preparation of hydrographs for analysis to determine the following types of flow conditions of the system: the annual average daily flow—as determined by averaging flows over one (1) year, exclusive of inflow due to rainfall; the minimum daily flow—as determined by observing twenty-four (24)-hour flows during dry weather (low rainfall period) when infiltration/inflow are at a minimum; wet weather peak flows—as determined by observing twenty-four (24)-hour flows during a period of one (1) year when infiltration/inflow are at a maximum; wet weather flows of seven (7)-day duration—as determined by observing for a period of one (1) year the daily flows during the immediate seven (7)-day period following rainfall sufficient to cause ground surface runoff; peak hourly flows—as determined by observing the maximum hydraulic load to the plant; and industrial waste flows—as determined by flow data, including water use records, for each of the industries tributary to the sewer system. The plant design flow selected shall meet the appropriate effluent and water quality standards in 10 CSR 20-7.015 and 10 CSR 20-7.031.

C. Flow equalization. Facilities for the equalization of flows and organic shock load shall be considered at all plants which are critically affected by surge loadings. The sizing of the flow equalization facilities should be based on data obtained from paragraph (5)(C)1. of this rule and 10 CSR 20-8.120(5)(B).

2. Organic design.

A. New system minimum design. Domestic waste treatment design shall be on the basis of at least 0.17 pounds (0.08 kg) of biochemical oxygen demand (BOD) 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; when garbage grinders are used in areas tributary to a domestic treatment plant, the design basis should be increased to 0.22 pounds (0.10 kg) of BOD per capita per day and 0.25 pounds (0.11 kg) of suspended solids per capita per day; domestic waste treatment plants that will receive industrial wastewater flows shall be designed to include these industrial waste loads.

B. Existing systems. When an existing treatment works is to be upgraded or expanded, the organic design shall be based upon the actual strength of the wastewater as determined from the measurements taken in accordance with subparagraph (5)(C)1.B. of this rule, with an appropriate increment for growth.

3. Shock effects. The shock effects of high concentrations and diurnal peaks for short periods of time on the treatment process, particularly for small treatment plants, shall be considered.

4. Design by analogy. 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 agency to establish the reliability and applic-

ability of the data.

(D) Conduits. All piping and channels should be designed to carry the maximum expected flows. The incoming sewer should be designed for unrestricted flow. Bottom corners of the channels must be filleted. Conduits shall be designed to avoid creation of pockets and corners where solids can accumulate. Suitable gates should be placed in the channels to seal off unused sections which might accumulate solids. The use of shear gates or stop planks is permitted where they can be used in place of gate valves or sluice gates. Noncorrosive materials shall be used for these control gates.

(E) Arrangement of Units. Component parts of the plant should be arranged for greatest operating and maintenance convenience, flexibility, economy, continuity of maximum effluent quality so as to facilitate installation of future units.

(F) Flow Division Control. Flow division control facilities shall be provided as necessary to insure organic and hydraulic loading control to plant process units and shall be designed for easy operator access, change, observation and maintenance. Appropriate flow measurement shall be incorporated in the flow division control design.

(6) Plant Details.

(A) Installation of Mechanical Equipment. The specifications should be so written that the installation and initial operation of major items of mechanical equipment will be supervised by a representative of the manufacturer.

(B) Unit Isolation. Properly located and arranged structures and piping shall be provided so that each unit of the plant can be removed from service independently. The design shall facilitate plant operation during unit maintenance and emergency repair so as to minimize deterioration of effluent quality and insure rapid process recovery upon return to normal operational mode.

1. Continuity during construction. Final plan documents shall include construction requirements as deemed necessary by the agency to avoid unacceptable temporary water quality degradation.

(C) Drains. Means shall be provided to de-water each unit to an appropriate point in the process. Due consideration shall be given to the possible need for hydrostatic pressure relief devices to prevent flotation of structures. Pipes subject to clogging shall be provided with means for mechanical cleaning or flushing.

(D) Construction Materials. Due consideration should be given to the selection of materials which are to be used in sewage treatment works because of the possible presence of hydrogen sulfide and other corrosive gases, greases, oils or similar constituents frequently present in sewage. This is particularly important in the selection of metals and paints. Contact between dissimilar metals should be avoided to minimize galvanic action.

(E) Painting. The use of paints containing lead or mercury should be avoided. In order to facilitate identification of piping, particularly in the large plants, it is suggested that different lines be color coded. The following color scheme is recommended for purposes of standardization: sludge line - brown; gas line - orange; potable water line - blue; chlorine line - yellow; sewage line - gray; compressed air line - green; and water lines for heating digesters or buildings - blue with a six inch (6") (15 cm) red band spaced thirty inches (30") (76 cm) apart. The contents shall be stenciled on the piping in contrasting color.

(F) Operating Equipment. A complete outfit of tools, accessories, and spare parts necessary for the plant operator's use shall be provided. Readily accessible storage space and workbench facilities shall be provided and consideration be given to provision of a garage storage area for large equipment, maintenance and repair.

(G) Erosion Control During Construction. Effective site erosion control shall be provided during construction.

(H) Grading and Landscaping. Upon completion of the plant, the ground should be graded. Concrete or gravel walkways should be provided for access to all units. Where possible, steep slopes should be avoided to prevent erosion. Surface water shall not be permitted to drain into any unit. Particular care shall be taken to protect trickling filter beds, sludge beds, and intermittent sand filters from stormwater runoff. Provision should be made for landscaping, particularly when a plant must be located near residential areas.]

(5) Design.

(A) Type of Treatment. Items to be considered in selection of the appropriate type of treatment are presented in 10 CSR 20-8.110(5).

(B) New and Innovative Technology. Follow the provisions in 10 CSR 20-8.110(6).

(C) Design Period. Identify the design period in the facility plan per 10 CSR 20-8.110(5)(B).

(D) Design Loads.

1. Hydraulic design.

A. Identify flow conditions critical to the design of the wastewater treatment facility as described in 10 CSR 20-8.110(3).

B. The design peak hourly flows shall be used to evaluate the effect of hydraulic peaks on unit processes, pumping, piping, etc.

C. The design of treatment units that are not subject to peak hourly flow requirements shall be based on the design average flow.

2. Organic design. Base organic loadings for wastewater treatment facility design on the information given in 10 CSR 20-8.110(3). When septage is accepted at a wastewater treatment facility, the effects of septage flow shall be evaluated in the design.

*[(7)]***(6)** *[Plant]* Outfalls.

[(A) Entrance Impact Control. The outfall sewer shall be designed to discharge to the receiving stream in a manner acceptable to the agency. Consideration should be given in each case to the following: preference for free fall or submerged discharge at the site selected; utilization of cascade aeration of effluent discharge to increase dissolved oxygen; limited or complete across stream dispersion as needed to protect aquatic life movement and growth in the immediate reaches of the receiving stream; appropriate effluent sampling in accordance with subsection (7)(C) of this rule.]

*[(B)]***(A)** Protection and Maintenance. The outfall *[sewer]* shall be so constructed and protected against the effects of flood water, ice**,** or other hazards as to reasonably *[insure]* **ensure** its structural stability and freedom from stoppage. *[A manhole should be provided at the shore end of all gravity sewers extending into the receiving waters. Hazards to navigation shall be considered in designing outfall sewers.]*

*[(C)]***(B)** Sampling Provisions. All *[outfalls]* **sampling points** shall be designed so that a **representative and discrete twenty-four (24) hour automatic composite sample or grab** sample of the effluent **discharge** can be obtained at a point after the final treatment process and before discharge to or mixing with the receiving waters.

(C) All outfalls shall be posted with a permanent sign indicating the outfall number (i.e., Outfall #001).

[(8) Essential Facilities.

(A) Emergency Power Facilities. All plants shall be provided with an alternate source of electric power to allow continuity of operation during power failures, except as noted in this subsection. Methods of providing alternates include the connection of at least two (2) independent public utility sources, such as substations; a power line from each substation is

recommended and will be required unless, documentation is received and approved by the agency verifying that duplicate line is not necessary to minimize water quality violations; portable or inplace internal combustion engine equipment which will generate electrical or mechanical energy; and portable pumping equipment when only emergency pumping is required.

1. Standby generating capacity normally is not required for aeration equipment used in the activated sludge process. In cases where a history of long-term (four (4) hours or more) power outages have occurred, auxiliary power for minimum aeration of the activated sludge will be required. Full power generating capacity may be required by the agency on certain stream segments.

2. Continuous disinfection, where required, shall be provided during all power outages.

(B) Water Supply.

1. General. An adequate supply of potable water under pressure should be provided for use in the laboratory and for general cleanliness around the plant. No piping or other connections shall exist in any part of the treatment works which, under any conditions, might cause the contamination of a potable water supply. The chemical quality should be checked for suitability for its intended uses, such as heat exchangers, chlorinators, etc.

2. Direct connections. Potable water from a municipal or separate supply may be used directly at points above grade for the following hot and cold supplies: lavatory; water closet; laboratory sink (with vacuum breaker); shower; drinking fountain; eye wash fountain; and safety shower. Hot water for any of these units shall not be taken directly from a boiler used for supplying hot water to a sludge heat exchanger or digester heating coils.

3. Indirect connections. A reduced pressure backflow preventer or a break tank shall be used to isolate the potable system from all other plant uses other than those listed in paragraph (8)(B)2. of this rule. Where permanent connections are to be made to uses other than those listed in paragraph (8)(B)2. of this rule, a break tank shall be used. Where a break tank is used, water shall be discharged to the break tank through an air-gap at least six inches (6") above the maximum flood line, ground level or the spill line of the tank, whichever is higher. Backflow preventers shall be located above the maximum flood line or ground level. A sign shall be permanently posted at every hose bib, faucet, hydrant or sill cock located on the water system beyond the break tank or backflow preventer to indicate that the water is not safe for drinking.

4. Separate potable water supply. Where it is not possible to provide potable water from a public water supply, a separate well may be provided. Location and construction of the well should comply with requirements of 10 CSR 60-2.010. Requirements governing the use of the supply are those contained in paragraphs (8)(B)2. and 3. of this rule.

5. Separate non potable water supply. Where a separate non potable water supply is to be provided, a break tank will not be necessary, but all system outlets shall be posted with a permanent sign indicating the water is not safe for drinking.

(C) Sanitary Facilities. Toilet, shower, lavatory and locker facilities should be provided in sufficient numbers and convenient locations to serve the expected plant personnel.

(D) Laboratory. All treatment works shall include a laboratory for making the necessary analytical determinations and operating control tests, except in individual situations where other arrangements are approved by the agency. The laboratory shall have sufficient size, bench space, equipment and supplies to perform all self-monitoring analytical work required by discharge permits and to perform the process control tests necessary for good management of each treatment process included in the design. The facilities and supplies necessary to perform analytical work to support industrial waste control programs will normally be included in the same laboratory. The laboratory size and arrangement must be sufficiently flexible and adaptable to accomplish these assignments. The layout should consider future needs for expansion in the event that more analytical work is needed.

1. Location and space. The laboratory should be located on ground level, easily accessible to all sampling points, with environmental control as an important consideration. It shall be located away from vibrating machinery or equipment which might have adverse effects on the performance of laboratory instruments or the analyst or design or to prevent adverse effects from vibration. A minimum of four hundred (400) square feet ($37m^3$) of floor space should be allocated for the laboratory. If more than two (2) persons will be working in the laboratory at any given time, one hundred (100) square feet ($9.3m^3$) of additional space should be provided for each additional person. Bench top working surface should occupy at least thirty-five percent (35%) of the total floor space. Minimum ceiling height should be eight feet six inches (8'6") (2 m). If possible this height should be increased to provide for installation of wall-mounted water stills, distillation racks and other equipment with extended height requirements.

2. Materials.

A. Ceilings. Acoustical tile should be used for ceiling except in high humidity areas where they should be constructed of plaster.

B. Walls. For easy maintenance and a pleasant working environment, light colored ceramic tile should be used from floor to ceiling for all interior walls.

C. Floors. Floor surfaces should be either vinyl asbestos or rubber, fire-resistant and highly resistant to acids, alkalies, solvents and salts.

D. Doors. Two (2) exit doors should be located to permit a straight egress from the laboratory preferably at least one (1) to outside the building. Panic hardware should be used. They should have large glass windows for easy visibility of approaching or departing personnel. Automatic door closers should be installed; swinging doors should not be used. Flush hardware should be provided doors if cart traffic is anticipated. Kick plates are also recommended.

3. Cabinets and bench tops. Wall hung cabinets are useful for dust-free storage of instruments and glassware. Units with sliding doors are preferable. They should be hung so the top shelf is easily accessible to the analyst. Thirty inches (30") (76 cm) from the bench top is recommended. One (1) or more cupboard style base cabinets should be provided for storing large items; however, drawer units are preferred for the remaining cabinets. Drawers should slide out so that entire contents are easily visible. They should be provided with rubber bumpers and with stops which prevent accidental removal. Drawers should be supported on ball bearings or nylon rollers which pull easily in adjustable steel channels. All metal drawer fronts should be of double wall construction. All cabinet shelving should be acid resistant and adjustable from inside the cabinet. Water, gas, air and vacuum service fixtures; traps, strainers, overflows, plugs and tailpieces; and all electrical service fixtures shall be supplied with the laboratory furniture. Generally, bench top height should be thirty-six inches (36") (91 cm). However, areas to be used exclusively for sit-down type operations should be thirty inches (30") (76 cm) high and include knee hole space. One-inch (1") (2.54 cm) overhangs and drip grooves should be provided to keep liquid spills from running along

the face of the cabinet. Tops should be furnished in large sections one and one-fourth inches (1 1/4") (3.18 cm) thick. They should be field joined into a continuous surface with acid, alkali and solvent resistant cements which are at least as strong as the material of which the top is made.

4. Hoods. Fume hoods to promote safety and canopy hoods over heat releasing equipment shall be installed.

A. Fume hoods.

(I) Location. Fume hoods should be located where air disturbance at the face of the hood is minimal. Air disturbance may be created by persons walking past the hood, supply in diffusers, drafts from opening or closing a door, etc. Safety factors should be considered in locating a hood. If a hood is situated near a doorway, a secondary means of egress must be provided. Bench surfaces should be available next to the hood so that chemicals need not be carried long distances.

(II) Design and materials. The selection of fume hoods, their design and materials of construction must be made considering the variety of analytical work to be performed and the characteristics of the fumes, chemicals, gases or vapors that will or may be released by the activities therein. Special design and construction is necessary if perchloric acid use is anticipated. Consideration should be given for providing more than one (1) fume hood to minimize potential hazardous conditions throughout the laboratory. Fume hoods are not appropriate for operation of heat releasing equipment, that does not contribute to hazards, unless they are provided in addition to those needed to perform hazardous tasks.

(III) Fixtures. A cup sink should be provided inside each fume hood. All switches, electrical outlets, utility and baffle adjustment handles should be located outside the hood. Light fixtures should be explosion proof.

(IV) Exhaust. Twenty-four (24)-hour continuous exhaust capability should be provided. Exhaust fans should be explosion proof. Exhaust velocities should be checked when fume hoods are installed.

(V) Alarms. A buzzer for indicating exhaust fan failure and a static pressure gauge should be placed in the exhaust duct. A high temperature sensing device located inside the hood should be connected to the buzzer.

(VI) Canopy hoods. Canopy hoods should be installed over the bench top areas where hot plate, steam bath or other heating equipment or heat releasing instruments are used. The canopies should be constructed of steel, plastic or equivalent material and finished with enamel to blend with other laboratory furnishings.

5. Sinks. The laboratory shall be equipped with at least one (1) double-wall sink with drainboards. Additional sinks should be provided in separate work areas as needed and identified for the use intended. Sinks should be made of epoxy resin or plastic material with all appropriate characteristics for laboratory applications. Waste openings should be located toward the back so that a standing overflow will not interfere. All water fixtures on which hoses may be used should be provided with reduced zone pressure backflow preventers to prevent contamination of water lines. The sinks should be constructed of material highly resistant to acids, alkalies, solvents and salts, should be abrasion and heat resistant, nonabsorbent and light in weight. Traps should be made of glass, plastic or lead and easily accessible for cleaning.

6. Ventilation and lighting. Laboratories should be separately air conditioned with external air supply for one hundred percent (100%) makeup volume. In addition, separate exhaust ventilation should be provided. Ventilation outlet locations should be remote from ventilation inlets. Good lighting, free from shadows, is important for reading dials, meniscuses, etc., in the laboratory.

7. Gas and vacuum. Natural gas should be supplied to the laboratory. Digester gas should not be used. An adequately sized line source of vacuum should be provided with outlets available throughout the laboratory.

8. Balance and table. An analytical balance of the automatic, digital readout, single pan 0.1 milligram sensitivity type shall be provided. A heavy special design balance table which will minimize vibration of the balance shall be provided. It shall be located as remote as possible from windows, doors or other sources of drafts or air movements, so as to minimize undesirable impacts from these sources upon the balance.

9. Equipment, supplies and reagents. The laboratory shall be provided with all of the equipment, supplies and reagents that are needed to carry out all of the facility's analytical testing requirements. Discharge permit requirements, process control requirements and industrial waste monitoring requirements should be considered when specifying equipment needs.

(E) Floor Slope. Floor surfaces shall be sloped adequately to a point of drainage.

(F) Stairways. Stairways shall be installed wherever possible in lieu of ladders. Spiral or winding stairs are permitted only for secondary access where dual means of egress are provided. Stairways shall have slopes between fifty degrees (50°) and thirty degrees (30°) (preferably nearer the latter) from the horizontal to facilitate carrying samples, tools, etc. Each tread and riser shall be of uniform dimension in each flight. Minimum tread run shall not be less than eight inches (8) (20.3 cm). The sum of the tread run and riser shall not be less than seventeen inches (17") (43 cm) nor more than eighteen inches (18") (46 cm). A flight of stairs shall consist of not more than a twelve- foot (12') (3.7 m) continuous rise without a platform.

(G) Flow Measurement. Flow measurement facilities shall be provided at all plants. Indicating, totalizing and recording flow measurement devices shall be provided for all mechanical plants. Flow measurement facilities for lagoon systems shall not be less than pump calibration time clocks or calibrated flume and shall be provided on both the influent and effluent.]

(7) Essential Facilities.

(A) Emergency Power Facilities.

1. General. All wastewater treatment facilities shall be provided with an alternate source of electric power or pumping capability to allow continuity of operation during power failures.

2. Power for disinfection. Disinfection and dechlorination, when used, shall be provided during all power outages.

(B) Electrical Controls. Electrical systems and components in raw wastewater or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors that are normally present, shall comply with the NFPA 70 *National Electric Code (NEC)* (2017 Edition), as approved and published August 24, 2016, requirements for Class I, Division 1, Group D locations. This standard is incorporated by reference in this rule, as published by National Fire Protection Association® (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471. This rule does not incorporate any subsequent amendments or additions.

(C) Alarm Systems. An audiovisual alarm or a more advanced alert system, with a self-contained power supply, capable of monitoring the condition of equipment whose failure could result in a violation of the operating permit, shall be provided for all wastewater treatment facilities.

(D) Water Supply.

1. General. No piping or other connections shall exist in any

part of the wastewater treatment facility that might cause the contamination of a potable water supply.

2. Direct hot water connections. Hot water for any direct connections shall not be taken directly from a boiler used for supplying hot water to a digester heating unit or heat exchanger.

3. Indirect connections.

A. Where a potable water supply is to be used for any purpose in a wastewater treatment facility other than direct connections, a break tank, pressure pump, and pressure tank or a reduced pressure backflow preventer consistent with the department's Public Drinking Water Branch shall be provided.

B. A sign shall be permanently posted at every hose bib, faucet, hydrant, or sill cock located on the water system beyond the break tank or backflow preventer to indicate that the water is not safe for drinking.

4. Separate non-potable water supply. Where a separate non-potable water supply is to be provided, a break tank will not be necessary, but all system outlets shall be posted with a permanent sign indicating the water is not safe for drinking.

(E) Flow Measurement. A means of flow measurement shall be provided at all wastewater treatment facilities.

(F) Sampling Equipment. Effluent twenty-four (24) hour composite automatic sampling equipment shall be provided at all mechanical wastewater treatment facilities and at other facilities where necessary under provisions of the operating permit. See 10 CSR 20-7.015.

(G) Housed Facilities. Where wastewater treatment units are in a housed facility, follow the provisions in subsection (7)(J) of this rule for ventilation.

*[(9)]***(8)** Safety. Adequate provisions shall be made to effectively protect *[the operator]* **facility personnel** and visitors from hazards*[,]***.** *[t]***T**he following shall be provided to fulfill the particular needs of each *[plant]* **wastewater treatment facility**:

(A) Fencing. *[enclosure of]* **Enclose** the *[plant]* **facility** site with a fence designed to discourage the entrance of unauthorized persons and animals*[; installation of hand rails and guards around tanks, trenches, pits, stairwells and other hazardous structures];*

(B) Gratings over appropriate areas of treatment units where access for maintenance is necessary;

(C) *[provision of f]***F**irst*[-]* aid equipment;

(D) *[posting of]* **Posted** "No Smoking" signs in hazardous areas;

(E) *[provision of]* **Appropriate personal** protective *[clothing and]* equipment *[such as air pacs, goggles, gloves, hard hats, safety harnesses,etc.]* **(PPE)**;

(F) *[provision of p]***P**ortable blower and *[sufficient]* hose **sufficient to ventilate accessed confined spaces**;

(G) *[p]***P**ortable lighting equipment *[approved by the United States Bureau of Mines]* **complying with NEC requirements. See subsection (6)(B) of this rule**; *[and]*

(H) Gas detectors listed and labeled for use in NEC Class I, Division 1, Group D locations. See subsection (6)(B) of this rule;

(I) *[a]***A**ppropriately-placed warning signs for slippery areas, non-potable water fixtures **(see subparagraph (6)(D)3.B. of this rule)**, low head clearance areas, open service manholes, hazardous chemical storage areas, flammable fuel storage areas, **high noise areas,** etc.**;**

(J) Ventilation. Ventilation shall include the following:

1. Isolate all pumping stations and wastewater treatment components installed in a building where other equipment or offices are located from the rest of the building by an air-tight partition, provide separate outside entrances, and provide separate and independent fresh air supply;

2. Force fresh air into enclosed screening device areas or open pits more than four feet (4') deep. Also see 10 CSR 20-8.130(3)(F);

3. Dampers. Dampers are not to be used on exhaust or fresh air ducts. Avoid the use of fine screens or other obstructions on exhaust or fresh air ducts to prevent clogging;

4. Continuous ventilation. Where continuous ventilation is needed (e.g., housed facilities), provide at least twelve (12) complete air changes per hour. Where continuous ventilation would cause excessive heat loss, provide intermittent ventilation of at least thirty (30) complete air changes per hour when facility personnel enter the area. Base air change demands on one hundred percent (100%) fresh air;

5. Electrical controls. Mark and conveniently locate switches for operation of ventilation equipment outside of the wet well or building. Interconnect all intermittently operated ventilation equipment with the respective wet well, dry well, or building lighting system. The manual lighting/ventilation switch is expected to override the automatic controls. For a two (2) speed ventilation system with automatic switch over where gas detection equipment is installed, increase the ventilation rate automatically in response to the detection of hazardous concentrations of gases or vapors; and

6. Fans, heating, and dehumidification. Fabricate the fan wheel from non-sparking material. Provide automatic heating and dehumidification equipment in all dry wells and buildings. Follow the provisions in subsection (6)(B) of this rule for electrical controls;

(K) Explosion-proof electrical equipment, non-sparking tools, gas detectors, and similar devices, in work areas where hazardous conditions may exist, such as digester vaults and other locations where potentially explosive atmospheres of flammable gas or vapor with air may accumulate. See subsection (6)(B) of this rule;

(L) Provisions for local lockout/tagout on stop motor controls and other devices;

(M) Provisions for an arc flash hazard analysis and determination of the flash protection boundary distance and type of PPE to reduce exposure to major electrical hazards in accordance with NFPA 70E *Standard for Electrical Safety in the Workplace* (2018 Edition), as approved and published August 21, 2017. This standard is incorporated by reference in this rule, as published by National Fire Protection Association®, 1 Batterymarch Park, Quincy, MA 02169-7471. This rule does not incorporate any subsequent amendments or additions.

(9) Chemical Handling.

(A) *[Hazardous Chemical Handling]* **General**.

1. Containment materials. The materials utilized for storage, piping, valves, pumping, metering, **and** splash guards, etc., shall be specially selected considering the physical and chemical characteristics of each hazardous or corrosive chemical.

[2. Secondary containment. Chemical storage areas shall be enclosed in dikes or curbs which will contain the stored volume until it can be safely transferred to alternate storage or released to the wastewater at controlled rates which will not damage the facilities, inhibit the treatment processes, or contribute to stream pollution. Liquid polymer should be similarly contained to reduce areas with slippery floors, especially to protect travelways. Non slip floor surfaces are desirable in polymer-handling areas.]

2. Secondary containment. Secondary containment storage areas contain the stored volume until it can be safely transferred to alternate storage or released to the wastewater treatment plant at controlled rates that will not damage the facilities, inhibit the treatment processes, or contribute to stream pollution. Secondary containment shall be designed as follows:

A. A minimum volume of one hundred twenty-five percent (125%) of the volume of the largest storage container located within the containment area plus the space occupied by any other tanks located within the containment area when not protected from precipitation;

B. A minimum volume of one hundred ten percent (110%) of the volume of the largest storage container located within the containment area plus the space occupied by any other tanks located within the containment area when protected from precipitation; and

C. Walls and floors of the secondary containment structure constructed of suitable material that is compatible with the specifications of the product being stored.

[3. Eye wash fountains and safety showers. Eye wash fountains and safety showers utilizing potable water shall be provided in the laboratory and on each floor level or work location involving hazardous or corrosive chemical storage, mixing (or slaking), pumping, metering, or transportation unloading. These facilities are to be as close as practicable to possible chemical exposure sites and are to be fully useful during all weather conditions. The eye wash fountains shall be supplied with water of moderate temperature— fifty degrees to ninety degrees Fahrenheit (50°–90 °F) (ten degrees to thirty-two degrees Celsius (10°–32 °C)), separate from the hot water supply, suitable to provide fifteen to thirty (15–30) minutes of continuous irrigation of the eyes. The emergency showers shall be capable of discharging thirty to fifty gallons per day (30–50 gpm) (1.9–3.2 l/s) of water at moderate temperature at pressures of twenty to fifty pounds per square inch (20–50 psi) (1.41–3.52 kgf/cm^2). The eye wash fountains and showers shall be no more than twenty-five feet (25') (7.6 m) from points of hazardous chemical exposure.]

*[4.]***3.** Splash guards. All pumps or feeders for hazardous or corrosive chemicals shall have guards *[which]* **that** will effectively prevent spray of chemicals into space occupied by **facility** personnel. *[The splash guards are in addition to guards to prevent injury from moving or rotating machinery parts.]*

*[5.]***4.** Piping, labeling, **and** coupling guard*[s,]* location**s**.

A. All piping containing or transporting corrosive or hazardous chemicals shall be identified with labels every ten feet (10') *[(3.0 m)]* and with at least two (2) labels in each room, closet**,** or pipe chase. *[Color coding may also be used but is not an adequate substitute for labeling.]*

B. All connections (flanged or other type), except **those** adjacent to storage or feeder areas, shall have guards *[which]* **that** will direct any leakage away from space occupied by **facility** personnel. *[Pipes containing hazardous or corrosive chemicals should not be located above shoulder level except where continuous drip collection trays and coupling guards will eliminate spray or dripping onto personnel.]*

[6. Protective clothing and equipment. The following items of protective clothing or equipment shall be available and utilized for all operations or procedures where their use will minimize injury hazard to personnel: respirators, air supply type recommended for protection against chlorine; chemical workers' goggles or other suitable goggles (safety glasses are insufficient); face masks or shields for use over goggles; rubber gloves, rubber aprons with leg straps; rubber boots (leather and wool clothing should be avoided near caustics); and safety harness and line.]

*[7.]***5.** *[Warning]* **Alarm** system *[and signs]*. Facilities shall be provided for automatic shutdown of pumps and sounding of alarms when failure occurs in a pressurized chemical discharge line. *[Warning signs requiring use of goggles shall be located near chemical unloading stations, pumps and other points of frequent hazard.]*

*[8.]***6.** Dust *[collection]*. Dust collection equipment shall be provided to protect **facility** personnel from dusts injurious to the lungs or skin and to prevent polymer dust from settling on walkways **that become slick when wet**. *[The latter is to minimize slick floors which result when a polymer-covered floor becomes wet.]*

(B) Chemical Housing. The following shall be provided to fulfill the particular needs of each chemical housing facility:

1. Provide storage for a minimum of thirty (30) days' supply, unless local suppliers and conditions indicate that such storage can be reduced without limiting the supply;

2. Construct the chemical storage room of fire and corrosion resistant material;

3. Equip doors with panic hardware. To prevent unauthorized access, doors lock but do not need a key to exit the locked room using the panic hardware;

4. Provide chemical storage areas with drains, sumps, finished water plumbing, and the hose bibs and hoses necessary to clean up spills and to wash equipment;

5. Construct chemical storage area floors and walls of material that is suitable to the chemicals being stored and that is capable of being cleaned;

6. Install floor surfaces to be smooth, chemical resistant, slip resistant, and well drained with three inches per ten feet (3"/10') minimum slope;

7. Provide adequate lighting;

8. Comply with the NEC recommendation for lighting and electrical equipment based on the chemicals stored. See subsection (6)(B) of this rule;

9. Store chemical containers in a cool, dry, and well-ventilated area;

10. Design vents from feeders, storage facilities, and equipment exhaust to discharge to the outside atmosphere above grade and remote from air intakes;

11. Locate storage area for chemical containers out of direct sunlight;

12. Maintain storage temperatures between forty degrees and eighty-six degrees Fahrenheit (40–86 °F);

13. Control humidity as necessary when storing dry chemicals;

14. Design the storage area with designated areas for "full" and "empty" chemical containers;

15. Provide storage rooms housing flammable chemicals with an automatic sprinkler system designed for four tenths gallons per minute per square foot (0.4 gpm/ft^2) and a minimum duration of twenty (20) minutes;

16. Store incompatible chemicals separately to ensure the safety of facility personnel and the wastewater treatment system. Store any two (2) chemicals that can react to form a toxic gas in separate housing facilities;

17. Design and isolate areas intended for storage and handling of chlorine and sulfur dioxide and other hazardous gases. Follow the provisions in 10 CSR 20-8.190(3) and 10 CSR 20-8.190(4) for chlorine and dechlorination;

18. Design an isolated fireproof storage area and explosion proof electrical outlets, lights, and motors for all powdered activated carbon storage and handling areas in accordance with federal, state, and local requirements;

19. Vent acid storage tanks to the outside atmosphere, but not through vents in common with day tanks;

20. Keep concentrated acid solutions or dry powder in closed, acid-resistant shipping containers or storage units; and

21. Pump concentrated liquid acids in undiluted form from the original container to the point of treatment or to a covered storage tank. Do not handle in open vessels.

(C) Chemical Handling Design. The following shall be provided, where applicable, for the design of chemical handling:

1. Make provisions for measuring quantities of chemicals used for treatment or to prepare feed solutions over the range of design application rates;

2. Select storage tanks, piping, and equipment for liquid chemicals specific to the chemicals;

3. Install all liquid chemical mixing and feed installations on corrosion resistant pedestals;

4. Provide sufficient capacity of solution storage or day tanks feeding directly for twenty-four- (24-) hour operation at design average flow;

5. Provide a minimum of two (2) chemical feeders for continuous operability. Provide a standby unit or combination of units of sufficient capacity to replace the largest unit out-of-service;

6. Chemical feeders shall—

A. Be designed with chemical feed equipment to meet the maximum dosage requirements for the design average flow conditions;

B. Be able to supply, at all times, the necessary amounts of chemicals at an accurate rate throughout the range of feed;

C. Provide proportioning of chemical feed to the rate of flow where the flow rate is not constant;

D. Be designed to be readily accessible for servicing, repair, and observation;

E. Protect the entire feeder system against freezing;

F. Be located adjacent to points of application to minimize length of feed lines;

G. Provide for both automatic and manual operation for chemical feed control systems;

H. Utilize automatic chemical dose or residual analyzers, and where provided, include alarms for critical values and recording charts;

I. Provide screens and valves on the chemical feed pump suction lines; and

J. Provide an air break or anti-siphon device where the chemical solution enters the water stream;

7. Dry chemical feed system shall—

A. Be equipped with a dissolver capable of providing a minimum retention period of five (5) minutes at the maximum feed rate;

B. Be equipped with two (2) solution vessels and transfer piping for polyelectrolyte feed installations;

C. Have an eductor funnel or other appropriate arrangement for wetting the polymer during the preparation of the stock feed solution on the makeup tanks;

D. Provide adequate mixing by means of a large diameter, low-speed mixer;

E. Make provisions to measure the dry chemical volumetrically or gravimetrically; and

F. Completely enclose chemicals and prevent emission of dust;

8. Provide for uniform strength of solution consistent with the nature of the chemical solution for solution tank dosing;

9. Use solution feed pumps to feed chemical slurries that are not diaphragm or piston type positive displacement types;

10. Provide continuous agitation to maintain slurries in suspension;

11. Provide a minimum of two (2) flocculation tanks or channels having a combined detention period of twenty to thirty (20 – 30) minutes. Provide independent controls for each tank or channel;

12. Insulate pipelines carrying soda ash at concentrations greater than twenty percent (20%) solution to prevent crystallization; and

13. Do not bag soda ash in a damp or humid place.

(D) Chemical Safety. The following shall be provided in addition to the safety provisions in section (7) of this rule:

1. Appropriate personal protective equipment (PPE).

2. Eye wash fountains and safety showers. Eye wash fountains and safety showers utilizing potable water shall be provided in the laboratory and on each level or work location involving hazardous or corrosive chemical storage, mixing (or slaking), pumping, metering, or transportation unloading. The design of eye wash fountains and safety showers shall include the following:

A. Eye wash fountains with water of moderate temperature, fifty degrees to ninety degrees Fahrenheit (50°–90°F), suitable to provide fifteen to thirty (15–30) minutes of continuous irrigation of the eyes;

B. Emergency showers capable of discharging twenty gallons per minute (20 gpm) of water of moderate temperature, fifty degrees to ninety degrees Fahrenheit (50°–90°F), and at pressures of thirty to fifty pounds per square inch (30–50 psi);

C. Eye wash fountains and emergency showers located no more than twenty-five feet (25') from points of hazardous chemical exposure; and

D. Eye wash fountains and showers that are to be fully operable during all weather conditions; and

3. Warning signs. Warning signs requiring use of goggles shall be located near chemical stations, pumps, and other points of frequent hazard.

*[9.]***(E) Chemical** Container *[i]***I**dentification. The identification and hazard warning data included on shipping containers, when received**,** shall appear on all containers (regardless of size or type) used to store, carry**,** or use a hazardous substance. *[Sewage and sludge sample containers should be adequately labeled. Following is a suitable label for a sewage sample:]*

[RAW SEWAGE

Sample point No.

Contains Harmful Bacteria.

May contain hazardous or toxic material.

Do not drink or swallow.
Avoid contact with openings or breaks in the skin.]

*AUTHORITY: section 644.026, RSMo [Supp. 1989] **2016**. Original rule filed Aug. 10, 1978, effective March 11, 1979. Amended: Filed June 15, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Department of Natural Resources, Division of Environmental Quality, Water Protection Program, John Rustige, PO Box 176, Jefferson City, MO 65102. Comments may be sent with name and address through email to john.rustige@dnr.mo.gov. Public comments must be received by August 23, 2018. The public hearing is scheduled for 10 AM, on August 15, 2018, at the Department of Natural Resources, Elm Street Conference Center, Bennett Spring Conference Room, 1730 East Elm Street, Jefferson City, Missouri 65101.

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

PROPOSED AMENDMENT

10 CSR 20-8.150 *[Screening, Grit Removal and Flow Equalization]* ***Preliminary Treatment***. The Clean Water Commission is amending sections (1), (2), (3), (4), (5), (6), and removing section (7).

PURPOSE: This amendment will retain and add minimum design standards for preliminary treatment at wastewater treatment facilities that are required to protect or improve public health, safety, and water quality.

PURPOSE: [The following criteria have been prepared as a guide for the design of screening, grit removal and flow equalization facilities. This rule is to be used with rules 10 CSR 20-8.110–10 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 as regards adequacy of design, submission of plans, approval of plans and approval of completed sewage works. Deviation from these minimum requirements will be allowed where sufficient documentation is presented to justify the deviation. These criteria are taken largely from Great Lakes-Upper Mississippi River Board of State Sanitary Engineers Recommended Standards for Sewage Works 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. Addenda or supplements to this publication will be furnished to consulting engineers and city engineers. If others desire to receive addenda or supplements, please advise the Clean Water Commission so that names can be added to the mailing list.] ***This rule specifies the minimum standards for the design of preliminary treatment units that are part of wastewater collection and treatment systems. This rule is to be used with rules 10 CSR 20-8.110 through 10 CSR 20-8.210. It does not address all aspects of design, and the design engineer may refer to other appropriate reference materials so long as these minimum standards set forth in this rule are met.***

[(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 agency is concerned, unless justification is presented for deviation from the requirements. Other terms, such as should, recommend, preferred and the like, indicate discretionary requirements on the part of the agency and deviations are subject to individual consideration.

(2) Exceptions. This rule shall not apply to facilities designed for twenty-two thousand five hundred (22,500) gallons per day (85.4m^3) or less (see 10 CSR 20-8.020 for the requirements for those facilities).]

(1) Applicability. Wastewater treatment 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. In the event of any conflict between the above criteria, the requirement of this rule shall prevail.

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

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

(2) General. All wastewater treatment facilities must have a screening device, comminutor, or septic tank for the purpose of removing debris and nuisance materials from the influent wastewater.

(3) Grease Interceptors. Grease interceptors shall be provided on kitchen drain lines from institutions, hospitals, hotels, restaurants, schools, bars, cafeterias, clubs, and other establishments from which relatively large amounts of grease may be discharged to a wastewater treatment facility owned by the grease producing entity. Grease interceptors are typically constructed from fiberglass reinforced polyester, high density polyethylene (HDPE), or concrete. For corrugated HDPE grease interceptors, follow ASTM F2649 – 14 *Standard Specification for Corrugated High Density Polyethylene (HDPE) Grease Interceptor Tanks*, as approved and published September 1, 2014. For precast concrete grease interceptor tanks, follow ASTM C1613 – 17 *Standard Specification for Precast Concrete Grease Interceptor Tanks*, as approved and published September 1, 2017. These standards are hereby incorporated by reference into this rule, as published by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. This rule does not incorporate any subsequent amendments or additions.

*[(3)]***(4)** Screening Devices.

(A) General.

1. Freeze protection. Mechanically cleaned screening devices and screening storage areas shall be protected from freezing.

2. Provisions shall be made for isolating or removing screening devices from their location for servicing.

3. Safety.

A. Railings and gratings.

(I) Manually cleaned screen channels shall be protected by guard railings and deck gratings with adequate provisions for removal or opening to facilitate raking.

(II) Mechanically cleaned screen channels shall be protected by guard railings and deck gratings. Give consideration to temporary access arrangements to facilitate maintenance and repair.

B. Mechanical devices.

(I) Mechanical screening equipment shall have adequate removal enclosures to protect facility personnel against accidental contact with moving parts and to prevent dripping in multi-level installations.

(II) A positive means of locking out each mechanical device shall be provided.

(III) An emergency stop button with an automatic reverse function shall be located in close proximity to the mechanical device.

C. Electrical Equipment, Fixtures, and Controls. Electrical equipment, fixtures, and controls in screening area where hazardous gases may accumulate shall meet the requirements of the electrical code referenced in 10 CSR 20-8.140(7)(B).

*[(A)]***(B)** *[Bar Racks and]* Screens. **Where two (2) or more mechanically cleaned screens are used, the design shall provide for taking the largest unit out-of-service without sacrificing the capability to handle the average design flow. Where only one mechanically cleaned screen is used, it shall be sized to handle the design peak instantaneous flow. Screening devices shall be protected from freezing.**

[1. When required. Protection for pumps and other equipment shall be provided by either coarse bar racks or bar screens. Protection for comminutors should be provided by coarse bar racks.

2. Location.

A. Indoors. Screening devices, installed in a building where other equipment or offices are located, should be accessible only through a separate outside entrance.

B. Outdoors. Screening devices installed outside shall be protected from freezing.

C. Access. Screening areas shall be provided with stairway access, adequate lighting and ventilation and a convenient and adequate means for removing the screenings.

3. Design and installation.

A. Bar spacing. Clear opening between bars should be no less than one inch (1") (2.54 cm) for manually cleaned screens. Clear openings for mechanically cleaned screens may be as small as five-eighths of an inch (5/8") (1.50 cm). Maximum clear openings should be one and three-fourths

inches (1 3/4") (4.45 cm).

B. Slope. Manually cleaned screens, except those for emergency use, should be placed on a slope of thirty to forty-five degrees (35°–45°) on the horizontal.

C. Velocities. At normal operating flow conditions, approach velocities should be no less than 1.25 feet per second (38.1 cm/sec), to prevent settling; and no greater than 3.0 fps (91.4 cm/sec) to prevent forcing material through the openings.

D. Channels. Dual channels shall be provided and equipped with the necessary gates to isolate flow from any screening unit. Provisions shall also be made to facilitate dewatering each unit. The channel preceding and following the screen shall be shaped to eliminate stranding and settling of solids.

E. Invert. The screen channel invert should be three to six inches (3–6") (7.6–15.2 cm) below the invert of the incoming sewer.

F. Flow distribution. Entrance channels should be designed to provide equal and uniform distribution of flow to the screens.

G. Flow measurement. Flow measurement devices should be selected for reliability and accuracy. The effect of changes in backwater elevations, due to intermittent cleaning of screens, should be considered in locations of flow measurement equipment.

4. Safety.

A. Railings and gratings. Manually cleaned screen channels shall be protected by guard railings and deck gratings with adequate provisions for removal or opening to facilitate raking. Mechanically cleaned screen channels shall be protected by guard railings and deck gratings. Consideration should also be given to temporary access arrangements to facilitate maintenance and repair.

B. Mechanical devices. Mechanical screening equipment shall have adequate removal enclosures to protect personnel against accidental contact with moving parts and to prevent dripping in multi-level installations. A positive means of locking out each mechanical device shall be provided.

5. Control systems.

A. Timing devices. All mechanical units which are operated by timing devices shall be provided with auxiliary controls which will set the cleaning mechanism in operation at a pre-set high water elevation.

B. Electrical fixtures and controls. Electrical fixtures and controls in screening areas where hazardous gases may accumulate shall be suitable for hazardous locations (National Electrical Code, Class I, Group D, Division 1 location).

C. Manual override. Automatic controls shall be supplemented by a manual override.

6. Disposal of screenings. Facilities must be provided for removal, handling, storage and disposal of screenings in a sanitary manner. Separate grinding of screenings and return to the sewage flow is unacceptable. Manually cleaned screening facilities should include an accessible platform from which the operator may rake screenings easily and safely. Suitable drainage facilities shall be provided for both the platform and storage areas.

7. Auxiliary screens. Where a single mechanically cleaned screen is used, an auxiliary manually cleaned screen shall be provided. Where two (2) or more mechanically cleaned screens are used, the design shall provide for taking any unit out-of-service without sacrificing the capability to handle the peak design flow.]

(B) Fine Screens.

1. General. Fine screens may be used in lieu of primary sedimentation providing that subsequent treatment units are designed on the basis of anticipated screen performance. Fine screens should not be considered equivalent to primary sedimentation. Where fine screens are used, additional provisions for the removal of floatable oils and greases shall be considered.

2. Design. Tests should be conducted to determine BOD_5 and suspended solids removal efficiencies at the design peak hydraulic and peak organic loadings. A minimum of two (2) fine screens shall be provided; each unit being capable of independent operation. Capacity shall be provided to treat peak design flows with one (1) unit out-of-service. Fine screens shall be preceded by a mechanically cleaned bar screen or other protective device. Comminuting devices shall not be used ahead of fine screens.

3. Electrical fixtures and controls. Electrical fixtures and controls in screening areas where hazardous gases may accumulate shall be suitable for hazardous locations (National Electrical Code, Class I, Group D, Division 1 location).

4. Servicing. Hosing equipment shall be provided to facilitate cleaning. Provisions shall be made for isolating or removing units from their location for servicing.]

*[(4)]***(5)** Comminutors. **Provisions for location and safety shall be in accordance with screening devices, paragraph (4)(A)3. of this rule.**

[(A) General. Provisions for location shall be in accordance with screening devices, paragraph (3)(A)2. of this rule.

(B) When Required. Comminutors shall be used in plants that do not have primary sedimentation or fine screens and should be provided in cases where mechanically cleaned bar screens will not be used.

(C) Design Considerations.

1. Location. Comminutors should be located downstream of any grit removal equipment.

2. Size. Comminutor capacity shall be adequate to handle peak flows.

3. Installation. A screened bypass channel shall be provided. The use of the bypass channel should be automatic at depths of flow exceeding the design capacity for the comminutor. Each comminutor that is not preceded by grit removal equipment should be protected by a six inch (6.0") (15.2 cm) deep gravel trap. Gates shall be provided in accordance with subparagraph (3)(A)3.D. of this rule.

4. Servicing. Provisions shall be made to facilitate servicing units in place and removing units from their location for servicing.

5. Electrical controls and motors. Electrical equipment in comminutor chambers where hazardous gases may accumulate shall be suitable for hazardous locations (National Electrical Code, Class I, Group D, Division 1 location). Motors in areas not governed by this requirement may need protection against accidental submergence.]

*[(5)]***(6)** Grit Removal Facilities. **Wastewater treatment facilities using membrane bioreactors for secondary treatment, anaerobic digestion, and facilities receiving wastewater from combined sewers for from sewer systems receiving substantial amounts of grit must have grit removal facilities.**

[(A) When Required. Grit removal facilities should be provided for all sewage treatment plants; and are required for plants receiving sewage from combined sewers or from sewer systems receiving substantial amounts of grit. If a plant serving a separate sewer system is designed without grit facilities, the design shall include provisions for future installation. Consideration shall be given to possible damaging effects on pumps, comminutors and other preceding equipment and the need for additional storage capacity in

treatment units where grit is likely to accumulate.

(B) Location.

1. General. Grit removal facilities should be located ahead of pumps and comminuting devices. Coarse bar racks should be placed ahead of grit removal facilities.

2. Housed facilities.

A. Ventilation. Uncontaminated air shall be introduced continuously at a rate of twelve (12) air changes per hour or intermittently at a rate of thirty (30) air changes per hour. Odor control facilities may also be warranted.

B. Access. Adequate stairway access to above or below grade facilities shall be provided.

C. Electrical. All electrical work in enclosed grit removal areas where hazardous gases may accumulate shall be suitable for hazardous locations (National Electrical Code, Class I, Group D, Division 1 location).

3. Outside facilities. Grit removal facilities located outside shall be protected from freezing.

(C) Type and Number of Units. Plants treating wastes from combined sewers should have at least two (2) mechanically cleaned grit removal units with provisions for bypassing. A single manually cleaned or mechanically cleaned grit chamber with bypass is acceptable for small sewage treatment plants serving separate sanitary sewer systems. Minimum facilities for larger plants serving separate sanitary sewers should be at least one (1) mechanically cleaned unit with a bypass. Facilities other than channel-type are acceptable if provided with adequate and flexible controls for agitation and/or air supply devices and with grit collection and removal equipment.

(D) Design Factors.

1. General. The design effectiveness of a grit removal system shall be commensurate with the requirements of the subsequent process units.

2. Inlet. Inlet turbulence shall be minimized.

3. Velocity and detention. Channel-type chambers shall be designed to control velocities during normal variations in flow as close as possible to one foot (1') per second (30 cm/sec). The detention period shall be based on the size of particle to be removed. All grit removal facilities should be provided with adequate automatic control devices to regulate detention time, agitation or air supply.

4. Grit washing. The need for grit washing should be determined by the method of final grit disposal.

5. Drains. Provisions shall be made for isolating and dewatering each unit.

6. Water. An adequate supply of water under pressure shall be provided for cleanup.

7. Grit handling. Grit removal facilities located in deep pits should be provided with mechanical equipment for hoisting or transporting grit to ground level. Impervious nonslip working surfaces with adequate drainage shall be provided for grit handling areas. Grit transporting facilities shall be provided with protection against freezing and loss of material.

(6) Pre-aeration of sewage to reduce septicity may be required in special cases.

(7) Flow Equalization.

(A) General. Flow equalization can reduce the dry weather variations in organic and hydraulic loadings at any wastewater treatment plant. It should be provided where large diurnal variations are expected.

(B) Location. Equalization basins should be located downstream of pretreatment facilities such as bar screens, comminutors and grit chambers.

(C) Type. Flow equalization can be provided by using separate basins or on-line treatment units such as aeration tanks. Equalization basins may be designed as either in-line or side-line units. Unused treatment units, such as sedimentation or aeration tanks, may be utilized as equalization basins during the early period of design life.

(D) Size. Equalization basin capacity should be sufficient to effectively reduce expected flow and load variations to the extent deemed to be economically advantageous. With a diurnal flow pattern, the volume required to achieve the desired degree of equalization can be determined from a cumulative flow plot over the representative twenty-four (24)-hour period.

(E) Operation.

1. Mixing. Aeration or mechanical equipment shall be provided to maintain adequate mixing. Corner fillets and hopper bottoms with draw-offs should be provided to alleviate the accumulation of sludge and grit.

2. Aeration. Aeration equipment shall be sufficient to maintain a minimum of 1.0 mg/l of dissolved oxygen in the mixed basin contents at all times. Air supply rates should be a minimum of 1.25 cfm per one thousand gallons (1000 gal) (9 l/min/m^3) of storage capacity. The air supply should be isolated from other treatment plant aeration requirements to facilitate process aeration control. Standard process aeration supply equipment may be utilized as a source of standby aeration.

3. Controls. Inlets and outlets for all basin compartments shall be suitably equipped with accessible external valves, stop plates, weirs or other devices to permit flow control and the removal of an individual unit from service. Facilities shall also be provided to measure and indicate liquid levels and flow rates.

(F) Electrical. All electrical work in housed equalization basins shall be suitable for hazardous locations (National Electrical Code, Class I, Group D, Division 1 location).

(G) Access. Suitable access shall be provided to facilitate the maintenance of equipment and cleaning.]

*AUTHORITY: section 644.026, RSMo [Supp. 1988] **2016**. Original rule filed Aug. 10, 1978, effective March 11, 1979. Amended: Filed June 15, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Department of Natural Resources, Division of Environmental Quality, Water Protection Program, John Rustige, PO Box 176, Jefferson City, MO 65102. Comments may be sent with name and address through email to john.rustige@dnr.mo.gov. Public comments must be received by August 23, 2018. The public hearing is scheduled for 10 AM, on August 15, 2018, at the Department of Natural Resources, Elm Street Conference Center, Bennett Spring Conference Room, 1730 East Elm Street, Jefferson City, Missouri 65101.

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

PROPOSED AMENDMENT

10 CSR 20-8.160 Settling. The Clean Water Commission is amending sections (1) through (6).

PURPOSE: This amendment will retain and add minimum design standards for settling processes that are required to protect or improve public health, safety, and water quality.

PURPOSE: [The following criteria have been prepared as a guide for the design of settling tanks. This rule is to be used with rules 10 CSR 20-8.110–10 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 as regards adequacy of design, submission of plans, approval of plans, and approval of completed sewage works Deviation from these minimum requirements will be allowed where sufficient documentation is presented to justify the deviation. These criteria are taken largely from Great Lakes-Upper Mississippi River Board of State Sanitary Engineers Recommended Standards for Sewage Works 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. Addenda or supplements to this publication will be furnished to consulting engineers and city engineers. If others desire to receive addenda or supplements, please advise the Clean Water Commission so that names can be added to the mailing list.] ***This rule specifies the minimum standards for the design of settling operations that are part of wastewater collection and treatment systems. This rule is to be used with rules 10 CSR 20-8.110 through 10 CSR 20-8.210. It does not address all aspects of design, and the design engineer may refer to other appropriate reference materials so long as these minimum standards set forth in this rule are met.***

[(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 agency is concerned, unless justification is presented for deviation from the requirements. Other terms, such as should, recommend, referred and the like, indicate discretionary requirements on the part of the agency and deviations are subject to individual consideration.

(2) Exceptions. This rule shall not apply to facilities designed for twenty-two thousand five hundred gallons per day (22,500 gpd) (85.4m^3) or less (see 10 CSR 20-8.020 for the requirements for those facilities).]

(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. In the event 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. Requirements for these facilities are found in 10 CSR 20-8.300.

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

*[(3)]***(2)** General Considerations.

(A) Number of Units. Multiple **settling** units capable of independent operation are desirable and shall be provided in all *[plants]* **wastewater treatment facilities** where design flows exceed one hundred thousand (100,000) *[gpd (379m^3/d)]* **gallons per day (gpd)**. *[Plants not having]* **Wastewater treatment facilities without** multiple **settling** units shall **be designed to** include other provisions to assure continuity of treatment.

[(B) Arrangement. Settling tanks shall be arranged in accordance with subsection 10 CSR 20-8.140(5)(E).]

*[(C)]***(B)** Flow Distribution. Effective flow *[measurement]* **splitting** devices and control appurtenances (*[that is, valves,]* ***e.g.*** gates*[,]* **and** splitter boxes*[, etc.]*) shall be provided to permit proper proportion**ing** of flow **and solids loading** to each **settling** unit**, throughout the expected range of flows**.

[(D) Tank Configuration. Consideration should be given to the probable flow pattern in the selection of tank size and shape, and inlet and outlet type and location.]

*[(4)]***(3)** Design *[Considerations]*.

[(A) Dimensions. The minimum length of flow from inlet to outlet should be ten feet (10') (3 m) unless special provisions are made to prevent short-circuiting. The sidewater depth for primary clarifiers shall be as shallow as practicable, but not less than seven feet (7') (2.1 m). Clarifiers following the activated sludge process shall have sidewater depths of at least twelve feet (12') (3.7 m) to provide adequate separation zone between the sludge blanket and the overflow weirs. Clarifiers following fixed film reactors shall have sidewater depth of at least seven feet (7') (2.1m).]

(A) Side Water Depth. The minimum side water depth shall be as follows in Table 160-1 below:

Table 160-1. Minimum Side Water Depth.

Type of Settling Tank	Minimum Side Water Depth (ft)
Primary (>100,000 gpd)	10
Primary (<100,000 gpd)	7
Final following activated sludge process	12
Final following attached growth biological reactor (>100,000 gpd)	10
Final following activated sludge and attached growth biological reactor (<100,000 gpd)	7

(B) Surface *[Settling Rates (]*Overflow Rates*[)]*.

[1. Primary settling tanks. Surface settling rates for primary tanks should not exceed one thousand (1000) gpd per square foot (41m^3/m^2/day) at design average flows or one thousand five hundred (1500) gpd per square foot (61m^3m^2/day) for peak hourly flows. Clarifier sizing shall be calculated for both flow conditions and the larger surface area determined shall be used. Primary settling of normal domestic sewage can be expected to remove thirty to fifty percent (30–50%) of the influent BOD. However, anticipated BOD removal for sewage containing appreciable quantities of industrial wastes (or chemical additions to be used) should be determined by laboratory tests and consideration of the quantity and character of the wastes.

2. Intermediate settling tanks. Surface settling rates for intermediate settling tanks following series units of fixed film reactor processes shall not exceed one thousand five hundred (1500) gpd per square foot (61m^3/m^2/day) based on peak hourly flow.

3. Final settling tanks. Settling tests should be conducted wherever pilot study of biological treatment is warranted by unusual waste characteristics or treatment requirements. Testing shall be done where proposed loadings go beyond the limits set forth in this section. Surface settling rates for settling tanks following trickling filters or rotating biological contractors shall not exceed one thousand two hundred (1200) gpd gallons per day per square foot (49m^3/m^2/day) (1,200 gpd/ft^2) based on the design peak hourly flow. Final settling tanks following activated sludge processes must be designed to meet thickening as well as solids separation requirements. Since the rate of recirculation of return sludge from the final settling tanks to the aeration or re-aeration tanks is quite high in activated sludge processes, surface settling rate and weir overflow rate should be adjusted for

the various processes to minimize the problems with sludge loadings, density currents, inlet hydraulic turbulence and occasional poor sludge settleability. The hydraulic design of intermediate and final settling tanks following activated sludge processes shall be based upon the anticipated peak hourly rate for the area downstream of the inlet baffle. The hydraulic loadings shall not exceed—one thousand two hundred (1200) gpd per square foot (49m^3/m^2/day) for conventional, step aeration, contact stabilization and the carbonaceous stage of separate-stage nitrification; one thousand (1000) gpd per square foot (41m^3/m^2/day) for extended aeration; and eight hundred (800) gpd per square foot (33m^3/m^2/day) for the separate nitrification stage. The solids loading for all activated sludge processes shall not exceed fifty pounds (50 lbs.) solids per day per square foot (244 kg/m^2/day) at the peak rate. Consideration should be given to flow equalization.]

1. Primary settling tanks. Calculate the surface overflow rates for both design average flow and design peak hourly flow from Table 160-2 below. The larger area shall determine the size of the settling tank.

Table 160-2. Maximum Primary Settling Tank Surface Overflow Rates.

Type of Primary Settling Tank	Surface Overflow Rates[1]: At Design Average Flow (gpd/ft^2)	At Design Peak Hourly Flow (gpd/ft^2)
Tanks not receiving waste activated sludge	1,000	3,000
Tanks receiving waste activated sludge	700	1,700

[1] Calculate surface overflow rates with all flows received at the settling tanks.

2. Final settling tanks – attached growth biological reactors. Surface overflow rates for settling tanks following attached growth biological reactors shall not exceed one thousand two hundred gallons per day per square foot (1,200 gpd/ft^2) based on the design peak hourly flow.

3. Final settling tanks – activated sludge. The following design criteria in Table 160-3, included herein, shall not be exceeded:

Table 160-3. Maximum Activated Sludge Final Settling Tank Rates.

Treatment Process	Surface Overflow Rate at Design Peak Hourly Flow[1] (gpd/ft^2)	Peak Solids Loading Rate[2] (lb/day/ft^2)
With diurnal flow equalization[3]	1,000	35
Without diurnal flow equalization[3]	150 x Peaking Factor[4]	35
Conventional, Step Aeration, Complete Mix, Contact Stabilization, Carbonaceous Stage of Separate Stage Nitrification	1,200 [5]	40
Extended Aeration Single-Stage Nitrification	1,000	35
Multi-Stage Nitrification	800	35
Activated Sludge with Chemical addition to Mixed Liquor for Phosphorus Removal	900	35

[1] Based on influent flow only.

[2] Calculate the peak solids loading rate based on the design maximum day flow rate plus the design maximum return sludge rate requirement and the design mixed liquor suspended solids under aeration.

[3] Applicable to wastewater treatment facilities with a design average flow of less than one hundred thousand gallons per day (100,000 gpd).

[4] To determine the peaking factor use 10 CSR 20-8.110(3) Equation 110-1.

[5] Wastewater treatment facilities needing to meet twenty milligrams per liter (20 mg/L) suspended solids or less should reduce the surface overflow rate to one thousand gallons per day per square foot (1,000 gpd/ft^2).

[(C) Inlet Structures. Inlets should be designed to dissipate the inlet velocity, to distribute the flow equally, both horizontally and vertically, and to prevent short-circuiting. Channels should be designed to maintain a velocity of at least one foot (1′) per second (0.3m/s) at one-half (1/2) the design flow. Corner pockets and dead ends should be eliminated and corner fillets or channeling used where necessary. Provisions shall be made for elimination or removal of floating materials in inlet structures.]

*[(D)]***(C)** Weirs.

1. General. Overflow weirs shall be **readily** adjustable *[for leveling]* **over the life of the structure to correct for differential settlement of the tank**.

[2. Location. Overflow weirs shall be located to optimize actual hydraulic detention time, and minimize short-circuiting.

3. Design rates. Weir loadings should not exceed: ten thousand (10,000) gpd per lineal foot (124m^3/m/day) for plants designed for average flows of 1.0 mgd (3,785m^3/day) or less. Higher weir loadings may be used for plants designed for larger average flows but should not exceed fifteen thousand (15,000) gpd per lineal foot (186m^3/m/day). If pumping is required, weir loadings should be related to pump delivery rates to avoid short-circuiting.

4. Weir troughs. Weir troughs shall be designed to prevent submergence at maximum design flow and to maintain a velocity of at least one foot (1′) per second (0.3m/s) at one-half (1/2) the design flow.]

2. Design rates. The following weir loadings in Table 160-4, below, shall not be exceeded:

Table 160-4. Maximum Weir Loading Rates.

Average Wastewater Treatment Facility Capacity (million gallons per day or MGD)	Loading Rate at Design Peak Hourly Flow (gpd/lf)
Less than 0.1	10,000
0.1 through 1.0	20,000
Greater than 1.0	30,000

*[(E)]***(D)** Submerged Surfaces. *[The tops of troughs, beams and similar submerged construction elements shall have a minimum slope of 1.4:1; t]***T**he underside *[of]* **and** the **tops of troughs, beams, and similar submerged construction** elements *[should]* **shall** have a **minimum** slope of one **vertical** to one **horizontal** (1:1) to prevent the accumulation of scum and solids.

[(F) Unit De-watering. Unit de-watering features shall conform to the provisions outlined in 10 CSR 20-8.140(6). The unit isolation design should also provide for redistribution of the plant flow to the remaining units.]

*[(G)]***(E)** Freeboard. Walls of settling tanks shall extend at least six inches (6") *[(15 cm)]* above the surrounding ground surface and shall provide not less than twelve inches (12") *[(30 cm)]* **of** freeboard. *[Additional freeboard or the use of wind screens is recommended where larger settling tanks are subject to high velocity wind currents that would cause tank surface waves and inhibit effective scum removal.]*

[(5) Sludge and Scum Removal.

(A) Scum Removal. Effective scum collection, and removal, including baffling, shall be provided for all settling tanks. The unusual characteristics of scum which may adversely affect pumping, piping, sludge handling and disposal should be recognized in design. Provisions may be made for the discharge of scum with the sludge; however, other special provisions for disposal may be necessary.

(B) Sludge Removal. Sludge collection and withdrawal facilities shall be so designed as to assure rapid removal of the sludge. Suction withdrawal should be provided for activated sludge plants designed for reduction of the nitrogenous oxygen demand and is encouraged for those plants designed for carbonaceous oxygen demand reduction.

1. Sludge hopper. The minimum slope of the side walls shall be 1.7:1. Hopper wall surfaces should be made smooth with rounded corners to aid in sludge removal. Hopper bottoms shall have a maximum dimension of two feet (2′) (.6m). Extra depth sludge hoppers for sludge thickening are not acceptable.

2. Cross-collectors. Cross-collectors serving one (1) or more settling tanks may be useful in place of multiple sludge

hoppers.

3. Sludge removal piping. Each hopper shall have an individually-valved sludge withdrawal line at least six inches (6") (15 cm) in diameter. The static head available for withdrawal of sludge shall be thirty inches (30") (76 cm) or greater as necessary to maintain a three-foot (3') per second (0.9m/s) velocity in the withdrawal pipe. Clearance between the end of the withdrawal line and the hopper walls shall to be sufficient to prevent bridging of the sludge. Adequate provisions shall be made for rodding or back-flushing individual pipe runs. Piping shall also be provided to return waste sludge to primary clarifiers.

4. Sludge removal control. Sludge wells equipped with telescoping valves or other appropriate equipment shall be provided for viewing, sampling, and controlling the rate of sludge withdrawal. The use of easily maintained sight glass and sampling valves may be appropriate. A means of measuring the sludge removal rate shall be provided. Air lift type of sludge removal will not be approved for removal of primary sludges. Sludge pump motor control system shall include time clocks and valve activators for regulating the duration and sequencing of sludge removal.]

(4) Sludge Removal.

(A) Settling floor. The minimum slope of the settling floor shall be one vertical to twelve horizontal (1:12).

(B) Sludge hopper. The minimum slope of the sludge hopper side walls shall be 1.7 vertical to one horizontal (1.7:1) (i.e., sixty degrees (60°) above the horizontal).

(C) When used, dual sludge hoppers shall provide a minimum water depth of two feet (2') over the connecting wall that is between hoppers.

*[(6)]***(5)** Protective and Service Facilities.

(A) Operator Protection. *[All settling tanks shall be equipped to enhance safety for operators. These]* **Safety** features shall appropriately include machinery covers, life lines, **handrails on all** stairways*[,]* **and** walkways, *[hand rails]* and slip*[-]* resistant surfaces. **For additional safety follow the provisions listed in 10 CSR 20-8.140(8).**

(B) Mechanical Maintenance Access. The design shall provide for convenient and safe access to routine maintenance items such as gear boxes, scum removal*[,]* mechanism**,** *[and]* baffles, weirs, inlet stilling baffle area**s,** and effluent channels.

(C) Electrical **Equipment,** Fixtures**,** and Controls. **For** *[E]***l**ectrical **equipment,** fixtures**,** and controls in enclosed settling basins *[shall be suitable for hazardous locations (National Electrical Code for Class I, Group D, Division 1 location)]* **and scum tanks, where hazardous concentrations of flammable gases or vapors may accumulate, follow the provisions in 10 CSR 20-8.140(6)(B)**. The fixtures and controls shall be **conveniently** located *[so as to provide convenient and safe access]* **and safely accessible** for operation and maintenance. *[Adequate area lighting shall be provided.]*

*AUTHORITY: section 644.026, RSMo [Supp. 1988] **2016**. Original rule filed Aug. 10, 1978, effective March 11, 1979. Amended: Filed June 15, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Department of Natural Resources, Division of Environmental Quality, Water Protection Program, John Rustige, PO Box 176, Jefferson City, MO 65102. Comments may be sent with name and address through email to john.rustige@dnr.mo.gov. Public comments must be received by August 23, 2018. The public hearing is scheduled for 10 AM, on August 15, 2018, at the Department of Natural Resources, Elm Street Conference Center, Bennett Spring Conference Room, 1730 East Elm Street, Jefferson City, Missouri 65101.

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

PROPOSED AMENDMENT

10 CSR 20-8.170 *[Sludge] **Solids*** **Handling and Disposal**. The Clean Water Commission is amending sections (1) through (8), and deleting sections (9) and (10).

PURPOSE: This amendment will retain and add minimum design standards for solids handling and disposal at wastewater treatment facilities that are required to protect or improve public health, safety, and water quality.

PURPOSE: [The following criteria have been prepared as a guide for the design of sludge handling and disposal facilities. This rule is to be used with rules 10 CSR 20-8.110–10 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 as regards adequacy of design, submission of plans, approval of plans and approval of completed sewage works. Deviation from these minimum requirements will be allowed where sufficient documentation is presented to justify the deviation. These criteria are taken largely from Great Lakes-Upper Mississippi River Board of State Sanitary Engineers, Recommended Standards for Sewage Works 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. Addenda or supplements to this publication will be furnished to consulting engineers and city engineers. If others desire to receive addenda or supplements, please advise the Clean Water Commission so that names can be added to the mailing list.] ***This rule specifies the minimum standards for the design of solids handling and disposal operations that are part of wastewater collection and treatment systems. This rule is to be used with rules 10 CSR 20-8.110 through 10 CSR 20-8.210. It does not address all aspects of design, and the design engineer may refer to other appropriate reference materials so long as these minimum standards set forth in this rule are met.***

[(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 agency is concerned, unless justification is presented for deviation from the requirements. Other terms, such as should, recommend, preferred and the like, indicate discretionary requirements on the part of the agency and deviations are subject to individual consideration.

(2) Exceptions. This rule shall not apply to facilities designed for twenty-two thousand five hundred gallons per day

(22,500 gpd) (85.4m^3) or less (see 10 CSR 20-8.020) for the requirements for those facilities.]

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

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

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

*[(3)]***(2) General** Design Considerations. *[The selection of sludge handling and disposal methods should include the following considerations: energy requirements; efficacy of sludge thickening; complexity of equipment; staffing requirements; toxic effects of heavy metals and other substances on sludge stabilization and disposal; treatment of side-stream flow such as digester and thickener supernatant; a back-up method of sludge handling and disposal; and methods of ultimate sludge disposal.]* **Systems to which this rule applies shall comply with 10 CSR 20-8.140(7) and (8).**

[(4) Sludge Thickeners. As the first step of sludge handling, the need for sludge thickeners to reduce the volume of sludge should be considered. The design of thickeners (gravity, dissolved air flotation, centrifuge and others) should consider the type and concentration of sludge, the sludge stabilization processes, the method of ultimate sludge disposal, chemical needs and the cost of operation. Particular attention should be given to the pumping and piping of the concentrated sludge and possible onset of anaerobic conditions. Sludge should be thickened to at least five percent (5%) solids prior to transmission to digesters.]

(3) Gravity Sludge Thickeners. For the minimum side water depth, follow the provisions listed in Table 160-1 in 10 CSR 20-8.160(3)(A).

*[(5)]***(4)** Anaerobic *[Sludge]* **Solids** Digestion.

(A) General.

[1. Multiple units. Multiple tanks are recommended. Where a single digestion tank is used, an alternate method of sludge processing or emergency storage to maintain continuity of service shall be provided.

2. Depth. For those units proposed to serve as supernatant separation tanks, the depth should be sufficient to allow for the formation of a reasonable depth of supernatant liquor. A minimum sidewater depth of twenty feet (20') (6.10 m) is recommended.

3. Maintenance provisions. To facilitate draining, cleaning and maintenance, the following features are desirable:

A. Slope. The tank bottom should slope to drain toward the withdrawal pipe. For tanks equipped with a suction mechanism for withdrawal of sludge, a bottom slope of one to twelve (1:12) or greater is recommended. Where the sludge is to be removed by gravity alone, one to four (1:4) slope is recommended.

B. Access manholes. At least two (2) thirty-six inch (36") (91 cm) diameter access manholes should be provided in the top of the tank in addition to the gas dome. There should be stairways to reach the access manholes. A separate sidewall manhole shall be provided. The opening should be large enough to permit the use of mechanical equipment to remove grit and sand.]

*[C.]***1.** Safety. *[Nonsparking tools, safety lights, rubber-soled shoes, safety harness, gas]* **Gas** detectors *[for inflammable and toxic gases, and at least two (2) self-contained breathing units]* shall be provided for emergency use.

2. Provide an alarm system in accordance with 10 CSR 20-8.140(6)(C) to warn of:

A. Any drop of the liquid level below minimum operating elevation; and

B. Low pressure in the space above the liquid level.

(B) *[Sludge Inlets and Outlets. Multiple recirculation withdrawal and return points should be provided to enhance flexible operation and effective mixing, unless mixing facilities are incorporated within the digester. The returns, in order to assist in scum breakup, should discharge above the liquid level and be located near the center of the tank. Raw sludge discharge to the digester should be through the sludge heater and recirculation return piping or directly to the tank if internal mixing facilities are provided. Sludge withdrawal to disposal should be from the bottom of the tank. This pipe should be interconnected with the recirculation piping to increase versatility in mixing the tank contents, if the piping is provided. Sludge withdrawal should be at the bottom of the tank.]* **High Level Emergency Overflow. An unvalved vented overflow shall be provided to prevent damage to the digestion tank and cover in case of accidental overfilling. Pipe this emergency overflow back to the treatment process or side stream treatment facility.**

[(C) Tank Capacity. The total digestion tank capacity should be determined by rational calculations based upon such factors as volume of sludge added, its percent solids and character, the temperature to be maintained in the digesters, the degree or extent of mixing to be obtained and the degree of volatile solids reduction required. Calculations should be submitted to justify the basis of design. When the calculations are not based on these factors, the minimum combined digestion tank capacity outlined in paragraphs (5)(C)1. and 2. will be required. The requirements assume that a raw sludge is derived from ordinary domestic wastewater, that a digestion temperature is to be maintained in the range of ninety degrees to one hundred degrees Fahrenheit (90°–100 °F) (32.2 °C–37.8 °C), that forty to fifty percent (40–50%) volatile matter will be maintained in the digested sludge, and that the digested sludge will be removed frequently from the system (see also paragraph (5)(A)1. of this rule).

1. Completely-mixed systems. Completely-mixed systems shall provide for intimate and effective mixing to prevent stratification and to assure homogeneity of digester content. The system may be loaded at a rate up to eighty pounds (80 lbs.) of volatile solids per one thousand (1000) cubic feet of volume per day (1.28 kg/m^3/day) in the active digestion units. When grit removal facilities are not provided, the reduction of digester volume due to grit accumulation should be considered. Complete mixing can be accomplished only with substantial energy input.

2. Moderately-mixed systems. For digestion systems where mixing is accomplished only by circulating sludge through an external heat exchanger, the system may be loaded at a rate up to forty pounds (40 lbs.)of volatile solids per one thousand (1000) cubic feet of volume per day (0.64 kg/m^3/day) in the active digestion units. This loading may be modified upward or downward depending upon the degree of mixing provided. Provisions for mixing scum shall be included.]

*[(D)]***(C)** Gas Collection, Piping and Appurtenances.

[1. General. All portions of the gas system, including the space above the tank liquor, storage facilities and piping, shall be so designed that under all normal operating conditions, including sludge withdrawal, the gas will be maintained under positive pressure. All enclosed areas where any

gas leakage might occur shall be adequately ventilated.

*[2.]***1.** Safety equipment. *[All necessary safety facilities shall be included w]***W**here gas is produced*[.]***, all necessary safety facilities shall:**

A. Provide *[P]***p**ressure and vacuum relief valves and flame traps, together with automatic safety shutoff valves*[, shall be provided.]* **and protect from freezing;**

B. Not install *[W]***w**ater seal equipment *[shall not be installed.]***; and**

C. House *[G]***g**as safety equipment and gas compressors *[should be housed]* in a separate room with an exterior entrance.

2. Ventilate piping galleries in accordance with paragraph (4)(C)4. of this rule.

[3. Gas piping and condensate. Gas piping shall be of adequate diameter and shall slope to condensate traps at low points. The use of float-controlled condensate traps is not permitted.

4. Gas utilization equipment. Gas-fired boilers for heating digesters shall be located in a separate room not connected to the digester gallery. The separated room would not ordinarily be classified as hazardous location. Gas lines to these units shall be provided with suitable flame traps.]

*[5.]***3.** Electrical fixtures**, equipment, and controls**. Electrical fixtures**, equipment,** and controls *[in places enclosing anaerobic digestive appurtenances where hazardous gases are normally contained in the tanks and/or piping]* shall comply with the National Electrical *[Code, Class I, Group D, Division 2 locations. Digester galleries should be isolated from normal operating areas to avoid an extension of the hazardous location in accordance with paragraph (5)(D)7. of this rule.]* **Manufacturers Association (NEMA) 4X enclosure rating where necessary; NEMA Standard 250-2014, published December 15, 2014. This standard is hereby incorporated by reference into this rule, as published by National Electrical Manufacturers Association, 1300 North 17th Street, Arlington, VA 22209. Electrical equipment, fixtures, and controls, in places enclosing and adjacent to anaerobic digestive appurtenances where hazardous gases are included.**

[6. Waste gas. Waste gas burners shall be readily accessible and should be located at least twenty-five feet (25') (7.6 m) away from any plant structure if placed at ground level or may be located on the roof of the control building if sufficiently removed from the tank. All waste gas burners shall be equipped with automatic ignition, such as pilot light or a device using a photoelectric cell sensor. Consideration should be given to the use of natural or propane gas to insure reliability of the pilot light. In remote locations it may be permissible to discharge the gas to the atmosphere through a return-bend screened vent terminating at least ten feet (10') (3 m) above the ground surface, provided that the assembly incorporates a flame trap.]

*[7.]***4.** Ventilation. Any underground enclosures connecting with digestion tanks or containing *[sludge]* **solids** or gas piping or equipment shall be provided with forced ventilation in accordance with *[10 CSR 20-8.130(4)(G) and 10 CSR 20-8.130(4)(G)2.]* **10 CSR 20-8.140(7)(J).** *[The piping gallery for digesters should not be connected to other passages. Where used, tightly fitting, self-closing doors should be provided at connecting passageways and tunnels to minimize the spread of gas.]*

[8. Meter. A gas meter with bypass shall be provided to meter total gas production.

(E) Digester Heating.

1. Insulation. Wherever possible digestion tanks should be constructed above groundwater level and should be suitably insulated to minimize heat loss.

2. Heating facilities. Sludge may be heated by circulating the sludge through external heaters or by heating units located inside the digestion tank.

A. External heating. Piping shall be designed to provide for the preheating of feed sludge before introduction to the digesters. Provisions shall be made in the layout of the piping and valving to facilitate cleaning of these lines. Heat exchanger sludge piping should be sized for heat transfer requirements.

B. Other heating methods. Other types of heating facilities will also be considered on their own merits.

3. Heating capacity. Heating capacity sufficient to consistently maintain the design sludge temperature shall be provided. Where digester tank gas is used for sludge heating, an auxiliary fuel supply is required.

4. Hot water internal heating controls.

A. Mixing valves. A suitable automatic mixing valve shall be provided to temper the boiler water with return water so that the inlet water to the heat jacket can be held below a temperature at which caking will be accentuated. Manual control should also be provided by suitable bypass valves.

B. Boiler controls. The boiler should be provided with suitable automatic controls to maintain the boiler temperature at approximately one hundred eighty degrees Fahrenheit (180 °F) (82 °C) to minimize corrosion and to shut off the main gas supply in the event of pilot burner or electrical failure, low boiler water level or excessive temperature.

C. Thermometers shall be provided to show temperatures of the sludge, hot water feed, hot water return and boiler water.

(F) Supernatant Withdrawal.

1. Piping size. Supernatant piping should not be less than six inches (6") (15 cm) in diameter.

2. Withdrawal arrangements.

A. Withdrawal levels. Piping should be arranged so that withdrawal can be made from three (3) or more levels in the digester. A positive unvalved vented overflow shall be provided.

B. Supernatant selector. If a supernatant selector is provided, provisions shall be made for at least one (1) other draw-off level located in the supernatant zone of the tank in addition to the unvalved emergency supernatant draw-off pipe. High pressure backwash facilities shall be provided.

3. Sampling. Provisions should be made for sampling at each supernatant draw-off level. Sampling pipes should be at least one and one-half inches (1 1/2") (3.8 cm) in diameter and should terminate at a suitably-sized sampling sink or basin.

4. Alternate supernatant disposal. Consideration should be given to supernatant conditioning where appropriate in relation to its effect on plant performance and effluent quality.]

(D) Water Supply. Water supplies using indirect connections shall comply with 10 CSR 20-8.140(6)(D).

*[(6)]***(5)** Aerobic *[Sludge]* **Solids** Digestion*[.]* **High Level Emergency Overflow. An unvalved emergency overflow shall be provided that will convey digester overflow to the treatment plant headworks, the aeration process, or to another liquid sludge storage facility and that has an alarm for high level conditions.**

[(A) General. Aerobic digestion can be used to stabilize primary sludge, secondary sludge or a combination of the two. Digestion is accomplished in single or multiple tanks designed to provide effective air mixing, reduction of the organic matter, supernatant separation and sludge concentration under controlled conditions.

1. Digestion tanks. Multiple tanks are recommended. A single sludge digestion tank may be used in the case of small treatment plants or where adequate provision is made for sludge handling where a single unit will not adversely

affect normal plant operations.

(B) Mixing and Air Requirements. Aerobic sludge digestion tanks shall be designed for effective mixing by satisfactory aeration equipment. Sufficient air shall be provided to keep the solids in suspension and maintain dissolved oxygen between one and two (1–2) mg/l. A minimum mixing and oxygen requirement of thirty (30) cfm per one thousand (1000) cubic feet of tank volume (30 l/min/m^3) shall be provided with the largest blower out-of-service. If diffusers are used, the nonclog type is recommended, and they should be designed to permit continuity of service. If mechanical aerators are utilized, a minimum of 1.0 horsepower per one thousand (1000) cubic feet (28.3m^3) should be provided. Use of mechanical equipment is discouraged where freezing temperatures are normally expected.

(C) Tank Capacity. The determination of tank capacities shall be based on rational calculations, including such factors as quantity of sludge produced, sludge characteristics, time of aeration and sludge temperature.

1. Volatile solids loading. It is recommended that the volatile suspended solids loading not exceed one hundred pounds per one thousand cubic feet (100 lb/1000 ft^3) of volume per day (1.60 kg/m^3/day) in the digestion units. Lower loading rates may be necessary depending on temperature, type of sludge and other factors.

2. Solids retention time. Required minimum solids retention time for stabilization of biological sludges vary depending on type of sludge. Normally, a minimum of fifteen (15) days' retention should be provided for waste activated sludge and twenty (20) days for combination of primary and waste activated sludge, or primary sludge alone. Where sludge temperature is lower than fifty degrees Fahrenheit (50 °F) (10 °C), additional detention time should be considered.

(D) Supernatant Separation. Facilities shall be provided for effective separation and withdrawal of supernatant and for effective collection and removal of scum and grease.

(7) Sludge Pumps and Piping.

(A) Sludge Pumps.

1. Capacity. Pump capacities should be adequate but not excessive. Provision for varying pump capacity is desirable.

2. Duplicate units. Duplicate units shall be provided where failure of one (1) unit would seriously hamper plant operation.

3. Type. Plunger pumps, screw feed pumps, recessed impeller type centrifugal pumps, progressive cavity pumps or other types of pumps with demonstrated solids handling capability shall be provided for handling raw sludge. Where centrifugal pumps are used, a parallel plunger type pump should be provided as an alternate to increase reliability of the centrifugal pump.

4. Minimum head. A minimum positive head of twenty-four inches (24") (61 cm) shall be provided at the suction side of centrifugal type pumps and is desirable for all types of sludge pumps. Maximum suction lifts should not exceed ten feet (10') (3m) for plunger pumps.

5. Sampling facilities. Unless sludge sampling facilities are otherwise provided, quick closing sampling valves shall be installed at the sludge pumps. The size of valve and piping should be at least one and one-half inches (1 1/2") (3.8 cm).

(B) Sludge Piping.

1. Size and head. Sludge withdrawal piping should have a minimum diameter of eight inches (8") (20.3 cm) for gravity withdrawal and six inches (6") (15.2 cm) for pump suction and discharge lines. Where withdrawal is by gravity the available head on the discharge pipe should be adequate to provide at least three feet (3') per second (0.9m/sec) velocity.

2. Slope. Gravity piping should be laid on uniform grade and alignment. The slope of gravity discharge piping should not be less than three percent (3%). Provisions should be made for cleaning, draining and flushing discharge lines.

3. Supports. Special consideration should be given to the corrosion resistance and continuing stability of supporting systems located inside the digestion tank.]

(6) For solids pumping systems, provide audio-visual alarms in accordance with 10 CSR 20-8.140(6)(C) for:

(A) Pump failure;

(B) Pressure loss; and

(C) High pressure.

*[(8)]***(7)** *[Sludge]* **Solids** De*[-]*watering.

[(A) Sludge Drying Beds.

1. Area. In determining the area of sludge drying beds, consideration shall be given to climatic conditions, the character and volume of the sludge to be de-watered, the method and schedule of sludge removal and other methods of sludge disposal. (It should be recognized that, in northern areas of the country, the drying season is only six (6) months a year.) In general, the sizing of the drying bed may be estimated on the basis of 2.0 ft^2/capita (0.2 m^2/capita) when the drying bed is the primary method of de-watering, and 1.0 ft^2/capita (0.1 m^2/capita) if it is to be used as a back-up de-watering unit. An increase of bed area by twenty-five percent (25%) is recommended for paved-type bed.

2. Percolation type. The lower course of gravel around the underdrains should be properly graded and should be twelve inches (12") (30 cm) in depth, extending at least six inches (6") (15.2 cm) above the top of the underdrains. It is desirable to place this in two (2) or more layers. The top layer of at least three inches (3") (7.6 cm) should consist of gravel one-eighth inch (1/8") to one-fourth inch (1/4") (3.2–6.4 mm) in size.

A. Sand. The top course should consist of at least six to nine inches (6"–9") (15–23 cm) of clean coarse sand. The finished sand surface should be level.

B. Underdrains. Underdrains should be clay pipe or concrete drain tile at least four inches (4") (10 cm) in diameter laid with open joints. Underdrains should be spaced not more than twenty feet (20') (6 m) apart. As to the discharge of the underdrain filtrate, refer to subsection (8)(C) of this rule.

3. Partially paved type. The partially paved type drying bed should be designed with consideration for space requirement to operate mechanical equipment for removing the dried sludge.

4. Walls. Walls should be watertight and extend fifteen to eighteen inches (15"–18") (38 cm–46 cm) above and at least six inches (6") (15 cm) below the surface. Outer walls should be curbed to prevent soil from washing into the beds.

5. Sludge removal. Not less than two (2) beds should be provided and they should be arranged to facilitate sludge removal. Concrete truck tracks should be provided for all percolation type sludge beds. Pairs of tracks for percolation type should be on twenty-foot (20') (6 m) centers.

6. Sludge influent. The sludge pipe to the drying beds should terminate at least twelve inches (12") (30 cm) above the surface and be so arranged that it will drain. Concrete splash plates for percolation type should be provided at sludge discharge points.

7. Protective enclosure. A protective enclosure shall be provided if winter operation is required.

(B) Mechanical De-watering Facilities. Provision shall be made to maintain sufficient continuity of service so that sludge may be de-watered without accumulation beyond storage capacity. The number of vacuum filters, centrifuges, filter presses, belt filters or other mechanical de-watering facilities should be sufficient to de-water the sludge produced with one (1) largest unit out-of-service. Unless other standby facilities are available, adequate storage facilities shall be provided. The storage capacity should be sufficient to handle at least a three (3)-month sludge production.

1. Auxiliary facilities per vacuum filters. There shall be a back-up vacuum pump and filtrate pump installed for each vacuum filter. It is permissible to have an uninstalled back-up vacuum pump or filtrate pump for every three (3) or less vacuum filters, provided that the installed unit can easily be removed and replaced.

2. Ventilation. Adequate facilities shall be provided for ventilation of de-watering area. The exhaust air should be properly conditioned to avoid odor nuisance.

3. Chemical handling enclosures. Lime-mixing facilities should be completely enclosed to prevent the escape of lime dust. Chemical handling equipment should be automated to eliminate the manual lifting requirement.

(C) Drainage and Filtrate Disposal. Drainage from beds or filtrate from de-watering units shall be returned to the sewage wastewater treatment process at appropriate points.

(D) Other De-watering Facilities. If it is proposed to de-water or dispose of sludge by other methods, a detailed description of the process and design data shall accompany the plans.]

(A) Belt presses and conveyors shall be provided with emergency shutoff controls along the entire length of the belt presses and conveyors that will:

1. Stop the press in an emergency; and

2. Trigger an audible alarm.

(B) Alarm systems shall be provided to notify the operator(s) of conditions that could result in process equipment failure or damage, threaten operator safety, or a solids spill or overflow condition.

(8) Sludge and Biosolids Storage Lagoons. Seal the sludge lagoon bottoms and embankments in accordance with 10 CSR 20-8.200(4)(C) to prevent leaching into adjacent soils or groundwater.

[(9) Municipal Sludge Disposal on Land. The program of land spreading of sludge must be evaluated as an integral system which include stabilization, storage, transportation, application, soil, crop and groundwater. The following guidelines were formulated to provide the criteria of municipal sludge disposal on land. Sewage sludge is useful to crop and soil by providing nutrients and organic matter. Sewage sludge contains heavy metals and other substances which could affect soil productivity and the quality of food. Sufficient information is not available to completely evaluate the deleterious effects. The purpose of the guidelines is to indicate the acceptable method of sludge disposal on land surface based on current knowledge. It is recognized that these guidelines should be revised as more information becomes available.

(A) General Limitations to be Observed.

1. Stabilized sludge. Only stabilized sludge shall be surface applied to farmland or pasture. Stabilized sludge is defined as processed sludge in which the organic and bacterial contents of raw sludge are reduced to levels deemed necessary by the agency to prevent nuisance odors and public health hazards. Any process which produces sludge equivalent in quality to the above in terms of public health factors and odor potential may be accepted. Additional treatment would be required to further reduce pathogens when the sludge is to be spread on dairy pastures and other crops which are in the human food chain.

2. Raw vegetables. Sludge should not be applied to land which is used for growing food crops to be eaten raw, such as leafed vegetables and root crops.

3. Minimum pH. No sludge shall be applied on land if the soil pH is less than 6.5 when sludge is applied and pH shall be maintained above 6.5 for at least two (2) years following end of sludge application.

4. Persistent organic chemicals. At present time, sufficient information is not available to establish criteria of sludge spreading in regard to persistent organic chemicals, such as pesticides and polychlorinated biphenyls (PCB). However, if there is a known source in the sewer service area which discharges or discharged in the past such chemicals, the sludge should be analyzed for chemicals and the agency shall be consulted for recommendations concerning sludge spreading.

(B) Site Selection. By proper selection of the sludge application site, the nuisance potential and public health hazard should be minimized. The following items should be considered and the agency should be consulted for specific limits: land ownership information; groundwater table and bedrock location; location of dwellings, road and public access; location of wells, springs, creeks, streams and flood plains; slope of land surface; soil characteristics; climatological information and periods of ground freezing; land use plan; and road weight restrictions.

(C) Sludge Application on Farmland. Heavy metal loading to land should be limited in order to avoid reduction of soil productivity. A detailed chemical analysis of the sludge shall be made and the application rate shall be based on characteristics of the application site and crop uptake. The agency shall be contacted for specific limits.

(D) Sludge Application on Forested Land. Disposal of sludge on forested land is considerably less hazardous than on cropland in terms of heavy metal toxicity unless the land is to be converted to cropland. For the allowable sludge loading the agency should be consulted.

(E) Management of Spreading Operation.

1. Hauling equipment. The sludge hauling equipment should be designed to prevent spillage, odor and other public nuisance.

2. Valve control. The spreading tank truck should be provided with a control so that the discharge valve can be opened and closed by the driver while the vehicle is in motion. The spreading valve should be of the fail-safe type (that is, self-closing) or an additional manual standby valve should be employed to prevent uncontrolled spreading or spillage.

3. Sludge storage. Sufficient sludge storage capacity shall be provided for periods of inclement weather and equipment failure. The storage facilities shall be designed, located and operated so as to avoid nuisance conditions.

4. Spreading methods. The selection of spreading methods depends on the sludge characteristics, environmental factor and others. When control of odor nuisance and runoff is required, immediate incorporation of sludge after spreading or subsurface injection should be considered. When such method is utilized, an adjustment in the reduced rate of ammonia loss into the atmosphere should be considered in the computation for nitrogen balance. The sewage sludge should be spread uniformly over the surface when tank truck spreading, ridge and furrow irrigation or other methods are used. Proposals for subsurface application of sludge shall include for review a description of the equipment and program for application. Spray systems except for downward

directed types will not ordinarily be approved.

5. Boundary demarcation. The boundaries of the site shall be marked (for example, with stakes at corners) so as to avoid confusion regarding the location of the site during the sludge application. The markers should be maintained until the end of the current growing season.

6. Public access. Public access of the disposal site must be controlled by either positive barriers or remoteness of the site.

(F) Monitoring and Reporting. The requirement of the agency on the monitoring and reporting of sludge spreading operation should be followed. As a minimum, the producer of sludge should regularly collect and record information on the sludge and soil characteristics and volume of sludge spread to a particular site.

(10) Other Sludge Disposal Methods. When other sludge disposal methods, such as incineration and landfill, are considered, pertinent requirements from the agency shall be followed.]

AUTHORITY: section 644.026, RSMo [Supp. 1988] ***2016****. Original rule filed Aug. 10, 1978, effective March 11, 1979. Amended: Filed June 15, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Department of Natural Resources, Division of Environmental Quality, Water Protection Program, John Rustige, PO Box 176, Jefferson City, MO 65102. Comments may be sent with name and address through email to john.rustige@dnr.mo.gov. Public comments must be received by August 23, 2018 The public hearing is scheduled for 10 AM, on August 15, 2018, at the Department of Natural Resources, Elm Street Conference Center, Bennett Spring Conference Room, 1730 East Elm Street, Jefferson City, Missouri 65101.

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

PROPOSED AMENDMENT

10 CSR 20-8.180 Biological Treatment. The Clean Water Commission is amending sections (1) through (6), and adding new sections (7) and (8).

PURPOSE: This amendment will retain and add minimum design standards for biological wastewater treatment that are required to protect or improve public health, safety, and water quality.

PURPOSE: [The following criteria have been prepared as a guide for the design of biological treatment facilities. This rule is to be used with rules 10 CSR 20-8.110–10 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 as regards adequacy of design, submission of plans, approval of plans and approval of completed sewage works. Deviation from these minimum requirements will be allowed where sufficient documentation is presented to justify the deviation. These criteria are taken largely from Great Lakes-Upper Mississippi River Board of State Sanitary Engineers Recommended Standards for Sewage Works 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. Addenda or supplements to this publication will be furnished to consulting engineers and city engineers. If others desire to receive addenda or supplements, please advise the Clean Water Commission so that the name can be added to the mailing list.] ***This rule specifies the minimum standards for the design of biological treatment that is part of wastewater collection and treatment systems. This rule is to be used with rules 10 CSR 20-8.110 through 10 CSR 20-8.210. It does not address all aspects of design, and the design engineer may refer to other appropriate reference materials so long as these minimum standards set forth in this rule are met.***

[(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 discretionary requirements on the part of the agency and deviations are subject to individual consideration.

(2) Exceptions. This rule shall not apply to facilities designed for twenty-two thousand five hundred gallons per day (22,500 gpd) (85.4m^3) or less (see 10 CSR 20-8.020 for the requirements for those facilities).]

(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. In the event 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. Requirements for these facilities are found in 10 CSR 20-8.300.

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

(2) Septic Tanks.

(A) A septic tank must have a minimum capacity of at least one thousand (1,000) gallons.

(B) The septic tank shall be baffled.

(3) Recirculating Media Filters.

(A) Location. Recirculating media filters following primary treatment shall be located a minimum of two hundred feet (200') from future or existing residences or other establishments.

(B) Filter Bed. A minimum of two (2) filter beds and a diversion box are required for all design flows.

(C) Dosing. Both timer and float switch controls are required; timers are the primary method of operation and the float switch control is a back-up.

(D) Loading. Hydraulic loading rate shall—

1. Follow the manufacturer's recommendation for synthetic media filters; and

2. Do not exceed three and half gallons per day per square foot (3.5 gpd/sqft) for sand or rock filters.

(E) Media Characteristics. The media is any of a number of

physical structures whose sole purpose is to provide a surface to support biological growth. Commonly used media includes rock, gravel, and sand of various sizes, textile media, and peat. Finely crushed limestone, dolomite, slag, any clay, limestone, or appreciable amounts of organic material is not acceptable.

1. Rock, sand, and gravel media, when used shall–

A. Be a total of at least thirty-three inches (33") deep; and

B. Have at least twenty-four inches (24") of fine filtering media.

*[(3)]***(4)** Trickling Filters.

(A) General. Trickling filters may be used for treatment of *[sewage]* **wastewater** amenable to treatment by aerobic biologic processes. *[Trickling filters shall be preceded by effective settling tanks equipped with scum and grease collecting devices or other suitable pretreatment facilities. Filters shall be designed so as to provide the reduction in carbonaceous and/or nitrogenous oxygen demand in accordance with 10 CSR 20-7.015, Effluent Regulations and 10 CSR 20-7.031, Water Quality Standards, or to properly condition the sewage for subsequent treatment processes.]*

[(B) Hydraulics.

1. Distribution.

A. Uniformity. The sewage may be distributed over the filter by rotary distributors or other suitable devices which will ensure uniform distribution to the surface area. At design average flow, the deviation from a calculated uniformly distributed volume per square foot (m^2) of the filter surface shall not exceed plus or minus ten percent (± 10%) at any point. All hydraulic factors involving proper distribution of sewage on the filters shall be submitted to the agency.

B. Head requirements. For reaction type distributions, a minimum head of twenty-four inches (24") (61 cm) between low water level in siphon chamber and center of arms is required. Similar allowance in design shall be provided for added pumping head requirements where pumping to the reaction type distributor is used.

C. Clearance. A minimum clearance of six inches (6") (15 cm) between media and distributor arms shall be provided. Greater clearance is essential where icing may occur.

2. Dosing. Sewage may be applied to the filters by siphons, pumps or by gravity discharge from preceding treatment units when suitable flow characteristics have been developed. Application of the sewage shall be practically continuous. The piping system shall be designed for recirculation.

3. Piping system. The piping system including dosing equipment and distributor shall be designed to provide capacity for the peak hourly flow rate including recirculation required under paragraph (3)(E)5. of this rule.

*[(C)]***(B)** Media.

[1. Quality. The media may be crushed rock, slag or specially manufactured material. The media shall be durable, resistant to spalling or flaking and be relatively insoluble in sewage. The top eighteen inches (18") (46 cm) shall have a loss by the twenty (20)-cycle, sodium sulfate soundness test of not more than ten percent (10%), as prescribed by the ASCE Manual of Engineering Practice, Number 13; the balance is to pass a ten (10)-cycle test using the same criteria. Slag media shall be free from iron. Manufactured media shall be resistant to ultraviolet degradation, disintegration, erosion, aging, all common acids and alkalies, organic compounds and fungus and biological attack. Media shall be either structurally capable of supporting a man's weight or a suitable access walkway provided to allow for distributor maintenance.]

*[2.]***1.** *[Depth. Rock and/or slag filter media shall have]* **Media depth shall—**

A. Be a minimum depth of five feet (5') *[(1.5 m)]* above the underdrains*[.]* **for rock filter media;**

B. Be a minimum depth of ten feet (10') for *[M]***m**anufactured filter media *[should have a minimum depth of ten feet (10') (3m)]* to provide adequate contact time with the wastewater*[.]***; and**

C. *[Rock and/or slag filter media depths shall not exceed]* **Be no more than** ten feet (10') *[(3m) and manufactured filter media depths shall not exceed thirty feet (30') (9.1m) except where special construction is justified through extensive pilot studies]* **for rock filter media**.

*[3.]***2.** Size and grading of *[media.*

*A. R]***r**ock*[, slag]* and similar media*[. Rock, slag and similar media]* shall**—**

A. *[not c]***C**ontain **no** more than five percent (5%) by weight of pieces whose longest dimension is three (3) times the least dimension*[.]***;**

B. *[They shall b]***B**e free from thin elongated and flat pieces, dust, clay, sand**,** or fine material**;** and *[shall]*

C. *[c]***C**onform to the following size and grading **as shown in Table 180-1, included herein,** when mechanically graded over vibrating screen with square openings.

[Passing 4 1/2-inch (4 1/2") screen (11.4 cm)—one hundred percent (100%) by weight.

Retained on 3-inch (3") screen (7.6 cm)—ninety-five to one hundred percent (95–100%) by weight.

Passing 2-inch (2") screen (5.1 cm)—0.2% by weight.

Passing 1-inch (1") screen (2.5 cm)—0.1% by weight.]

Table 180-1 Particle Size Distribution:

Screen Size	Percent Passing by Weight
4.5 inches	100%
3 inches	0-95%
2 inches	0-0.2%
1 inch	0 to 0.1%

*[B.]***3.** Manufactured *[Media. Suitability will be evaluated on the basis of experience with installations handling similar wastes and loadings.]* **and synthetic media material shall—**

A. Be used in accordance with all manufacturer's recommendations;

B. Be insoluble in wastewater and resistant to flaking, spalling, ultraviolet degradation, disintegration, erosion, aging, common acids and alkalis, organic compounds, and biological attack;

C. Be evaluated to determine the suitability based on experience with an installation treating wastewater under similar hydraulic and organic loading conditions (include a relevant case history involving the use of the synthetic media);

D. Have a structure able to support the synthetic media, water flowing through or trapped in voids, and the maximum anticipated thickness of the wetted biofilm;

E. Support the maintenance activities, unless a separate provision is made for maintenance access to the entire top of the trickling filter media and to the distributor; and

F. Be placed with the edges matched as nearly as possible to provide consistent hydraulic conditions within the trickling filter.

[C. Handling and placing of media. Material delivered to the filter site shall be stored on wood planks or other approved clean hard surfaced areas. All material shall be rehandled at the filter site and no material shall be dumped

directly into the filter. Crushed rock, slag and similar media shall be washed and rescreened or forked at the filter site to remove all fines. The material shall be placed by hand to a depth of twelve inches (12") (30 cm) above the tile underdrains and the remainder of material may be placed by means of belt conveyors or equally effective methods approved by the engineer. All material shall be carefully placed so as not to damage the underdrains. Manufactured media shall be handled and placed as approved by the engineer. Trucks, tractors or other heavy equipment shall not be driven over the filter during or after construction].

*[(D)]***(C)** Underdrainage System.

[1. Arrangement. Underdrains with semicircular inverts or equivalent should be provided and the underdrainage system shall cover the entire floor of the filter. Inlet openings into the underdrains shall have an unsubmerged gross combined area equal to at least fifteen percent (15%) of the surface area of the filter.]

*[2.]***1.** Hydraulic capacity *[and ventilation]*. The underdrains shall *[have a minimum]* **be designed with—**

A. *[s]***S**lopes of **at least** one percent (1%)*[.]***;**

B. Effluent channels *[shall be designed to]* **that** produce a minimum velocity of two feet *[(2')]* per second *[(0.61m/s)]* **(2 fps)** at average daily rate of application to the filter*[.]***;**

C. *[The u]***U**nderdrainage system, effluent channels and effluent pipe *[shall be designed to]* **that** permit free passage of air*[.]***;**

D. *[The size of d]***D**rains, channels**,** and pipe *[should be]* so that not more than fifty percent (50%) of their cross section area will be submerged under the design peak hydraulic loading, including proposed or possible future or recirculated flows. *[Consideration shall be given to the use of forced ventilation, particularly for covered filters and deep manufactured media filters.]*

[3. Flushing. Provision should be made for flushing the underdrains. In small filters, use of a peripheral head channel with vertical vents is acceptable for flushing purposes. Inspection facilities should be provided.

(E) Special Features.

1. Flooding. Appropriate valves, sluice gates or other structures shall be provided so as to enable flooding of filters comprised of rock or slag media for filter fly control.

2. Freeboard. A freeboard of four feet (4') (1.2 m) or more should be provided for tall, manufactured media filters to maximize the containment of windblown spray.

3. Maintenance. All distribution de-vices, underdrains, channels and pipes shall be installed so that they may be properly maintained, flushed or drained.

4. Winter protection. Adequate protection such as covers in severe climate or wind breaks in moderate climates shall be provided to maintain operation and treatment efficiencies when climatic conditions are expected to result in problems due to cold temperatures.

5. Recirculation. The piping system shall be designed for recirculation as required to achieve the design efficiency. The recirculation rate shall be variable and subject to plant operator control.

6. Recirculation measurement. Devices shall be provided to permit measurement of the recirculation rate. Time lapse meters and pump head recording devices are acceptable for facilities treating less than one million gallons per day (1 mgd) (3785m^3/d).

(F) Rotary Distributor Seals. Mercury seals shall not be permitted. Ease of seal replacement shall be considered in the design to ensure continuity of operation.

(G) Multi-Stage Filters. The foregoing standards also apply to all multi-stage filters.

(H) Unit Sizing. Required volumes of rock or slag media filters shall be based upon pilot testing with the particular wastewater or any of the various empirical design equations that have been verified through actual full scale experience. Calculations must be submitted if pilot testing is not utilized. Pilot testing is recommended to verify performance predictions based upon the various design equations, particularly when significant amounts of industrial wastes are present. Expected performance of filters packed with manufactured media shall be determined from documented full scale experience at similar installation or through actual use of a pilot plant on-site.

(I) Design Safety Factors. Trickling filters are affected by diurnal load conditions. The volume of media determined from either pilot plant studies or use of acceptable design equations shall be based upon the design peak hourly organic loading rate rather than the average rate. An alternative would be to provide flow equalization.]

(D) Forced Ventilation.

1. Forced ventilation for a trickling filter is required when—

A. Designed for nitrification;

B. Designed with a media depth in excess of six feet (6'); or

C. Designed where seasonal or diurnal temperatures do not provide sufficient difference between the ambient air and wastewater temperatures to sustain passive ventilation.

2. Minimum design airflow rate to nitrify using a trickling filter shall be the greater of—

A. Fifty pounds (50 lbs) of oxygen provided per pound of oxygen demand at average organic loading, based on stoichiometry; or

B. Thirty pounds (30 lbs) of oxygen provided per pound of oxygen demand at peak organic loading, based on stoichiometry.

[(4) Activated Sludge.

(A) General.

1. Applicability.

A. Biodegradable wastes. The activated sludge process and its various modifications may be used where sewage is amenable to biological treatment.

B. Operational requirement. This process requires close attention and competent operating supervision, including routine laboratory control. These requirements shall be considered when proposing this type of treatment.

C. Energy requirement. This process requires major energy usage to meet aeration demands. Energy costs and potential mandatory emergency public power reduction events in relation to critical water quality conditions must be carefully evaluated. Capability of energy usage phase down while still maintaining process viability, both under normal and emergency availability conditions, must be included in the activated sludge design.

2. Specific process selection. The activated sludge process and its several modifications may be employed to accomplish varied degrees of removal of suspended solids and reduction of carbonaceous and/or nitrogenous oxygen demand. Choice of the process most applicable will be influenced by the degree and consistency of treatment required, type of waste to be treated, proposed plant size, anticipated degree of operation and maintenance, and operating and capital costs. All designs shall provide for flexibility in operation. Plants over one (1) mgd (3785 m^3/d) shall be designed to facilitate easy conversion to various operation modes.

3. Winter protection. In severe climates, protection against freezing shall be provided to insure continuity of operation and performance.

(B) Pretreatment. Where primary settling tanks are not used, effective removal or exclusion of grit, debris, excessive oil or grease and comminution or screening of solids shall be

accomplished prior to the activated sludge process. Where primary settling is used, provision shall be made for discharging raw sewage directly to the aeration tanks to facilitate plant start-up and operation during the initial stages of the plant's design life.

(C) Aeration.

1. Capacities and permissible loadings. The size of the aeration tank for any particular adaptation of the process shall be determined by full scale experience, plant pilot studies or rational calculations based mainly on food to microorganism ratio and mixed liquor suspended solids levels. Other factors such as size of treatment plant, diurnal load variations and degree of treatment required shall also be considered. In addition, temperature, pH and reactor dissolved oxygen shall be considered when designing for nitrification. Calculations should be submitted to justify the basis for design of aeration tank capacity. Calculations using values differing substantially from those in the accompanying table should reference actual operational plants. Mixed liquor suspended solids levels greater than five thousand (5000) mg/l may be allowed provided that adequate data is submitted that shows the aeration and clarification system is capable of supporting the levels. When process design calculations are not submitted, the aeration tank capacities and permissible loadings for the several adaptations of the processes shown in the following table shall be used. These values apply to plants receiving peak to average diurnal load ratios ranging from about two to one (2:1) to four to one (4:1). The utilization of flow equalization facilities to reduce the diurnal peak organic load may be considered by the agency as justification to approve organic loading rates that exceed those specified in the table.

Permissible Aeration Tank Capacities and Loadings

(NOTE: For proper use of this table, see paragraph (4)(C)1. of this rule.)

Process	*Aeration Tank Organic Loading-lb. BOD_5/1,000 cu. ft./day*	*F/M Ratio-lb. BOD_5/lb. MLVSS/ day*	*MLSS* mg/liter*
Step Aeration, Complete Mix, and Conventional	*40*	*0.2–0.5*	*1000–3000*
Contact Stabilization	*50***	*0.2–0.6*	*1000–3000*
Extended Aeration and Oxidation-Ditches	*15*	*0.05–0.1*	*3000–5000*

**MLSS values are dependent upon the surface area provided for sedimentation and the rate of sludge return as well as the aeration process.*

***Total aeration capacity, includes both contact and reaeration capacities. Normally the contact zone equals thirty to thirty-five percent (30%–35%) of the total aeration capacity.*

2. Arrangement of aeration tanks.

A. General tank configuration.

(I) Dimensions. The dimensions of each independent mixed liquor aeration tank or return sludge reaeration tank shall be so as to maintain effective mixing and utilization of air. Ordinarily, liquid depths should not be less than ten feet (10') (3 m) or more than thirty feet (30') (9 m) except in special design cases.

(II) Short-circuiting. For very small tanks or tanks with special configuration, the shape of the tank and the installation of aeration equipment should provide the positive control of short-circuiting through the tank.

B. Number of units. Total aeration tank volume required shall be divided among two (2) or more units, capable of independent operation, when required by the agency to meet applicable effluent limitations and reliability guidelines.

C. Inlets and outlets.

(I) Controls. Inlets and outlets for each aeration tank unit shall be suitably equipped with valves, gates, stop plates, weirs or other devices to permit controlling the flow to any unit and to maintain reasonably constant liquid level. The hydraulic properties of the system shall permit the maximum instantaneous hydraulic load to be carried with any single aeration tank unit out-of-service.

(II) Conduits. Channels and pipes carrying liquids with solids in suspension shall be designed to maintain self-cleansing velocities or shall be agitated to keep the solids in suspension at all rates of flow within the design limits. Adequate provisions should be made to drain segments of channels which are not being used due to alternate flow patterns.

D. Freeboard. All aeration tanks should have a freeboard of not less than eighteen inches (18") (46 cm). Additional freeboard or windbreak may be necessary to protect against freezing or wind blown spray.

3. Aeration equipment.

A. General. Oxygen requirements generally depend on maximum diurnal organic loading, degree of treatment and level of suspended solids concentration to be maintained in the aeration tank mixed liquor. Aeration equipment shall be capable of maintaining a minimum of two (2.0) mg/l of dissolved oxygen in the mixed liquor at all times and providing thorough mixing of the mixed liquor. In the absence of experimentally determined values, the design oxygen requirements for all activated sludge processes shall be 1.1 lbs. O_2/lb. peak BOD_5 applied to the aeration tanks (1.1 kg O_2/kg peak BOD_5) except the value of 1.8 shall be used for the extended aeration process. In the case of nitrification, the oxygen requirement for oxidizing ammonia must be added to the above requirement for carbonaceous BOD_5 removal. The nitrogen oxygen demand (NOD) shall be taken as 4.6 times the diurnal peak total kjeldahl nitrogen (TKN) content of the influent. In addition, the oxygen demands due to recycle flows—heat treatment supernatant, vacuum filtrate, elutriates, etc., must be considered due to the high concentration of BOD_5 and TKN associated with the flows. Careful consideration should be given to maximizing oxygen utilization per unit power input. Unless flow equalization is provided, the aeration system should be designed to match the diurnal organic load variation while economizing on power input.

B. Diffused air systems. The desire of the diffused air system to provide the oxygen requirements shall be done by either of the following two (2) methods.

(I) Having determined the oxygen requirements per subparagraph (4)(C)3.A. of this rule, air requirements for a diffused air system shall by use of any of the well known equations incorporate such factors as tank depth, alpha factor of waste, beta factor of waste, certified aeration device transfer efficiency, minimum aeration tank dissolved oxygen

concentrations, critical wastewater temperature and altitude of plant. In the absence of experimentally determined alpha and beta factors, wastewater transfer efficiency shall be assumed to be fifty percent (50%) of clean water efficiency for plants treating primarily ninety percent (90%) or greater domestic sewage. Treatment plants where the waste contains higher percentages of industrial wastes shall use a correspondingly lower percentage of clean water efficiency and shall have calculations submitted to justify such a percentage.

(II) Normal air requirements for all activated sludge processes except extended aeration (assuming equipment capable of transmitting to the mixed liquor the amount of oxygen required in subparagraph (4)(C)3.A.) shall be considered to be fifteen hundred (1500) cu.ft. per pound of BOD_5 peak aeration tank loading (93.5 m^3/kg of BOD_5). For the extended-aeration process the value shall be two thousand (2000) cu. ft. (125 m).

(III) To the air requirements calculated in part (4)(C)3.B.(II) of this rule shall be added air required for channels, pumps, aerobic digesters or other air-use demand.

(IV) The specified capacity of blowers or air compressors, particularly centrifugal blowers, should take into account that the air intake temperature may reach forty degrees Celsius (40 °C) (one hundred four degrees Fahrenheit (104 °F)) or higher and the pressure may be less than normal. The specified capacity of the motor drive should also take into account that the intake air may be minus thirty degrees Celsius (-30 °C) (minus twenty-two degrees Fahrenheit (-22 °F)) or less and may require oversizing of the motor or a means of reducing the rate of air delivery to prevent overheating or damage to the motor.

(V) The blowers shall be so provided in multiple units, so arranged and in such capacities as to meet the maximum air demand with the single largest unit out-of-service. The design shall also provide for varying the volume of air delivered in proportion to the load demand of the plant. Aeration equipment shall be easily adjustable in increments and shall maintain solids suspension within these limits.

(VI) Diffuser systems shall be capable of providing for the diurnal peak oxygen demand or two hundred percent (200%) of the design average oxygen demand whichever is larger. The air diffusion piping and diffuser system shall be capable of delivering normal air requirements with minimal friction losses. Air piping systems should be designed such that total head loss from blower outlet (or silencer outlet where used) to the diffuser inlet does not exceed 0.5 pounds per square inch (psi) (0.04 kgf/cm^2) at average operating conditions. The spacing of diffusers should be in accordance with the oxygen requirements within the channel or tank, and should be designed to facilitate adjustment of their spacing without major revision to air header piping. All plants employing less than four (4) independent aeration tanks shall be designed to incorporate removable diffusers that can be serviced and/or replaced without de-watering the tank.

(VII) Individual assembly units of diffusers shall be equipped with control valves, preferably with indicator markings for throttling or for complete shutoff. Diffusers in any single assembly shall have substantially uniform pressure loss.

(VIII) Air filters shall be provided in numbers, arrangements and capacities to furnish at all times an air supply sufficiently free from dust to prevent damage to blowers and clogging of the diffuser system used.

C. Mechanical aeration systems.

(I) Oxygen transfer performance. The mechanism and drive unit shall be designed for the expected conditions in the aeration tank in terms of the power performance. Certified testing shall verify mechanical aerator performance.

(II) Design requirements. The design requirements of a mechanical aeration system shall accomplish the following: maintain a minimum of two (2.0) mg/l of dissolved oxygen in the mixed liquor at all times throughout the tank or basin; maintain all biological solids in suspension; meet maximum oxygen demand and maintain process performance with the largest unit out-of-service; and provide for varying the amount of oxygen transferred in proportion to the load demand on the plant.

(III) Winter protection. Due to high heat loss, the mechanism as well as subsequent treatment units shall be protected from freezing where extended cold weather conditions occur.

(D) Return Sludge Equipment.

1. Return sludge rate. The minimum permissible return sludge rate of withdrawal from the final settling tank is a function of the concentration of suspended solids in the mixed liquor entering it, the sludge volume index of these solids and the length of time these solids are retained in the settling tank. Since undue retention of solids in the final settling tanks may be deleterious to both the aeration and sedimentation phases of the activated sludge process, the rate of sludge return expressed as a percentage of the average design flow of sewage should generally be variable between the limits set forth as follows:

	Minimum	Maximum
Standard Rate	15	75
Carbonaceous Stage of Separate Stage Nitrification	15	75
Step Aeration	15	75
Contact Stabilization	50	150
Extended Aeration	50	150
Nitrification Stage of Separate Stage Nitrification	50	200

The rate of sludge return shall be varied by means of variable speed motors, drives or times (small plants) to pump sludge at the rates mentioned in the previous table.

2. Return sludge pumps. If motor driven return sludge pumps are used, the maximum return sludge capacity shall be obtained with the largest pump out-of-service. A positive head should be provided on pump suctions. Pumps should have at least three-inch (3") (7.6 cm) suction and discharge openings. If air lifts are used for returning sludge from each settling tank hopper, no standby unit will be required provided the design of the air lifts are so as to facilitate their rapid and easy cleaning and provided other suitable standby measures are provided. Air lifts should be at least three inches (3") (7.6 cm) in diameter.

3. Return sludge piping. Discharge piping should be at least four inches (4") (10 cm) in diameter and should be designed to maintain a velocity of not less than two feet (2') per second (0.61 m/s) when return sludge facilities are operating at normal return sludge rates. Suitable devices for observing, sampling and controlling return activated sludge

flow from each settling tank hopper shall be provided.

4. Waste sludge facilities. Waste sludge control facilities should have a maximum capacity of not less than twenty-five percent (25%) of the average rate of sewage flow and function satisfactorily at rates of 0.5 percent of average sewage flow or a minimum of ten (10) gallons per minute (0.63 l/s), whichever may be the larger. Means for observing, measuring, sampling and controlling waste activated sludge flow shall be provided. Waste sludge may be discharged to the concentration or thickening tank, primary settling tank, sludge digestion tank, vacuum filters or any practical combination of these units.

(E) Measuring Devices. Devices should be installed in all plants for indicating flow rates of raw sewage or primary effluent, return sludge and air to each tank unit. For plants designed for sewage flows of 1 mgd (3785 m^3/d) or more, these devices should totalize and record, as well as, indicate flows. Where the design provides for all return sludge to be mixed with the raw sewage (or primary effluent) at one (1) location, then the mixed liquor flow rate to each aeration unit should be measured.

(5) Rotating Biological Contactors.

(A) General.

1. Applicability. The rotating biological contactor (RBC) process may be used where sewage is amenable to biological treatment. The process may be used to accomplish carbonaceous and/or nitrogenous oxygen demand reductions. Design standards, operating data and experience for this process are not well established. Therefore, expected performance of RBCs shall be based upon experience to similar full scale installations or thoroughly documented pilot testing with the particular wastewater.

2. Winter protection. Wastewater temperature affects rotating contactor performance. Year round operation in colder climates requires that rotating contactors be covered to protect the biological growth from cold temperatures and the excessive loss of heat from the wastewater with the resulting loss of performance. Enclosures shall be constructed of a suitable corrosion-resistant material. Windows or simple louvered mechanisms which can be opened in the summer and closed in the winter shall be installed to provide adequate ventilation. To minimize condensation, the enclosure should be adequately insulated and/or heated.

(B) Required Pretreatment. RBCs must be preceded by effective settling tanks equipped with scum and grease collecting devices unless substantial justification is submitted for other pretreatment devices which provide for effective removal of grit, debris and excessive oil or grease prior to the RBC units. Bar screening or comminution are not suitable as the sole means of pretreatment.

(C) Unit Sizing. Unit sizing shall be based on experience at similar full-scale installations or thoroughly documented pilot testing with the particular wastewater. In determining design loading rates, expressed in units of volume per day per unit area of media covered by biological growth, the following parameters must be considered: design flow rate and influent waste strength; percentage of BOD_5 to be removed; media arrangement including number of stages and unit area in each stage; rotational velocity of the media; retention time within the tank containing the media; and wastewater temperature; and the percentage of influent BOD_5 which is soluble. In addition to these parameters, loading rates for nitrification will depend upon influent TKN, pH and the allowable effluent ammonia nitrogen concentration.

(D) Design Safety Factor. Effluent concentrations of ammonia nitrogen from the RBC process designed for nitrification are affected by diurnal load variations. Therefore, it may be necessary to increase the design surface area proportional to the ammonia nitrogen diurnal peaking rates appropriately to meet effluent limitations. An alternative is to provide flow equalization sufficient to insure process performance within the required effluent limitations.

(6) Other Biological Systems. New biological treatment schemes with promising applicability in wastewater treatment may be considered if the required engineering data for new process evaluation is provided in accordance with 10 CSR 20-8.140(5)(B).]

(5) Activated Sludge.

(A) Basin lining. If using a synthetic liner, it shall be a minimum of thirty millimeters (30 mm) thick.

(B) Tank dimensions. Horizontally mixed aeration tanks shall have a depth of not less than five and a half feet (5.5').

(C) High purity oxygen, when used and enclosed. An enclosed high purity oxygen exhaust system shall be provided to collect and vent the reactor off-gases.

(6) Sequencing Batch Reactor (SBR).

(A) General. The minimum total basin volume shall be equal to the design daily influent flow volume and either upstream inline or off-line storage is necessary to minimize influent flow during settling and decanting.

(B) Design. A minimum of two (2) reactor basins shall be installed.

(7) Membrane Bioreactor (MBR).

(A) General.

1. For wastewater treatment plants with a flow equal to or greater than one hundred thousand gallons per day (100,000 gpd), the MBR process must be designed with a minimum of two (2) membrane trains capable of treating the daily average flow with one (1) membrane cassette out of service.

2. Design flux criteria must be satisfied with one (1) membrane module out-of-service (e.g., for external clean in place, recovery cleaning, repair). For purposes of these criteria, a membrane module is the smallest membrane unit capable of separate removal from the tank while maintaining operation of other membrane units in the same tank.

3. Membranes placed in the aeration basin(s) rather than a separate membrane tank shall have—

A. Individual modules and individual diffusers that can be removed separately for maintenance and repair; and

B. Aeration basin(s) volume sized for complete nitrification.

(B) Preliminary Treatment. Each system shall—

1. Be consistent with the membrane manufacturer recommendations;

2. Comply with 10 CSR 20-8.150(6) for grit removal;

3. Provide oil and grease removal when the levels in the influent may cause damage to the membranes;

4. Provide a fine screen and high water alarm, designed to treat peak hourly flow. Coarse screens followed by fine screens may be used in larger facilities to minimize the complications of fine screening; and

5. Comply with 10 CSR 20-8.150(4)(B) for reliability.

(C) Aeration. The aeration blowers must provide adequate air for membrane scour and process demands.

(D) Redundancy. The facility shall have at least one (1) of the following:

1. The ability to run in full programmable logic control (PLC) or standby power mode in case of an automatic control failure;

2. An operational battery backup PLC if manual control is not possible; or

3. Sufficient standby power generating capabilities to provide continuous flow through the membranes during a power outage (e.g., preliminary screening, process aeration, recycle/RAS/permeate pumps, air scour, vacuum pumps) or an adequate method to handle flow for an indefinite period (e.g., private control of influent combined with contingency methods).

(E) Operations and Maintenance. The MBR design shall—

1. Include provisions to monitor membrane integrity;

2. Provide on-line continuous turbidity monitoring of filtrate or an equivalent for operational control and indirect membrane integrity monitoring for a treatment plant with design average flow greater than or equal to one hundred thousand gallons per day (100,000 gpd); and

3. Include provisions to remove membrane cassette for cleaning considering the membrane cassette wet weight plus additional weight of the solids accumulated on the membranes.

(8) Moving Bed Bioreactor (MBBR). A MBBR secondary treatment system shall provide upstream preliminary treatment units capable of—

(A) Screening to reduce pass-through and suspended solids;

(B) Grit removal; and

(C) Oil and grease removal.

*AUTHORITY: section 644.026, RSMo [Supp. 1988] **2016**. Original rule filed Aug. 10, 1978, effective March 11, 1979. Amended: Filed June 15, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Department of Natural Resources, Division of Environmental Quality, Water Protection Program, John Rustige, PO Box 176, Jefferson City, MO 65102. Comments may be sent with name and address through email to john.rustige@dnr.mo.gov. Public comments must be received by August 23, 2018. The public hearing is scheduled for 10 AM, on August 15, 2018, at the Department of Natural Resources, Elm Street Conference Center, Bennett Spring Conference Room, 1730 East Elm Street, Jefferson City, Missouri 65101.

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

PROPOSED AMENDMENT

10 CSR 20-8.190 Disinfection. The Clean Water Commission is deleting sections (1) through (11) and adding new sections (1)–(5).

PURPOSE: This amendment will retain and add minimum design standards for disinfection processes that are required to protect or improve public health, safety, and water quality.

[PURPOSE: The following criteria have been prepared as a guide for the design of disinfection facilities. This rule is to be used with rules 10 CSR 20-8.110–10 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 as regards adequacy of design, submission of plans, approval of plans and approval of completed sewage works. Deviation from these minimum requirements will be allowed where sufficient documentation is presented to justify the deviation. These criteria are taken largely from Great Lakes-Upper Mississippi River Board of State Sanitary Engineers Recommended Standards for Sewage Works 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. Addenda or supplements to this publication will be furnished to consulting engineers and city engineers. If others desire to receive addenda or supplements, please advise the Clean Water Commission so that names can be added to the mailing list.

Editor's Note: The secretary of state has determined that the publication of this rule in its entirety would be unduly cumbersome or expensive. The entire text of the material referenced has been filed with the secretary of state. This material may be found at the Office of the Secretary of State or at the headquarters of the agency and is available to any interested person at a cost established by state law.

(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 agency is concerned, unless justification is presented for deviation from the requirements. Other terms, such as should, recommend, preferred and the like, indicate discretionary requirements on the part of the agency and deviations are subject to individual consideration.

(2) Exceptions. This rule shall not apply to facilities designed for twenty-two thousand five hundred gallons per day (22,500 gpd) (85.4 m^3) or less (see 10 CSR 20-8.020 for the requirements for those facilities).

(3) Forms of Disinfection. Chlorine is the most commonly used chemical for wastewater disinfection. The forms most often used are liquid chlorine and calcium or sodium hypochlorite. Other disinfectants, including chlorine dioxide, ozone or bromine, may be accepted by the agency in individual cases. The chemical should be selected after due consideration of waste flow rates, application and demand rates, pH of the wastewater, cost of equipment, chemical availability and maintenance problems. If chlorination is utilized, it may be necessary to dechlorinate if the chlorine level in the effluent would impair the natural aquatic habitat of the receiving stream.

(4) Feed Equipment.

(A) Type. Solution-feed vacuum-type chlorinators are generally preferred for large chlorination installations. The use of hypochlorite feeders of the positive displacement type may be considered and are generally preferred when intermittent disinfection is required. The preferred method of generation of chlorine dioxide is the injection of a sodium chlorite solution into the discharge line of a solution-feed gas-type chlorinator with subsequent formation of the chlorine dioxide in a reaction chamber at a pH of four (4.0) or less. Ozone dissolution is accomplished through the use of conventional gas diffusion equipment, with appropriate consideration of materials. If ozone is being produced from air, gas preparation equipment (driers, filters, compressors) is required. If ozone is being produced from oxygen, this equipment may not be needed as a clean dry pressurized gas supply will be

available.

(B) Control.

1. Chlorination without dechlorination. Facilities with design flows of one million gallons per day (1.0 mgd) (3785 m^3/d) or greater shall be equipped with a chlorine rate control to feed the chlorine proportional to the flow of wastewater and the chlorine residual. Facilities with design flows between one (1.0) mgd (3785 m^3/d) and twenty-two thousand five hundred (22,500) gpd (85.4 m^3) should be equipped with a control system to feed the chlorine proportional to the flow of wastewater.

2. Chlorination with dechlorination. All facilities designed for dechlorination must be equipped to feed the chlorine proportional to the flow of wastewater and the chlorine residual. Dechlorination equipment shall be equipped to feed in proportion to the flow of wastewater.

3. Ozone. Facilities for disinfection with ozone should be equipped to feed the ozone in proportion to the flow of wastewater.

(C) Capacity. Required disinfection capacity will vary, depending on the uses and points of application of the disinfecting chemical. For disinfection, the capacity should be adequate to produce an effluent that will meet the coliform limits specified by the agency. For normal domestic sewage, the following may be used as a guide in sizing chlorination facilities.

Type of Treatment	*Dosage*
Trickling filter plant	*10 mg/l*
Activated sludge plant effluent	*8 mg/l*
Tertiary filtration effluent	*6 mg/l*
Nitrified effluent	*6 mg/l*

(D) Standby Equipment and Spare Parts. Standby equipment of sufficient capacity should be available to replace the largest unit during shutdowns. Spare parts shall be available for all disinfection equipment to replace parts which are subject to wear and breakage.

(E) Water Supply. An ample supply of water shall be available for operating the chlorinator. Where a booster pump is required, duplicate equipment should be provided, and, when necessary, standby power as well. Protection of a potable water supply shall conform to the requirements of 10 CSR 20-8.140(8)(B).

(5) Chlorine Supply.

(A) General. The type of chlorine supply should be carefully evaluated during the planning process. Large quantities of chlorine are contained in ton cylinders and tank cars can present a considerable hazard to plant personnel and to the surrounding area should the containers develop leaks.

(B) Containers. The use of ton containers should be considered where the average daily chlorine consumption is over one hundred fifty pounds (150 lbs.) (68 kg). Both monetary cost and the potential residential exposure to chlorine should be considered when making the final determination.

(C) Tank Cars. At large chlorination installations consideration should be given to the use of tank cars, generally accompanied by gas evaporators. Both monetary cost and the potential residential exposure to chlorine should be considered when making the final determination. Liquid chlorine lines from tank cars to evaporators shall be buried and installed in a conduit and shall not enter below grade spaces. Systems shall be designed for the shortest possible pipe transportation of liquid chlorine.

(D) Scales. Scales for weighing cylinders shall be provided at all plants using chlorine gas. At large plants, scales of the indicating and recording type are recommended. At least a platform scale shall be provided. Scales shall be of corrosion-resistant material.

(E) Evaporators. Where manifolding of several cylinders or ton containers will be required to evaporate sufficient chlorine, consideration should be given to the installation of evaporators, to produce the quantity of gas required.

(F) Leak Detection and Controls. A bottle of fifty-six percent (56%) ammonium hydroxide solution shall be available for detecting chlorine leaks. Where ton containers or tankcars are used, a leak repair kit approved by the Chlorine Institute shall be provided. Consideration should be given to the provision of caustic soda solution reaction tanks for absorbing the contents of leaking ton containers where the containers are in use. At large chlorination installations, consideration should be given to the installation of automatic gas detection and related alarm equipment. For ozone installations, similar purpose equipment shall be provided.

(6) Ozone Generation. Ozone may be produced from either an air or an oxygen gas source. Generation units shall be automatically controlled to adjust ozone production to meet disinfection requirements.

(7) Piping and Connections. Piping systems should be as simple as possible, specifically selected and manufactured to be suitable for chlorine or ozone service, with a minimum number of joints. Piping should be well supported and protected against temperature extremes. The correct weight or thickness of steel is suitable for use with dry chlorine liquid or gas. Even minute traces of water added to chlorine results in a corrosive attack that can only be resisted by pressure piping utilizing materials such as silver, gold, platinum or Hasteloy C. Low pressure lines made of hard rubber, saran-lined, rubber-lined, polyethylene, polyvinylchloride (PVC) or Uscolite materials are satisfactory for wet chlorine or aqueous solutions of chlorine. Due to the corrosiveness of wet chlorine, all lines designed to handle dry chlorine should be protected from the entrance of water or air containing water. For ozonation systems, the selection of material should be made with due consideration for ozone's corrosive nature. Copper or aluminum alloy should be avoided. Stainless steel with a corrosion resistance of at least equal to grade 304 L should be specified for piping containing ozone in nonsubmerged applications. Unplasticized PVC, Type 1, may be used in submerged piping, provided the gas temperature is below one hundred forty degrees Fahrenheit (140 °F) (60 °C) and the gas pressure is low.

(8) Housing.

(A) Separation. If gas chlorination equipment, chlorine cylinders or ozone generation equipment are to be in a building used for other purposes, a gas-tight room shall separate this equipment from any other portion of the building. Floor drains from the chlorine room should not be connected to floor drains from other rooms. Doors to this room shall open only to the outside of the building and shall be equipped with panic hardware. The rooms shall be at ground level and should permit easy access to all equipment. Storage area should be separate from the feed area. Chlorination equipment should be situated as close to the application point as reasonably possible.

(B) Inspection Window. A clear glass, gas-tight window shall be installed in an exterior door or interior wall of the chlorinator or ozone generator room to permit the units to be viewed without entering the room.

(C) Heat. Rooms containing disinfection equipment shall be provided with a means of heating so that a temperature

of at least sixty degrees Fahrenheit (60 °F) (16 °C) can be maintained but the room should be protected from excess heat. Cylinders shall be kept at essentially room temperature. The room containing the ozone generation units shall be maintained above thirty-five degrees Fahrenheit (35 °F) (2 °C) at all times.

(D) Ventilation. With chlorination systems, forced, mechanical ventilation shall be installed which will provide one (1) complete air change per minute when the room is occupied. For ozonation systems, continuous ventilation to provide at least six (6) complete air changes per hour should be installed. The entrance to the air exhaust duct from the room shall be near the floor and the point of discharge shall be so located as not to contaminate the air inlet to any buildings or inhabited areas. Air inlets shall be so located as to provide cross ventilation with air and at a temperature that will not adversely affect the chlorination of ozone generation equipment. The vent hose from the chlorinator shall discharge to the outside atmosphere above grade.

(E) Electrical Controls. Switches for fans and lights shall be outside of the room at the entrance. A labeled signal light indicating fan operation should be provided at each entrance, if the fan can be controlled from more than more one (1) point.

(9) Respiratory Protection. Respiratory air-pac protection equipment, meeting the requirements of the 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. Instructions for using, testing and replacing mask parts including canisters, shall be posted adjacent to the equipment. The units shall use compressed air, have at least thirty (30)-minute capacity and be compatible with the units used by the fire department responsible for the plant.

(10) Application of Chlorine or Ozone.

(A) Mixing. The disinfectant shall be positively mixed as rapidly as possible, with a complete mix being effected in three (3) seconds. This may be accomplished by either the use of turbulent flow regime or a mechanical flash mixer.

(B) Contact Period. For a chlorination system, a minimum contact period of fifteen (15) minutes at peak hourly flow or maximum rate of pumpage shall be provided after thorough mixing. Consideration should be given to running a field tracer study to assure adequate contact time. If dechlorination is required after complete mixing of the effluent with the chemical, no further contact time is necessary. The required contact time for an ozonation unit varies with the type of dissolution equipment used. Certain high rate devices require contact times less than one (1) minute to achieve disinfection while conventional dissolution equipment may require contact times similar to chlorination systems.

(C) Contact Tank. The chlorine or ozone contact tank shall be constructed so as to reduce short-circuiting of flow to a practical minimum. Baffles shall be parallel to the longitudinal axis of the chamber with a minimum length to width ratio of forty to one (40:1) (the total length of the channel created by the baffles should be forty (40) times the distance between the baffles). The tank should be designed to facilitate maintenance and cleaning without reducing effectiveness of disinfection. Duplicate tanks, mechanical scrapers or portable deck level vacuum cleaning equipment shall be provided. Consideration should be given to providing skimming devices on all contact tanks. Covered tanks are discouraged.

(11) Evaluation of Effectiveness.

(A) Sampling. Facilities shall be included for sampling the disinfected effluent after contact. In large installations, or where stream conditions warrant, provisions should be made for continuous monitoring of effluent chlorine residual.

(B) Testing. Equipment shall be provided for measuring chlorine residuals using accepted test procedures. Automatic equipment required by subsection (4)(C) of this rule may be used to meet the requirements of this subsection. Equipment shall also be required for measuring fecal coliform using accepted test procedures as required by 10 CSR 20-9.010.]

PURPOSE: This rule specifies the minimum standards for the design of disinfection processes that are part of wastewater collection and treatment systems. This rule is to be used with rules 10 CSR 20-8.110 through 10 CSR 20-8.210. It does not address all aspects of design, and the design engineer may refer to other appropriate reference materials so long as these minimum standards set forth in this rule are met.

(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. In the event 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. Requirements for these facilities are found in 10 CSR 20-8.300.

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

(2) General.

(A) Emergency Power. Disinfection and dechlorination processes, when used, shall be provided during all power outages. For additional emergency power requirements, refer to the provisions listed in 10 CSR 20-8.140(7).

(B) Secondary containment. Secondary containment shall comply with the provisions listed in 10 CSR 20-8.140(9)(A)2.

(3) Chlorine Disinfection.

(A) Contact period. A minimum contact period of fifteen (15) minutes at design peak hourly flow or maximum rate of pumpage shall be provided after thorough mixing.

(B) Gaseous Chlorine Housing.

1. Feed and storage rooms shall—

A. Have chlorine gas feed and storage rooms constructed of fire and corrosion resistant material;

B. Provide a gas-tight room to separate equipment from any other portion of the building if gas chlorination equipment or chlorine cylinders are to be in a building used for other purposes;

C. Have smooth floor surfaces that are chemical resistant, impervious, and slip resistant. Floor drains are discouraged. Design floor drains, where provided, with the ability to be plugged and sealed;

D. Have doors to this room that only open to the outside of the building, and are equipped with panic hardware. Provide door locks to prevent unauthorized access, but do not need a key to exit the locked room using the panic hardware;

E. Be well-lit with lights that are sealed so that they will continue working during a chlorine leak. Comply with 10 CSR 20-8.140(7)(B), requirements for Class I, Division 2, Group D locations when selecting lighting and electrical equipment;

F. Be at ground level and permit easy access to all equipment;

G. Separate storage areas for one- (1-) ton cylinders from the feed area; and

H. Have designated areas for "full" and "empty" cylinder storage.

2. Heating and cooling.

A. Rooms containing disinfection equipment shall be provided with a means of heating and cooling so that a temperature of at least sixty degrees Fahrenheit (60° F) and no more than eighty-six degrees Fahrenheit (86°F) can be maintained.

B. Heating or air conditioning equipment provided for the chlorinator room shall be separate from central heating and air conditioning systems to prevent chlorine gas from entering the central system and central heating or cooling ducts are not allowed to terminate or pass through a chlorinator room.

3. Ventilation shall conform to the following:

A. Install forced mechanical ventilation to provide one (1) complete fresh air change per minute when the chlorinator room is occupied. Construct fans of chemical resistant materials and have chemical proof motors. Squirrel cage type fans located outside the chlorinator room may be approved if the fan housings and ducting are airtight and made of chlorine and corrosion resistant material;

B. Locate the entrance to the air exhaust duct from the room no more than twelve inches (12") off the floor. Locate the point of discharge as not to contaminate the air inlet to any buildings or present a hazard at the access to the chlorinator room or other inhabited areas. Utilize louvers for air exhaust to facilitate airtight closure;

C. Locate air inlets as to provide cross ventilation. Place the outside air inlet at least three feet (3') above grade. Utilize louvers for air inlets to facilitate airtight closure; and

D. Position the vent hose from the chlorinator to the outside atmosphere above grade. Provide passive vent screens.

4. Electrical controls. Switches for fans and lights shall be outside of the chlorinator room at the entrance.

5. Protective and respiratory gear. Where chlorine gas is present the applicant shall comply with 10 CSR 20-8.140(9)(D)1.

(C) Alarm System. The applicant shall conform to 10 CSR 20-8.140(7)(C) and be responsible for specifying what the alarm requirements are necessary to assure consistent disinfection in compliance with the applicable bacteria limits and the disinfection residual limit in the effluent.

(D) Sampling Equipment. Sampling equipment shall be consistent with the requirements in 10 CSR 20-8.140(7)(F).

(4) Dechlorination.

(A) Containers. Dilution tanks and mixing tanks are required when using dry compounds and may be necessary when using liquid compounds to deliver the proper dosage.

(B) Mixing and Contact Requirements.

1. Mixing requirements. Solid dechlorination systems shall not be located in the chlorine contact tank.

2. Contact time. A minimum of thirty (30) seconds for mixing and contact time shall be provided at the design peak hourly flow or maximum rate of pumpage.

(C) Housing Requirements.

1. Feed and storage rooms. The requirements for housing sulfite gas equipment shall follow the same guidelines as for chlorine gas. For specific details follow the provisions listed in subsection (3)(B).

2. Protective and respiratory gear. See paragraph (3)(B)5. of this rule.

(D) Alarm System. See subsection (3)(C) of this rule.

(E) Sampling Equipment. Sampling equipment shall be consistent with the requirements in 10 CSR 20-8.140(7)(F).

(5) Ultraviolet Disinfection.

(A) Dosage and System Sizing.

1. General. The UV dosage shall be based on the design peak hourly flow, maximum rate of pumpage, or peak batch flow.

2. Batch discharges. If no flow equalization is provided for a batch discharger, the dosage shall be based on the peak batch flow.

3. Bioassay. The UV system shall deliver the target dosage based on equipment derating factors and, if needed, have the UV equipment manufacturer verify that the scale up or scale down factor utilized in the design is appropriate for the specific application under consideration.

4. The design delivered UV dosage for a wastewater treatment facility shall be a minimum of thirty thousand microwatt seconds per centimeters squared (30,000 μW • s/cm^2) based on MS-2 phage inactivation.

(B) Design.

1. Open channel systems. The combination of the total number of banks shall be capable of treating the design peak hourly flow, maximum rate of pumpage, or peak batch flow.

2. Closed vessel systems. The combination of the total number of closed vessels shall be capable of treating the design peak hourly flow, maximum rate of pumpage, or peak batch flow.

3. Cleaning. Closed vessel systems utilizing medium-pressure lamps shall be provided with an automatic cleaning system in order to prevent algae growth.

(C) Monitoring and Alarms.

1. The UV system must continuously monitor and display at the UV system control panel the following minimum conditions:

A. The relative intensity of each bank or closed vessel system;

B. The operational status and condition of each bank or closed vessel system;

C. The ON/OFF status of each lamp in the system; and

D. The total number of operating hours of each bank or each closed vessel system.

2. The UV system shall include an alarm system. Alarm systems shall comply with 10 CSR 20-8.140(7)(C).

(D) Electrical Controls. For electrical controls, follow the provisions listed in 10 CSR 20-8.140(7)(B) for electrical controls requirements.

(E) Sampling Equipment. Sampling equipment shall be consistent with the requirements in 10 CSR 20-8.140(7)(F).

*AUTHORITY: section 644.026, RSMo [Supp. 1988] **2016**. Original rule filed Aug. 10, 1978, effective March 11, 1979. Amended: Filed June 15, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Department of Natural Resources, Division of Environmental Quality, Water Protection Program, John Rustige, PO Box 176, Jefferson City, MO 65102. Comments may be sent with name and address through email to john.rustige@dnr.mo.gov. Public comments must be received by August 23, 2018. The public hearing is scheduled for 10 AM, on August 15, 2018, at the Department of Natural Resources, Elm Street Conference Center, Bennett Spring Conference Room, 1730 East Elm Street, Jefferson City, Missouri 65101.

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

PROPOSED AMENDMENT

10 CSR 20-8.200 Wastewater Treatment *[Ponds ([]*Lagoons*[])] and Wastewater Irrigation Alternatives*. The Clean Water Commission is

amending sections (1) through (8), and adding new section (9).

PURPOSE: This amendment will retain and add minimum design standards for wastewater treatment lagoons and wastewater irrigation alternatives that are required to protect or improve public health, safety, and water quality.

PURPOSE: [The following criteria have been prepared as a guide for the design of waste-water treatment ponds (lagoons). This rule is to be used with rules 10 CSR 20-8.110–10 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 as regards adequacy of design, submission of plans, approval of plans and approval of completed sewage works. Deviation from these minimum requirements will be allowed where sufficient documentation is presented to justify the deviation. These criteria are taken largely from Great Lakes-Upper Mississippi River Board of State Sanitary Engineers Recommended Standards for Sewage Works 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. Addenda or supplements to this publication will be furnished to consulting engineers and city engineers. If others desire to receive addenda or supplements, please advise the Clean Water Commission so that names can be added to the mailing list.] ***This rule specifies the minimum standards for the design of lagoons and wastewater irrigation alternatives that are part of wastewater collection and treatment systems. This rule is to be used with rules 10 CSR 20-8.110 through 10 CSR 20-8.210. It does not address all aspects of design, and the design engineer may refer to other appropriate reference materials so long as these minimum standards set forth in this rule are met.***

PUBLISHER'S NOTE: The secretary of state has determined that the publication of the entire text of the material which is incorporated by reference as a portion of this rule would be unduly cumbersome or expensive. This material as incorporated by reference in this rule shall be maintained by the agency at its headquarters and shall be made available to the public for inspection and copying at no more than the actual cost of reproduction. This note applies only to the reference material. The entire text of the rule is printed here.

[(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 agency is concerned, unless justification is presented for deviation from the requirements. Other terms, such as should, recommend, preferred and the like, indicate discretionary requirements on the part of the agency and deviations are subject to individual consideration.

(2) Exceptions. This rule shall not apply to facilities designed for twenty-two thousand five hundred (22,500) gallons per day (85.4 m^3) or less (see 10 CSR 20-8.020 for the requirements for those facilities).

(3) General. This rule deals with generally used variations of treatment ponds to achieve secondary treatment including controlled discharge pond systems, flow-through pond systems and aerate pond systems. Ponds utilized for equalization, percolation, evaporation and sludge storage will not be discussed in this rule.]

(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. In the event 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. Requirements for these facilities are found in 10 CSR 20-8.300.

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

*[(4)]***(2)** Supplement**ary** *[to Engineer's Report]* **Field Data for the Facility Plan**. The *[engineer's report]* **facility plan** shall contain pertinent information on location, geology, soil conditions, area for expansion and any other factors that will affect the feasibility and acceptability of the proposed project**, including the information required per 10 CSR 20-8.110**. The following information must be submitted *[in addition to that required in 10 CSR 20-8.110.]***:**

[(A) Supplementary Field Survey Data.

1. The location and direction of all residences, commercial developments, parks, recreational areas and water supplies, including a log of each well if available within one-half (1/2) mile (0.8 km) of the proposed pond shall be included in the engineer's report.

2. Land use zoning adjacent to the proposed pond site shall be included.

3. A description, including maps showing elevations and contours, of the site and adjacent area shall be provided. Due consideration shall be given to additional treatment units and/or increased waste loadings in determining land requirements. Current United States Geological Survey and Soil Conservation Service maps may be considered adequate for preliminary evaluation of the proposed site.

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

5. A geological evaluation of the proposed lagoon site prepared by the Division of Geology and Land Survey (DGLS) shall be submitted. To obtain this geological evaluation of the proposed site, the engineer shall submit the following information to the Department of Natural Resources, Division of Geology and Land Survey, P.O. Box 250, Rolla, MO 65401:

A. A layout sheet showing the proposed location. The layout shall include the legal description, property boundaries, roads, streams and other geographical landmarks which will assist in locating the site;

B. Size of the lagoon and/or approximate volume of waste to be treated;

C. Maximum cuts to be made in the construction of the lagoon; and

D. Location and depth of cut for borrow area, if any.

6. Sulfate content of the primary water supply shall be determined.

7. Data from all soil borings conducted by a professional soil testing laboratory to determine subsurface soil characteristics and groundwater characteristics, including elevation, at the proposed site and their effect on the construction and operation of a pond shall also be provided. All boring holes shall be filled and sealed. The permeability characteristics of the pond bottom and pond seal material shall also be studied. At the facility plan stage particle size analysis, Atterburg limits, standard Procter density (moisture-density relations) or permeability coefficient may be required on a case-by-case basis to reflect soil characteristics. At the twenty percent (20%) design stage, soil analysis of each representative soil material including particle size analysis, Atterburg limits, standard Procter density (moisture-density

relations) and permeability coefficient of the compacted soil as measured in a falling head permeameter or other test procedure acceptable to the agency may be required. Soil borings may be required in each geological area to determine depth to piezometric surface and to bedrock. Recommendations of the DGLS will be used to establish the required tests at the facility plan and twenty percent (20%) design stages.

(B) Site Information.

1. Distance from habitation. Lagoon sites should be as far as practicable from habitation or any area which may be built up within a reasonable future period. The agency does not attempt to set any minimum distance from habitation since each case must be judged upon its own merits.

2. Prevailing winds. If practicable, ponds should be located so that local prevailing winds will be in the direction of uninhabited areas.

3. Surface runoff. Location of ponds in watersheds receiving significant amounts of stormwater runoff is discouraged. Adequate provisions must be made to divert stormwater runoff around the ponds and protect embankments from erosion.

4. Hydrology. Construction of ponds in close proximity to water supplies and other facilities subject to contamination should be avoided. A minimum separation of four feet (4') (1.2 m) between the bottom of the pond and the maximum groundwater elevation should be maintained where feasible.

5. Groundwater pollution. Proximity of lagoons to water supply located in areas of porous soils and fissured rock formation shall be elevated to avoid creation of health hazards or other undesirable conditions. If the geological report from DGLS makes suggestions for remedial treatment of the site, the engineer shall comply with the suggestions. In some cases, the engineering geologist requests to visit the site during or after construction. When a request is made, the consulting engineer shall comply with the request.]

(A) Lagoons and spray irrigation fields shall be located where stormwater runoff from the watershed is minimized.

(B) Geohydrological Evaluation. A geohydrological evaluation shall be conducted on all new lagoons, new wastewater irrigation sites, and subsurface absorption fields.

1. High Collapse Potential. Lagoons shall not be located in areas with a high collapse potential due to bedrock and soil conditions.

(C) Soils investigation. Detailed soils investigations and reports shall be submitted for facilities surface irrigating more than twenty-four inches per year (24"/ yr) and for all subsurface absorption fields. Soils reports shall comply with 10 CSR 20-8.110(7).

(D) Where geosynthetic liners are used in storage or treatment basins for wastewaters of an industrial nature, the application shall:

1. Document that the liner or storage structure material is capable of containing the wastewater for at least twenty (20) years;

2. Specify repair or replacement procedures in the event of leakage or damage to the seal; and

3. Include an evaluation of secondary containment or leakage detection and collection devices for corrosive or reactive wastewaters and for toxic materials.

*[(5)]***(3)** Basis of Design.

[(A) Quality of Effluent. A controlled discharge stabilization pond (four (4)-cell) will be considered capable of meeting effluent limitations of thirty (30) mg/l biochemical oxygen demand (BOD_5) and thirty (30) mg/l suspended solids. Flow-through stabilization ponds (three (3)-cell), and aerated lagoon systems will be considered capable of meeting effluent limitations of thirty (30) mg/l BOD_5 and eighty (80) mg/l suspended solids. Flow-through lagoon systems and aerated lagoon systems followed by submerged sand filters will be considered capable of meeting effluent limitations of twenty (20) mg/l BOD_5 and twenty (20) mg/l suspended solids. Lagoons may be incorporated into irrigation systems or systems utilizing chemical coagulation and filtration to meet the requirements of 10 CSR 20-7.015(3)(A)3. Please refer to 10 CSR 20-7.015 Effluent Regulation for discharge requirements.]

*[(B)]***(A)** Area and Loadings for *[Controlled Discharge Stabilization Ponds (four (4)-cell)]* **Discharging Lagoons**.

1. *[Pond]* **Lagoon** design for BOD_5 loadings shall not exceed thirty-four *[(34) lbs./acre/day (38 km per hectare per day)]* **pounds per day per acre (34 lbs/day/acre)** at the three-foot (3') *[(1.9 m)]* operating depth in the primary cells. *[The primary cell shall be followed by a secondary cell having 0.3 the area of the primary cell and by two (2) storage cells. The two (2) storage cells shall have a volume above the two-foot (2') (0.6 m) level for one (1) month's storage of average daily flow in each cell. At least one hundred twenty (120) days' detention time between the two-foot (2') level (0.6 m) and the maximum operating depth shall be provided in the entire pond system. Flow can be based on one hundred (100) gallons per capita per day (38 m^3/cap/d) or other values if data is presented to justify the rate. Primary and secondary cells shall be designed for water depths up to a maximum of five feet (5') (1.5 m). The storage cell should be made as deep as possible up to a maximum depth of eight feet (8') (2.4 m).]*

[(C) Area and Loadings for Flow-through Stabilization Ponds (three (3)-cell). Pond design for BOD_5 loadings shall not exceed thirty-four (34) pounds per acre per day (38 km per hectare per day). The second cell must be at least 0.3 the area of the first cell and the third cell 0.1 the area of the first cell. The first and second cells must have a variable operating level of between two feet (2') (0.6 m) and five feet (5') (1.5 m). The third cell must have a variable operating level of between two feet (2') (0.6 m) and eight feet (8') (2.4 m).Detention time of at least one hundred twenty (120) days must be provided. Flows of less than one hundred (100) gallons per capita per day (.38 m^3/cap/d) may be used if data is presented to justify the lower rate.

(D) Aerated Lagoons. For the development of final design parameters it is recommended that actual experimental data be developed; however, the aerated lagoon design for minimum detention time may be estimated using the following formula:

$$t = \frac{E}{2.3\ K_1 \times (100\text{-}E)}$$

where:
t = detention time in the aeration cell in days;
E = percent of BOD_5 to be removed in an aerated pond; and
K_1 = reaction coefficient aerated lagoon, base 10.
For normal domestic sewage the K_1 value may be assumed to be .15 per day for Missouri conditions. The reaction rate coefficient for domestic sewage which includes some industrial waste, other waste or partially treated sewage must be determined experimentally for various conditions which might be encountered in the aerated ponds. Conversion of the reaction coefficient at other temperatures shall be based on experimental data. Raw sewage strength should also consider the effect of any return sludges. Also, additional storage volume should be considered for sludge and in northern climates, ice cover. Oxygen requirements generally will depend on the BOD_5 loading, the degree of treatment and

the concentration of suspended solids to be maintained. Aeration equipment shall be capable of maintaining a minimum dissolved oxygen level of two (2) mg/l in the ponds at all times. Suitable protection from weather shall be provided for electrical controls. The aeration equipment shall be capable of providing 1.3 pounds of oxygen per pound of BOD_5 (1.3 kg/kg BOD_5) removed. BOD_5 removal shall be based on warm weather rates. Aerated cells shall be followed by a polishing cell with a volume of 0.3 of the volume of the aerated cell (see 10 CSR 20-8.180 for details on aeration equipment).

(E) Multiple Units. Parallel cells should be considered for large installations. The maximum size of any cell should be forty (40) acres (16 ha). The system should be designed to permit isolation of any cell without disrupting service of the other cells.

(F) Pond Shape. The shape of all cells should be so that there are no narrow or elongated portions. Round, square or rectangular ponds with a length not exceeding three (3) times the width are considered most desirable. No islands, peninsulas or coves shall be permitted. Dikes should be rounded at corners to minimize accumulation of floating materials. Common dike construction, wherever possible, is strongly encouraged.

(G) Industrial Wastes. Consideration shall be given to the type and effects of industrial wastes on the treatment process. In some cases it may be necessary to pretreat industrial or other discharges. Industrial wastes shall not be discharged to ponds without assessment of the effects the substances may have upon the treatment processor discharge requirements in accordance with state and federal laws.

(H) Additional Treatment. Consideration should be given in the design stage to the utilization of additional treatment units as may be necessary to meet applicable discharge standards (see paragraph (4)(A)3. of this rule).]

2. Aerated Lagoons. Aeration equipment shall be capable of:

A. Maintaining the design level of dissolved oxygen within a particular cell with one (1) unit in the cell out of service;

B. Maintaining a minimum dissolved oxygen level of two milligrams per liter (2 mg/L) in the lagoon at all times;

C. Delivering one and four tenths pounds of oxygen per pound of biochemical oxygen demand removed (1.4 lbs O_2/1 lb BOD); and

D. Delivering an additional four and sixth tenths pounds of oxygen per pound of ammonia nitrogen removal (4.6 lbs O_2/1 lb NH_3).

(B) Area and Loadings for Wastewater Irrigation Storage Basins. Treatment prior to surface irrigation shall provide performance equivalent to that obtained from a primary wastewater lagoon cell designed and constructed in accordance with section (4) of this rule, except that the lagoon depth may be increased to include wastewater storage in addition to the primary volume.

*[(6)]***(4)** *[Pond]* **Lagoon** Construction Details.

(A) Embankments and *[Dikes]* **Berms**.

1. *[Material. Dikes]* **Berms** shall be constructed of relatively impervious material and compacted to at least ninety-five percent (95%) *[standard Procter]* **maximum dry** density **test method** to form a stable structure. *[Vegetation and other unsuitable materials shall be removed from the area where the embankment is to be placed.]*

2. *[Top width.]* The minimum *[dike]* **berm** width shall be eight feet (8') *[(2.4 m)]* to permit access of maintenance vehicles.

[3. Maximum slopes. Inner and outer dike slopes shall not be steeper than three horizontal to one vertical (3:1).

4. Minimum slopes. Inner slopes should not be flatter than four horizontal to one vertical (4:1). Flatter slopes can be specified for larger installations because of wave action but have the disadvantage of added shallow areas being conducive to emergent vegetation. Outer slopes shall be sufficient to prevent surface runoff from entering the ponds.]

*[5.]***3.** *[Freeboard.]* Minimum freeboard shall be two feet (2') *[(0.6 m)]. [For very large cells, three feet (3') (1.0 m) should be considered.]*

[6. Design depth. The minimum operating depth should be sufficient to prevent growth of aquatic plants and damage to the dikes, bottom, control structures, aeration equipment and other appurtenances. In no case should pond depths be less than two feet (2') (0.6 m). The design water depth for aerated lagoons should be ten to fifteen feet (10–15') (3–4.5 m). This depth limitation may be altered depending on the aeration equipment, waste strength, climatic conditions and geologic conditions.

7. Erosion control. A justification and detailed discussion of the method of erosion control which encompasses all relative factors such as pond location and size, variations in operating depths, seal material, topography, prevailing winds, cost breakdown, application procedures, etc., shall be provided.

A. Seeding. The dikes shall have a cover layer of fertile topsoil with a minimum thickness of four inches (4") (10 cm) to promote establishment of an adequate vegetative cover wherever riprap is not utilized. Prior to prefilling (in accordance with paragraph (6)(C)3. of this rule), adequate vegetation shall be established on dikes from the outside toe to one foot (1') above the water line measured on the slope. Perennial-type, low growing, spreading grasses that minimize erosion and can be mowed are most satisfactory for seeding of dikes. In general, alfalfa and other long-rooted crops should not be used for seeding since the roots of this type are apt to impair the water holding efficiency of the dikes. Alternate dike stabilization practices may be considered if vegetative cover cannot be established prior to prefilling.

B. Additional erosion protection. Riprap or some other acceptable method of erosion control is required as a minimum around all piping entrances and exits. For aerated cell(s) design should ensure erosion protection on the slopes and bottoms in the areas where turbulence will occur. Additional erosion control may also be necessary on the exterior dike slope(s) to protect the embankment(s) from erosion due to severe flooding of a water course.

C. Alternate erosion protection. Alternate erosion control on the interior dike slopes may be necessary for ponds which are subject to severe wave action. In these cases riprap or an acceptable equal shall be placed from one foot (1') (.3 m) above the high water mark to two feet (2') (0.6 m) below the low water mark (measured on the vertical). This protection should also be provided in the storage cells of a controlled discharge (four (4)-cell) pond and the third cell of a flow-through pond (three (3)-cell) where large fluctuations in operating depths will occur.]

4. An emergency spillway shall be provided that—

A. Prevents the overtopping and cutting of berms;

B. Is compacted and vegetated or otherwise constructed to prevent erosion; and

C. Has the ability for a representative sample to be collected, if discharging.

(B) *[Pond]* **Lagoon** Bottom.

[1. Soil. Soil used in constructing the pond bottom (not including the seal) and dike cores shall be selected to avoid settlement.] Soil shall be compacted with the moisture content between two percent (2%) below and four percent (4%) above the optimum water content and **compacted** to *[the specified standard Procter density but no less than]* **at least** ninety-five percent

(95%) *[standard Procter]* **maximum dry** density **test method**.

(C) **Lagoon** Seal.

1. *[Design. Ponds shall be sealed so that seepage loss through the seal is as low as practicably possible. Seals consisting of soils or synthetic liners may be used provided the permeability, durability, integrity and cost effectiveness of the proposed materials can be satisfactorily demonstrated for anticipated conditions. Bentonite, soda ash or other sealing aids may be used to achieve an adequate seal in systems using soil. Results of a testing program which substantiates the adequacy of the proposed seal must be incorporated into and/or accompany the engineering report. Standard ASTM procedures or other acceptable methods shall be used for all tests. Soils having a permeability coefficient of 10- cm/sec or less with a compacted thickness of twelve inches (12") (30.5 cm) will be acceptable as a lagoon seal for water depths up to five feet (5') (1.5 m).]* **The lagoon shall be sealed to ensure that seepage loss is as low as possible and has a design permeability not exceeding 1.0 x 10-7 cm/sec.**

2. Soil Seals. The minimum thickness of the compacted clay liner must be twelve inches (12"). For permeability coefficients greater than *[10^{-7} cm/sec]* **1.0 × 10-7 cm/sec** or for heads over five feet (5') *[(1.5 m)]* such as an aerated lagoon system, the following formula shall be used to determine minimum seal thickness**, Equation 200-1**:

Equation 200-1

$$t = \frac{H \times K}{5.4 \times 10^{-7}\ \text{cm/sec}}$$

where:

K = the permeability coefficient of the soil in question;

H = the head of water in the lagoon; and

t = the thickness of the soil seal.

[Units for H and t may be English or metric; however, they must be the same. For a seal consisting of an artificial liner, seepage loss shall not exceed the equivalent of the rate expressed in this paragraph.

2. Normal construction methods will include over-excavation below grade level of twelve inches (12") (30.5 cm), scarification and compaction of base material to ninety-five percent (95%) standard Procter density at moisture content between two percent (2%) below and four percent (4%) above optimum, and compaction of lifts generally not exceeding six inches (6") (15.2 cm) to ninety-five percent (95%) standard Procter density at moisture content between two percent (2%) below and four percent (4%) above optimum. Maximum rock size should not exceed one-half (1/2) of the thickness of the compacted lift. The cut face of dikes must also be over-excavated and compacted in lifts not to exceed six inches (6") (15.2 cm) per lift. Soils containing plastic clay may be excluded from this construction requirement on a case-by-case basis based on particle size analysis and Atterburg limits. In fact, with some clay soils, satisfactory construction cannot be obtained by over-excavation and recompaction. Construction control must include field density. A minimum of two (2) density tests per acre or not less than three (3) tests must be performed for the base and each lift. Permeability tests of field compacted material may be performed at the option of the consulting engineer.

3. Prefilling. The pond shall be prefilled in order to protect the liner, to prevent weed growth, to reduce odor, to allow measurement of percolation losses and to maintain moisture content of the seal. However, the dikes must be completely prepared as described in subparagraphs (6)(A)7.A. and/or B. of this rule before the introduction of water. If the lagoon bottom is allowed to dry, the seal must be recompacted as required in paragraph (6)(C)2.

4. Percolation losses. Measurement of percolation losses shall consider flow into and out of the lagoon, rainfall and evaporation, and changes in water level. Measured percolation losses in excess of one-sixteenth inch (1/16") (1.6 mm) per day will be considered excessive.]

3. Synthetic Liners. Synthetic seals thickness may vary due to liner material but the liner thickness shall be no less than two-hundredths inch (.02") or twenty (20) mil and be the appropriate material to perform under existing conditions.

4. Seep collars shall be provided on drainpipes where they pass through the lagoon seal.

(D) Influent Lines.

1. *[Material. Cast- or ductile-iron pipe should be used for the influent line to the pond.]* Unlined corrugated metal pipe *[should be avoided]* **shall not be used** due to corrosion problems. *[Other materials selected shall be suited to local conditions. In material selection, consideration must be given to the quality of the wastes, exceptionally heavy external loadings, abrasion, soft foundations and similar problems.]*

2. *[Manhole. A manhole shall be installed prior to entrance of the influent line into the primary cell(s) and shall be located as close to the dike as topography permits. Its invert shall be at least six inches (6") (15 cm) above the maximum operating level of the pond and provide sufficient hydraulic head without surcharging the manhole.]* **A manhole shall be installed with its invert at least six inches (6") above the maximum operating level of the lagoon, prior to the entrance into the primary cell, and provide sufficient hydraulic head without surcharging the manhole. For manhole installation, follow the provisions listed in 10 CSR 8.120(6).**

[3. Flow distribution. Flow distribution structures shall be designed to effectively split hydraulic and organic loads equally to the primary cells.]

*[4.]***3.** *[Influent line(s).]* The influent line(s) shall be located along the bottom of the *[pond]* **lagoon** so that the top of the pipe is just below the average elevation of the *[pond]* **lagoon** seal; however, there *[pipe]* shall *[have]* be an adequate seal below *[it]* **the pipe**.

[5. Point of discharge. All primary cells shall have individual influent line(s) which terminate at approximately the center of the cell so as to minimize short-circuiting. Consideration should be given to multi-influent discharge points for primary cells of twenty (20) acres (8 hectares) or larger to enhance distribution of the waste load on the cell. All aerated cells shall have influent lines which distribute the load within the mixing zone of the aeration equipment. Consideration of multi-inlets should be closely evaluated for any diffused aeration systems.

6. Influent discharge apron. The influent line(s) shall discharge horizontally into the shallow saucer-shaped depression. The end of the discharge line(s) shall rest on a suitable concrete apron large enough so that the terminal influent velocity at the end of the apron does not cause soil erosion. A minimum size apron of two feet (2') (0.6 m) square shall be provided.

(E) Control Structures and Interconnecting Piping.

1. Structure. Facilities design shall consider the use of multipurpose control structures, where possible, to facilitate normal operational functions such as drawdown and flow distribution, flow and depth measurement, sampling, pumps for recirculation, chemical additions and mixing and to minimize the number of construction sites within the dikes. As a minimum, control structures shall be accessible for maintenance and adjustment of controls; adequately ventilated for safety and to minimize corrosion; locked to discourage vandalism; contain controls to allow water level and flow rate control, complete shut off and complete draining; constructed of noncorrosive materials (metal on metal contact in controls should be of like alloys to discourage electrochemical reactions); and located to minimize short-circuiting within

the cell and avoid freezing and ice damage. Recommended devices to regulate the water level are valves, slide tubes or dual slide gates. Regulators should be designed so that they can be preset to stop flows at any pond elevation.

2. Piping. All piping shall be of cast-iron or other acceptable materials. The piping should not be located within the seal. Seep collars shall be provided on drain pipes where they pass through the pond seal. Backfill around the drain pipe shall be placed and compacted in the same manner as the pond seal. Pipes should be anchored with adequate erosion control.

A. Drawdown structure piping.

(I) Multilevel outlets. The outlet structure on each pond cell, except aerated cells, shall be designed to permit overflow at one-foot (1') (30.5 cm) increments between the two foot (2') (61 cm) level and the maximum operating level. Suitable baffling shall be provided to prevent discharge of scum or other floating materials. Means must be provided to prevent unauthorized variance of the lagoon depth. A flap valve shall be provided at the outlet end of the final cell overflow or drain pipe to prevent entrance of animals or backwater from flooding.

(II) Pond drain. All ponds shall have emergency drawdown piping to allow complete draining for maintenance. These should be incorporated into the previously described structures. Sufficient pumps and appurtenances shall be made available to facilitate draining of individual ponds if ponds cannot be drained by gravity.

(III) Emergency overflow. To prevent overtopping of dikes, emergency overflow should be provided.

B. Hydraulic Capacity. The hydraulic capacity for constant discharge structures and piping shall allow for a minimum of two hundred fifty percent (250%) of the design flow of the system. The hydraulic capacity for controlled discharge systems shall permit transfer of water at a minimum rate of six inches (6") (15.2 cm) of pond water depth per day at the available head.

(7) Submerged Sand Filters.

(A) Applications. Submerged sand filters may be used for solids and BOD_5 removal following waste stabilization ponds and are considered to be both a third lagoon cell and solids removal facility when designed according to the parameters in subsection (7)(B) of this rule.

(B) Design Details.

1. Following nonaerated waste stabilization ponds, the loading shall not exceed five (5) gallons per day per square foot (.2 m^3/m^2/day) of sand. Following aerated waste stabilization ponds, the loading shall not exceed fifteen (15) gallons per day per square foot (.6 m^3/m^2/day) of sand.

2. Clean graded gravel, preferably placed in at least three (3) layers should be placed around the underdrains and to a depth of at least six inches (6") (15 cm) over the top of the underdrains. Suggested gradings for the three (3) layers are: one and one-half inches to three-fourths inch (1 1/2"–3/4") (3.8 cm–1.9 cm), three-fourths inch to one-fourth inch (3/4"–1/4") (1.9 cm–.6 cm) and one-fourth inch to one-eighth inch (1/4"–1/8") (.6 cm–.3 cm).

3. At least twenty-four inches (24") (0.6 m) of clean washed sand should be provided. The sand should have an effective size of 0.3–1.0 mm and a uniformity coefficient of 3.5 or less.

4. Open-joint or perforated pipe underdrains may be used. They should be spaced not to exceed ten-foot (10') (3.0 m) center-to-center.

5. The earth base of the filters should be sloped to the underdrains or the underdrains may simply be placed in the gravel base on the flat bottom of the basin.

6. The depth of liquid above the sand must be adjustable from one to five feet (1–5') (.3 m–1.5 m).

7. At least two (2) cells must be provided with the combined capacity equal to that necessary for the design loading.

8. A vehicle access ramp from the top of the embankment down to the sand surface and running along one (1) side of the filter is a desirable feature for periodic maintenance of the filter.

(8) Miscellaneous.

(A) Fencing. The pond area shall be enclosed with an adequate fence to discourage trespassing and prevent entering of livestock. Minimum fence height shall be five feet (5') (1.5 m). The fence may be of the chain link or woven type. Fencing shall not obstruct vehicle traffic or mowing operations on the dike. A vehicle access gate of sufficient width to accommodate mowing equipment shall be provided. All access gates shall be provided with locks.

(B) Access. An all-weather access road shall be provided to the pond site to allow year-round maintenance of the facility.

(C) Warning Signs. Appropriate permanent signs shall be provided along the fence around the pond to designate the nature of the facility and advise against trespassing. At least one (1) sign shall be provided on each side of the site and one (1) for every five hundred feet (500') (150 m) of its perimeter.

(D) Flow Measurement. Refer to 10 CSR 20-8.140(8)(G).

(E) Groundwater Monitoring. An approved system of groundwater monitoring wells or lysimeters may be required around the perimeter of the pond site to facilitate groundwater monitoring. The use of wells and/or lysimeters will be determined on a case-by-case basis.

(F) Laboratory Equipment. Refer to 10 CSR 20-8.140(8)(D).

(G) Pond Level Gauges. Pond level gauges shall be provided.

(H) Service Building. Consideration in design should be given to a service building for laboratory and maintenance equipment.]

(5) Covers for Lagoon Retrofits.

(A) Lagoon covers shall be constructed with a minimum thickness of 2 mil or meet the manufacturer's recommendations, and be ultraviolet and weather resistant.

(B) Trial seams shall be used to verify acceptable installation techniques.

(C) The cover shall include a stormwater removal system that conveys collected precipitation to sumps or includes drainage areas in the membrane within the acceptable leakage rate to allow stormwater to drain into the lagoon.

(6) Surface Irrigation of Wastewater.

(A) Site Considerations. For site considerations, follow the provision in section (2) of this rule.

(B) Wetted Application Area. The wetted application area is the land area that is normally wetted by wastewater application. The wetted application area must be:

1. Located outside of flood-prone areas having a flood frequency greater than once every ten (10) years;

2. Established—

A. At least one hundred fifty feet (150') from existing dwellings or public use areas, excluding roads or highways;

B. At least fifty feet (50') inside the property line;

C. At least three hundred feet (300') from any sinkhole, losing stream, or other structure or physiographic feature that may provide direct connection between the ground water table

and the surface;

D. At least three hundred feet (300') from any existing potable water supply well not located on the property. Adequate protection shall be provided for wells located on the application site;

E. One hundred feet (100') to wetlands, ponds, gaining streams (classified or unclassified; perennial or intermittent); and

F. If an established vegetated buffer or the wastewater is disinfected, the setbacks established in subsections (A)–(E) above may be decreased if the applicant demonstrates the risk is mitigated.

3. Fenced, or if not fenced, provide in the construction permit application or the facility plan, the—

A. Method of disinfection being utilized;

B. Suitable barriers in place, or

C. Details on how public access is limited and not expected to be present.

(C) Preapplication Treatment. At a minimum, treatment prior to irrigation shall provide performance equivalent to that obtained from a primary wastewater lagoon cell designed and constructed in accordance with sections (3) and (4) of this rule, except that the lagoon depth may be increased to include wastewater storage in addition to the primary volume.

1. The size of storage basins shall be based on the design wastewater flows and net rainfall minus evaporation expected for a one (1) in ten (10) year twenty-four (24) hour return frequency for the storage period selected and shall meet the minimum storage days listed below.

A. Seventy-five (75) days for facilities located in Scott, Stoddard, Butler, Dunklin, New Madrid, Pemiscot, Mississippi, McDonald, Newton, Jasper, Lawrence, Barry, Stone, Taney, Christian, Green, Webster, Douglas, Ozark, Howell, Texas, Dent, Shannon, Oregon, Ripley, Carter, Reynolds, Iron, Madison, Wayne, Cape Girardeau, Barton, Dade, Perry, and Bollinger counties.

B. Ninety (90) days for facilities located in Vernon, Bates, Henry, St. Clair, Cedar, Dallas, Polk, Hickory, Benton, Cooper, Morgan, Moniteau, Miller, Cole, Camden, Laclede, Pulaski, Phelps, Maries, Osage, Gasconade, Franklin, Jefferson, St. Louis, Ste. Genevieve, St. Francois, St. Charles, and Crawford counties.

C. One hundred five (105) days for facilities located in Cass, Johnson, Pettis, Platte, Jackson, Clay, Ray, Lafayette, Carroll, Saline, Chariton, Randolph, Howard, Boone, Callaway, Audrain, Monroe, Ralls, Pike, Lincoln, Warren, and Montgomery counties.

D. One hundred twenty (120) days for facilities located in Atchison, Holt, Andrew, Nodaway, Worth, Gentry, DeKalb, Harrison, Daviess, Grundy, Mercer, Putnam, Sullivan, Linn, Macon, Adair, Schuyler, Scotland, Clark, Knox, Lewis, Shelby, Buchanan, Clinton, Caldwell, Livingston, and Marion counties.

E. Seasonal facilities. For facilities that operate and generate flows only from April through October season, a minimum storage capacity of forty-five (45) days shall be provided. For facilities that operate or generate flows only from November through March, the minimum storage listed in subsection (A)–(D) above is required.

(D) Application Rates and Soils Information. The application rates for each individual site shall be based on topography, soils, geology, hydrology, weather, agricultural practice, adjacent land use, and application method. Application of wastewater shall not be allowed during periods of ground frost, frozen soil, saturated conditions, or precipitation events. In design of the application rates, the following shall apply:

1. Do not exceed the hourly application rate at the design sustained permeability rate except for short periods when initial soil moisture is significantly below field capacity. Do not exceed an hourly rate of one-half (½) the design sustained permeability for slopes exceeding ten percent (10%).

2. Base the daily and weekly application rates on soil moisture holding capacity, antecedent rainfall, and depth to the most restrictive soil permeability.

A. For facilities applying at twenty-four inches per year (24"/yr), the application rate cannot exceed one inch (1") per day and three inches (3") per week.

B. For facilities applying above twenty-four inches per year (24"/yr), the application rate cannot exceed the values determined in the soils report and loading design. Follow the provisions in 10 CSR 20-8.110(7), Soils Reports for additional information.

3. Design the maximum annual application rate not to exceed ten percent (10%) of the design sustained soil permeability rate for the number of days per year when soils are not frozen.

(E) The grazing of animals or harvesting of forage crops shall be deferred, as listed below, following wastewater irrigation, depending upon ambient air temperature and sunlight conditions.

1. Fourteen (14) days from grazing or forage harvesting during the period from May 1 to October 31 of each year; and

2. Thirty (30) days from grazing or forage harvesting during the period from November 1 to April 30 of each year.

(F) Public Access Areas. Disinfect wastewater prior to irrigation (not storage) in accordance with section (3) of this rule.

1. The wastewater shall contain as few of the indicator organisms as possible and in no case contain more than one hundred twenty-six (126) Escherichia coliform colony forming units per one hundred milliliters (126 cfu/ 100 ml);

2. The public shall not be allowed into an area when irrigation is being conducted; and

3. For golf courses utilizing wastewater, all piping and sprinklers associated with the distribution or transmission of wastewater shall be color-coded and labeled or tagged to warn against the consumptive use of contents.

(G) Alarm System. An automatic notification alarm system shall be installed on the pressure monitoring system, on each pivot and pump system, and be capable of notifying an on-call operator when a fault occurs in the system.

(7) Subsurface Adsorption Systems.

(A) Site Restrictions.

1. Subsurface systems shall—

A. Exclude unstabilized fill and soils that have been highly compacted and/or disturbed, such as old road beds, foundations, or similar things;

B. Provide adequate surface drainage where slopes are less than two percent (2%);

C. Provide surface and subsurface water diversion where necessary, such as a curtain or perimeter drain; and

D. Have a ten foot (10') buffer from the property line.

2. The vertical separation between the bottom of the drip lines and/or the trench and a limiting layer, including but not limited to, bedrock; restrictive horizon; or seasonal high water table, shall be no less than:

A. Twenty-four inches (24"); or

B. Twelve inches (12") for systems dispersing secondary or higher quality effluent; or

C. Forty-eight inches (48") where karst features are present unless the site can be reclassified.

(B) Preliminary treatment. Subsurface systems shall be, at a minimum, preceded by preliminary treatment. For design of a secondary treatment system, follow the provisions in 10 CSR 20-8.180 or section (3) of this rule.

(C) Loading rates shall not exceed the values assigned by the site and soil evaluation.

(8) Low Pressure Pipe (LPP) Subsurface Systems.

(A) Design.

1. The LPP system shall be sized in accordance with the following equations, Equation 200-2 and Equation 200-3:

Equation 200-2

$$A = \frac{Q}{LTAR}$$

and

Equation 200-3

$$L = \frac{A}{5\ ft}$$

where:

A = Minimum LPP soil treatment area (square feet (sq.ft))

L = Minimum total length of LPP trench (ft)

Q = Maximum daily wastewater flow (gallons per day (gpd))

LTAR = Long term acceptance rate (gpd/sq.ft). This is the lowest reported LPP soil loading rate between the soil surface and at least twelve inches (12") below the specified LPP trench bottom or as approved by the Missouri Department of Natural Resources (department).

2. All network piping and low pressure distribution piping and fittings with polyvinyl chloride (PVC) shall meet ASTM Standard D 1785 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, or 120 as approved and published August 1, 2015, or equivalent rated to meet or exceed ASTM D2466 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings as approved and published August 1, 2017. These standards are hereby incorporated by reference into this rule, as published by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. This rule does not incorporate any subsequent amendments or additions.

3. Manifold design shall address freeze protection while assuring uniform distribution and to minimize drain down of laterals into other laterals at a lower elevation between dosing events.

(B) Dosage. The dosing frequency shall be based on the soils report and the dosing volume in zoned systems.

(C) Orifices and Orifice Shielding.

1. The orifice number and spacing shall be designed to provide a distribution of no more than six square feet per orifice with an orifice size of not less than one-eighth inch.

2. The distal pressure shall be designed and maintained at the end of each lateral to be no less than two feet (2 ft) (0.87 psi) when using three-sixteenth inch (3/16") or larger diameter orifices, and no less than five feet (5 ft) (2.18 psi) when using orifices smaller than three-sixteenth inch (3/16").

(9) Drip Dispersal Subsurface Systems.

(A) Design.

1. The location and size of the drains and buffers must be factored into the total area required for the drip dispersal system.

2. The drip dispersal system shall be sized with the minimum soil treatment area and total length, in accordance with the following equations, Equation 200-4 and Equation 200-5:

Equation 200-4

$$A = \frac{Q}{HLR}$$

Equation 200-5

$$L = \frac{A}{2\ feet}$$

Where:

A = Minimum soil treatment area (square feet (sq. ft))

Q = Maximum daily wastewater flow (gallons per day (gpd))

HLR= Maximum hydraulic loading rate determined in the soils report (gpd/sq.ft)

L = Minimum total length (ft)

(B) Lines.

1. The drip dispersal lines shall be placed at a minimum depth of six inches (6") below the surface.

2. Emitters and drip dispersal lines shall be placed at a minimum on a two foot (2') spacing to achieve even distribution of the wastewater and maximum utilization of the soil.

*AUTHORITY: section 644.026, RSMo [Supp. 1988] **2016**. Original rule filed Aug. 10, 1978, effective March 11, 1979. Amended: Filed June 15, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Department of Natural Resources, Division of Environmental Quality, Water Protection Program, John Rustige, PO Box 176, Jefferson City, MO 65102. Comments may be sent with name and address through email to john.rustige@dnr.mo.gov. Public comments must be received by August 23, 2018. The public hearing is scheduled for 10 AM, on August 15, 2018, at the Department of Natural Resources, Elm Street Conference Center, Bennett Spring Conference Room, 1730 East Elm Street, Jefferson City, Missouri 65101.

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

PROPOSED AMENDMENT

10 CSR 20-8.210 Supplemental Treatment *[Processes]*. The Clean Water Commission is deleting sections (1) through (4), adding new sections (1)–(3), amending and renumbering old section (5), and adding new section (5).

PURPOSE: This amendment will retain and add minimum design standards for supplemental treatment that are required to protect or improve public health, safety, and water quality.

PURPOSE: [The following criteria have been prepared as a guide for the design of supplemental treatment processes. This rule is to be used with rules 10 CSR 20-8.110– 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 as regards adequacy of design, submission of plans, approval of plans, and approval of completed sewage works. Deviation from these minimum requirements will be allowed where sufficient documentation is presented to justify the deviation. These criteria are taken largely from Great Lakes-Upper Mississippi River Board of State Sanitary Engineers Recommended Standards for Sewage Works 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. Addenda or supplements to this publication will be furnished to consulting engineers and city

engineers. If others desire to receive addenda or supplements, please advise the Clean Water Commission so that names can be added to the mailing list.] ***This rule specifies the minimum standards for the design of supplemental treatment processes that are part of wastewater collection and treatment systems. This rule is to be used with rules 10 CSR 20-8.110 through 10 CSR 20-8.210. It does not address all aspects of design, and the design engineer may refer to other appropriate reference materials so long as these minimum standards set forth in this rule are met.***

[(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 agency is concerned, unless justification is presented for deviation from the requirements. Other terms, such as should, recommend, preferred and the like, indicate discretionary requirements on the part of the agency and deviations are subject to individual consideration.

(2) Exceptions This rule shall not apply to facilities designed for twenty-two thousand five hundred (22,500) gallons per day (85.4 m^3) or less (see 10 CSR 20-8.020 for the requirements for those facilities).

(3) Phosphorus Removal by Chemical Treatment.

(A) General.

1. Method. Addition of line or the salts of aluminum or iron may be used for the chemical removal of soluble phosphorus. The phosphorus reacts with the calcium, aluminum or iron ions to form insoluble compounds. These insoluble compounds may be coagulated with or without the addition of a coagulant aid such as polyelectrolyte to facilitate separation by sedimentation.

2. Design basis. Laboratory, pilot or full scale trial of various chemical feed systems and treatment processes are recommended to determine the performance level achievable, cost-effective design criteria and ranges of chemical dosages required. Systems shall be designed with sufficient flexibility to allow for several operational adjustments in chemical feed point location, chemical feed rates and for feeding alternate chemical compounds.

(B) Process Requirements.

1. Dosage. The chemical dosage required shall include the amount needed to react with the phosphorous in the wastewater, the amount required to drive the chemical reaction to the desired state of completion and the amount required due to inefficiencies in mixing or dispersion. Excessive chemical dosage should be avoided.

2. Chemical selection. The choice of lime or the salts of aluminum or iron should be based on the wastewater characteristics and the economics of the total system. When lime is used it may be necessary to neutralize the high pH prior to subsequent treatment in secondary biological systems or prior to discharge in those flow schemes where lime treatment is the final step in the treatment process.

3. Chemical feed points. Selection of chemical feed points shall include consideration of the type of chemicals used in the process, necessary reaction times between chemical and polyelectrolyte additions, and the type of wastewater treatment processes and components utilized. Considerable flexibility in feed point location should be provided, and multiple feed points are recommended.

4. Flash mixing. Each chemical must be mixed rapidly and uniformly with the flow stream. Where separate mixing basins are provided, they should be equipped with mechanical mixing devices. The detention period should be at least thirty (30) seconds.

5. Flocculation. The particle size of the precipitate formed by chemical treatment may be very small. Consideration should be given in the process design to the addition of synthetic polyelectrolytes to aid settling. The flocculation equipment should be adjustable in order to obtain optimum flow growth, control deposition of solids and prevent floc destruction.

6. Liquid—solids separation. The velocity through pipes or conduits from flocculation basins to settling basins should not exceed 1.5 feet per second (0.46 m/s) in order to minimize floc destruction. Entrance works to settling basins should also be designed to minimize floc shear. Settling basin design shall be in accordance with criteria outlined in 10 CSR 20-8.160. For the design of a sludge handling system, special consideration should be given to the type and volume of sludge generated in the phosphorus removal process.

7. Filtration. Effluent filtration shall be considered where effluent phosphorus concentrations of less than one (1) mg/l must be achieved.

(C) Feed Systems.

1. Location. All liquid chemical mixing and feed installations should be installed in corrosion-resistant pedestals and elevated above the highest liquid level anticipated during emergency conditions. Lime feed equipment should be located so as to minimize the length of slurry conduits. All slurry conduits shall be accessible for cleaning.

2. Liquid chemical feed system. Liquid chemical feed pumps should be of the positive displacement type with variable feed rate control. Pumps shall be selected to feed the full range of chemical quantities required for the phosphorus mass loading conditions anticipated with the largest unit out-of-service. Screens and valves shall be provided on the chemical feed pump suction lines. An air break or antisiphon device shall be provided where the chemical solution discharges to the transport water stream to prevent an induction effect resulting in overfeed. Consideration shall be given to providing pacing equipment to optimize chemical feed rates.

3. Dry chemical feed system. Each dry chemical feeder shall be equipped with a dissolver which is capable of providing a minimum five (5)-minute retention at the maximum feed rate. Polyelectrolyte feed installations should be equipped with two (2) solution vessels and transfer piping for solution makeup and daily operation. Makeup tanks shall be provided with an eductor funnel or other appropriate arrangement for wetting the polymer during the preparation of the stock feed solution. Adequate mixing should be provided by a large diameter, low-speed mixer.

(D) Storage Facilities.

1. Size. Storage facilities shall be sufficient to insure that an adequate supply of the chemical is available at all times. Exact size required will depend on size of shipment, length of delivery time and process requirements. Storage for a minimum of ten (10) days' supply should be provided.

2. Location. The liquid chemical storage tanks and tank fill connections shall be located within a containment structure having a capacity exceeding the total volume of all storage vessels. Valves on discharge lines shall be located adjacent to the storage tank and within the containment structure. Auxiliary facilities, including pumps and controls, within the containment area shall be located above the highest anticipated liquid level. Containment areas shall be sloped to a sump area and shall not contain floor drains. Bag storage should be located near the solution makeup point to avoid unnecessary transportation and housekeeping problems.

3. Accessories. Platforms, ladders and railings should be

provided as necessary to afford convenient, safe access to all filling connections, storage tank entries and measuring devices. Storage tanks shall have reasonable access provided to facilitate cleaning.

(E) Other Requirements.

1. Materials. All chemical feed equipment and storage facilities shall be constructed of materials resistant to chemical attack by all chemicals normally used for phosphorous treatment.

2. Temperature/humidity and dust control. Precautions shall be taken to prevent chemical storage tanks and feed lines from reaching temperatures likely to result in freezing or chemical crystallization at the concentrations employed. A heated enclosure or insulation may be required. Consideration should be given to temperature, humidity and dust control in all chemical feed room areas.

3. Cleaning. Consideration shall be given to the accessibility of piping. Piping should be installed with plugged wyes, tees or crosses at changes in direction to facilitate cleaning.

4. Drains and drawoff. Above-bottom drawoff from chemical storage or feed tanks shall be provided to avoid withdrawal of settled solids into the feed system. A bottom drain shall also be installed for periodic removal of accumulated settled solids.

(F) Hazardous Chemical Handling. The requirements of 10 CSR 20-8.140(9)(A) shall be met.

(G) Sludge Handling.

1. General. Consideration shall be given to the type and additional capacity of the sludge handling facilities needed when chemicals are used.

2. De-watering. Design of de-watering systems should be based, where possible, on an analysis of the characteristics of the sludge to be handled. Consideration should be given to the ease of operation, effect of recycle streams generated, production rate, moisture content, de-waterability, final disposal and operating costs.

(4) High Rate Effluent Filtration.

(A) General.

1. Applicability. Granular media filters may be used as a tertiary treatment device for the removal of residual suspended solids from secondary effluent. Where effluent suspended solids requirements are less than ten (10) mg/l, where secondary effluent quality can be expected to fluctuate significantly or where filters follow a treatment process where significant amounts of algae will be present, a pretreatment process such as chemical coagulation and sedimentation or other acceptable process should precede the filter units. Pretreatment units shall meet the applicable requirements of section (3) of this rule.

2. Design consideration. Care should be given in the selection of pumping equipment ahead of filter units to minimize shearing of floc particles. Consideration should be given in the plant design to providing flow equalization facilities to moderate filter influent quality and quantity.

(B) Filter Types. Filters may be of the gravity-type or pressure-type. Pressure filters shall be provided with ready and convenient access to the media for treatment or cleaning. Where greases or similar solids which result in filter plugging are expected, filters should be of the gravity-type.

(C) Filtration Rates.

1. Allowable rates. Filtration rates shall not exceed five (5) gallons per minute per square foot based on the maximum hydraulic flow rate applied to the filter units.

2. Number of units. Total filter area shall be provided in two (2) or more units, and the filtration rate shall be calculated on the total available filter area with one (1) unit out-of-service.

(D) Backwash.

1. The backwash rate shall be adequate to fluidize and expand each media layer a minimum of twenty percent (20%) based on the media selected. The backwash system shall be capable of providing a variable backwash rate having a maximum of at least twenty (20) gpm/sq. ft. (13.6 $l/m^2/s$) and a minimum backwash period of ten (10) minutes.

2. Backwash. Pumps for backwashing filter units shall be sized and interconnected to provide the required rate to any filter with the largest pump out-of-service. Filtered water should be used as the source of backwash water. Waste filter backwash water shall be adequately treated.

(E) Filter Media.

1. Selection. Selection of proper media size will depend on the filtration rate selected, the type of treatment provided prior to filtration, filter configuration and effluent quality objectives. In dual or multi-media filters, media size selection must consider compatibility among media.

2. Media specifications. The following table provides a listing of the normal acceptable range of media sizes and minimum media depths. The designer has the responsibility for selection of media to meet specific conditions and treatment requirements relative to the project under consideration.

Media Sizes, mm and Minimum Depths, (in)

	Single Media	*Dual Media*	*Multi Media*
Anthracite	*—*	*1.0–2.0 (20″)*	*1.0–2.0 (20″)*
Sand	*1.0–4.0 (48″)*	*0.5–1.0 (12″)*	*0.6–0.8 (10″)*
Garnet or Similar Material	*—*	*—*	*0.3–0.6 (2″)*

Uniformity Coefficient shall be 1.7 or less.

(F) Filter Appurtenances. The filters shall be equipped with washwater troughs, surface wash or air scouring equipment, means of measurement and positive control of the backwash rate, equipment for measuring filter head loss, positive means of shutting off flow to a filter being backwashed and filter influent and effluent sampling points. If automatic controls are provided, there shall be a manual override for operating equipment, including each individual valve essential to the filter operation. The underdrain system shall be designed for uniform distribution of backwash water (and air, if provided) without danger of clogging from solids in the backwash water. Provision shall be made to allow periodic chlorination of the filter influent or backwash water to control slime growths.

(G) Reliability. Each filter unit shall be designed and installed so that there is ready and convenient access to all components and the media surface for inspection and maintenance without taking other units out-of-service. The need for housing of filter units shall depend on expected extreme climatic conditions at the treatment plant site. As minimum, all controls shall be enclosed. The structure housing filter controls and equipment shall be provided with adequate heating and ventilation equipment to minimize problems with excess humidity.

(H) Backwash Surge Control. The rate of return of waste filter backwash water to treatment units shall be controlled so that the rate does not exceed fifteen percent (15%) of

the design average daily flow rate to the treatment units. The hydraulic and organic load from waste backwash water shall be considered in the overall design of the treatment plant. Surge tanks shall have a minimum capacity of two (2) backwash volumes, although additional capacity should be considered to allow for operational flexibility. Where waste backwash water is returned for treatment by pumping, adequate pumping capacity shall be provided with the largest unit out-of-service.

(I) Backwash Water Storage. Total backwash water storage capacity provided in an effluent clearwell or other unit shall equal or exceed the volume required for two (2) complete backwash cycles.

(J) Proprietary Equipment. Where proprietary filtration equipment not conforming to the preceding requirements is proposed, data which supports the capability of the equipment to meet effluent requirements under design conditions shall be provided. The equipment will be reviewed on a case-by-case basis at the discretion of the agency.]

(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. In the event 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. Requirements for these facilities are found in 10 CSR 20-8.300.

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

(2) Polishing Reactors.

(A) Design. The process shall—

1. Provide a minimum hydraulic retention time of three (3) hours;

2. Be based on actual reactor influent characteristics;

3. Be based on Biochemical Oxygen Demand loading rate of forty-eight pounds per one thousand cubic feet per day (48 lbs BOD/1,000 cf/day) or less;

4. Be sized using less than two tenths a pound TKN per one thousand square feet per day (0.2 lbs TKN/1,000 ft^2/day) when nitrifying;

5. Provide sufficient alkalinity with a minimum residual of fifty milligrams per liter (50 mg/L) in the effluent or include chemical treatment;

6. Include cold weather provisions, such as heaters, insulated covers, installation of temperature controlled enclosures for above-ground components to prevent freezing and to ensure ammonia removal; and

7. Provide a blower malfunction alarm able to notify the operator of alarm activations through audio-visual means.

(3) Filtration.

(A) Filtration systems shall be preceded with additional process, such as chemical coagulation and sedimentation or other acceptable process, when:

1. Permit requirements for total suspended solids (TSS) are less than ten milligrams (10 mg/L);

2. Effluent quality is expected to fluctuate significantly;

3. Significant amounts of algae are present; or

4. The manufacturer recommends an additional process.

(B) General Design.

1. Filtration systems shall have:

A. Convenient access to all components and the media surface for inspection and maintenance without taking other units out of service;

B. Enclosed controls and heating and ventilation equipment to control humidity; and

C. The capacity to process the design average flow to the filters with the largest unit out of service utilizing a minimum of two (2) units.

2. Flocculation. For filtration systems requiring coagulation and flocculation prior to the filtration, the flocculation system shall:

A. Include chemical feed equipment to meet the system's anticipated peak design flow and the ability to proportion chemical feed rates; and

B. Ensure the rapid dispersion and mixing of chemicals throughout the wastewater by providing mechanical or in-line static mixers.

(C) Deep bed filters.

1. The design of manifold type filtrate collection or underdrain systems shall:

A. Minimize loss of head in the manifold and baffles;

B. Provide the ratio of the area of the underdrain orifices to the entire surface area of the filter media at about three one-thousandths (0.003);

C. Provide the total cross-sectional area of the laterals at about twice the area of the final openings; and

D. Provide a manifold that has a minimum cross sectional area that is one and one half (1.5) times the total area of the laterals.

2. All rotary surface wash devices shall provide adequate surface wash water to provide half to one gallon per minute per square foot (0.5-1.0 gpm/ sq ft) of filter area.

(D) Shallow bed filters. The shallow bed filter shall:

1. Comply with the manufacturer's recommendations at average design flow;

2. Provide multiple unit operations to allow for continuous operability and operational variability;

3. Consist of a series of up to eight inch (8") filter increments having a minimum total media depth of eleven inches (11"), if using filter media except for sand media.

4. Have an effective size in the range of four-tenths millimeter to sixty-five hundredths millimeters (0.40 mm-0.65 mm) and a uniformity coefficient of one and one half (1.5) or less, if utilizing sand media;

5. Include inlet ports located throughout the length of the filter.

6. Provide an underdrainage system along the entire length of the filter so that filter effluent is uniformly withdrawn without clogging outlet openings.

7. Have a traveling bridge mechanism which—

A. Provides support and access to the backwash pumps and equipment;

B. Is constructed of corrosion resistant materials;

C. Provides for consistent tracking of the bridge;

D. Provides support of the power cords; and

E. Initiates a backwash cycle automatically when a preset head loss through the filter media occurs.

(E) Cloth/Disc Filters.

1. Media Design. The media shall:

A. Have an average pore size of no larger than thirty (30) microns;

B. Follow the manufacturer's recommendations; and

C. Be chemical-resistant if the filter will be exposed to chemicals, such as chlorine or disinfectants.

2. Filtration Rates and Hydraulics. The design shall—

A. Base the filtration rate on the effective submerged surface area of the media and provide a maximum filtration rate for peak flow of not more than six and one half gallons per minute per square foot (6.5 gpm/sq ft) of submerged cloth media; and

B. Be able to treat the design flow rate with one (1) filter unit in backwash mode.

*[(5)]***(4)** Microscreening.

[(A) General.

1. Applicability. Microscreening units may be used following a biological treatment process for the removal of residual suspended solids. Selection of this unit process should consider final effluent requirements, the preceding biological treatment process and anticipated consistency of biological process to provide a high quality effluent.

2. Design considerations. Pilot plant testing on existing secondary effluent is encouraged. Where pilot studies so indicate, where microscreens follow trickling filters or lagoons, or where effluent suspended solids requirements are less than ten (10) mg/l, a pretreatment process such as chemical coagulation and sedimentation shall be provided. Care should be taken in the selection of pumping equipment ahead of microscreens to minimize shearing of floc particles. The process design shall include flow equalization facilities to moderate microscreen influent quality and quantity.]

*[(B)]***(A)** Screen Material. The microfabric shall be a material demonstrated to be durable through long-term performance data. *[The aperture size must be selected considering required removal efficiencies, normally ranging from twenty to thirty-five (20–35) microns. The use of pilot plant testing for aperture size selection is recommended.]*

[(C) Screening Rate. The screening rate shall be selected to be compatible with available pilot plant test results and selected screen aperture size, but shall not exceed five (5) gallons per minute per square foot (3.40 l/m^2/s) of effective screen area based on the maximum hydraulic flow rate applied to the units. The effective screen area shall be considered the submerged screen surface area less the area of screen blocked by structural supports and fasteners. The screening rate shall be that applied to the units with one (1) unit out-of-service.]

*[(D)]***(B)** Backwash. All *[waste]* backwash *[water generated by the microscreening operation]* shall be recycled for treatment. *[The backwash volume and pressure shall be adequate to assure maintenance of fabric cleanliness and flow capacity. Equipment for backwash of at least eight (8) gallons per minute per linear foot (1.66 l/m/s) of screen length and sixty (60) pounds per square inch (4.22 kgf/cm^2), respectively, shall be provided. Backwash water shall be supplied continuously by multiple pumps, including one (1) standby and should be] obtained from microscreened effluent. The rate of return of waste backwash water to treatment units shall be controlled so that the rate does not exceed fifteen percent (15%) of the design average daily flow rate to the treatment plant. The hydraulic and organic load from waste backwash water shall be considered in the overall design of the treatment plant. Where waste backwash water is returned for treatment by pumping, adequate pumping capacity shall be provided with the largest unit out-of-service. Provisions should be made for measuring backwash flow.]*

[(E) Appurtenances. Each microscreen unit shall be provided with automatic drum speed controls, with provisions for manual override, a bypass weir with an alarm for use when the screen becomes blinded to prevent excessive head development, and means for de-watering the unit for inspection and maintenance. Bypassed flows must be segregated from water used for backwashing. Equipment for control of biological slime growths shall be provided. The use of chlorine should be restricted to those installations where the screen material is not subject to damage by the chlorine.

(F) Reliability. A minimum of two (2) microscreen units shall be provided, each unit being capable of independent operation. A supply of critical spare parts shall be provided and maintained. All units and controls shall be enclosed in a heated and ventilated structure with adequate working space to provide for ease of maintenance.]

(5) In-stream Diffusers.

(A) General.

1. The mixing zone shall not encroach on a drinking water intake, recreation area, or sensitive habitat, overlap the next downstream outfall, or occlude a downstream tributary.

2. Diffuser installation requires notification and an Army Corps of Engineers permit.

(B) Diffuser Design Criteria.

1. The pipeline shall be contained within approved property boundaries or easements.

2. Maximum port velocity shall not exceed fifteen feet per second (15 fps).

*AUTHORITY: section 644.026, RSMo [1986] **2016**. Original rule filed Aug. 10, 1978, effective March 11, 1979. Amended: Filed June 15, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Department of Natural Resources, Division of Environmental Quality, Water Protection Program, John Rustige, PO Box 176, Jefferson City, MO 65102. Comments may be sent with name and address through email to john.rustige@dnr.mo.gov. Public comments must be received by August 23, 2018. The public hearing is scheduled for 10 AM, on August 15, 2018, at the Department of Natural Resources, Elm Street Conference Center, Bennett Spring Conference Room, 1730 East Elm Street, Jefferson City, Missouri 65101.

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

PROPOSED RESCISSION

10 CSR 20-8.220 Land Treatment. The following criteria was prepared as a guide for the design of land treatment systems. This rule was to be used with rules 10 CSR 20-8.110–10 CSR 20-8.220 for the planning and design of the complete treatment facility. This rule reflected the minimum requirements of the Missouri Clean Water Commission as regards adequacy of design, submission of plans, approval of plans and approval of completed sewage works. Deviation from these minimum requirements was allowed where sufficient documentation was presented to justify the deviation. These criteria were taken largely from Great Lakes-Upper Mississippi River Board of State Sanitary Engineers.

PURPOSE: This rule is being rescinded to reduce duplication throughout Chapter 8. The requirements from 10 CSR 20-8.220 that are necessary to protect human and environmental health and safety will be incorporated throughout other sections of Chapter 8.

AUTHORITY: section 644.026, RSMo Supp. 1988. Original rule filed Aug. 10, 1978, effective March 11, 1979. Rescinded: Filed June 15, 2018.

PUBLIC COST: This proposed rescission will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed rescission will not cost private entities

more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed rescission with the Department of Natural Resources, Lacey Hirschvogel, Water Protection Program, PO Box 176, Jefferson City, MO 65101. To be considered, comments must be received within thirty (30) days after publication of this notice in the ***Missouri Register****. A public hearing is scheduled for September 5, 2018, at Department of Natural Resources, 1101 Riverside Drive, Jefferson City, MO 65101.*

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

PROPOSED AMENDMENT

10 CSR 20-8.300 *[Manure Storage Design Regulations]* ***Design of Animal Waste Management Systems***. The Clean Water Commission is deleting sections (1), (9), and (12) and renumbering and amending sections (2)–(8), (10), (11), and (13).

PURPOSE: This amendment will retain and add minimum design standards for the design of animal waste management systems required to protect or improve public health, safety, and our natural resources.

PURPOSE: [This rule sets forth criteria prepared as a guide for the design of animal waste management systems at Concentrated Animal Feeding Operations. This rule shall be used together with 10 CSR 20-6.300 Concentrated Animal Feeding Operations. This rule reflects the minimum requirements of the Missouri Clean Water Commission in regard to adequacy of design, submission of plans, and approval of plans. It is not reasonable or practical to include all aspects of design in this standard. The design engineer should obtain appropriate reference materials which include, but are not limited to: copies of ASTM International standards, design manuals such as Water Environment Federation's Manuals of Practice, and other 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.] ***This rule specifies the minimum standards for the design of animal waste management systems. It does not address all aspects of design, and the design engineer may refer to other appropriate reference materials so long as these minimum standards set forth in this rule are met.***

[(1) Definitions.

(A) Definitions as set forth in the Missouri Clean Water Law, Chapter 644, Concentrated Animal Feeding Operation (Hog Bill) Section 640.703, RSMo, 10 CSR 20-2.010, and 10 CSR 20-6.300 shall apply to the terms in this rule unless otherwise defined by subsection (1)(B) below.

(B) Other applicable definitions are as follows:

1. Design storage period—The calculated number of days that will fill the manure storage structure from the lower to the upper operating level for a covered storage structure or from the lower to the upper operating level for an uncovered, liquid storage structure during a period of average rainfall minus evaporation (R-E).

A. For a design storage period of fewer than three hundred sixty-five (365) days, the largest consecutive average monthly R-E, corresponding with the number of months of the storage period, shall be used.

B. For multiple storage stages, the storage period is the sum of available storage days in each stage.

C. For covered liquid manure storage structures, the upper operating level is one foot (1') below the top of the structure;

2. Freeboard—The elevation difference between the bottom of the spillway to the top of the berm for an earthen basin;

3. Groundwater table—The seasonal high water level occurring beneath the surface of the ground, including underground watercourses, artesian basins, underground reservoirs and lakes, aquifers, other bodies of water located below the surface of the ground, and water in the saturated zone. For the purposes of this rule, groundwater table does not include the perched water table;

4. Manure—The fecal and urinary excretion of animals;

5. Manure storage structure—A fabricated structure or earthen basin used to store manure, litter, and/or process wastewater;

6. Rainfall minus evaporation (R-E)—The average depth of monthly liquid precipitation minus evaporation as published in the most recent National Weather Service Climate Atlas for the geographical region of the proposed structure;

7. Safety depth—One foot (1') of liquid depth or the depth needed to hold the volume of the ten- (10-) year, ten- (10-) day storm, whichever is greater;

8. Solid manure—Manure that can be stacked without free flowing liquids;

9. Safety volume—The volume of wastewater stored between the upper pumpdown and emergency spillway crest;

10. Storage lagoon—A lagoon that does not have adequate volume to accomplish treatment;

11. Storage volume—The volume of manure, runoff, washwater, rainfall, and additional water sources between the lower and upper operating levels;

12. Ten- (10-) year, ten- (10-) day storm—The depth of rainfall occurring in a ten- (10-) day duration over a ten- (10-) year return frequency as defined by the most recent publication of the National Weather Service Climate Atlas for the geographical region of the proposed manure storage structure;

13. Total storage capacity—The combined volume of storage and safety volumes stored between the lower pumpdown level and emergency spillway crest;

14. Treatment volume—The permanent volume maintained below the lower pumpdown designed for anaerobic treatment of manure based on latitude;

15. Waste treatment lagoon—A lagoon that is sized to have three hundred sixty-five (365) days of storage volume and adequate treatment volume;

16. Wastewater—A combination of manure, washwater, runoff, rainfall, and process wastewater; and

17. Wastewater flow—The annual rate of wastewater contributed to an animal waste management system.]

*[(2)]***(1)** *[General]* **Applicability**.

[(A) Applicability.] This rule *[shall apply]* **applies** to all new or expanding Concentrated Animal Feeding Operations (CAFOs), however, only those applicants that are constructing earthen basins *[need]* **are required** to obtain construction permits. **The Missouri Department of Natural Resources (department) will not examine the adequacy or efficiency of the structural, mechanical, or electrical components of the animal waste management systems, only adherence to rules and regulations.**

[(B) These design regulations may also be applicable to other types of agricultural waste management systems regulated by the department. Other facilities that wish to use

this regulation when preparing a permit application shall first obtain written approval from the department.

(C) Careful consideration should be given to the type of storage, treatment, and land application before choosing a final system design. Important factors to consider include: location and topography of the operation; concentration and quantity of the manure to be managed; land available for manure utilization; operating costs; and the probable type of supervision and maintenance the operation will require.

(D) New Processes, Methods, and Equipment. The policy of the department is to not obstruct the development of new methods, equipment, and management practices for manure management. The lack of inclusion in this standard of a particular type of treatment process or equipment should not be construed as precluding its use. The department will approve other types of processes or equipment under the following conditions:

1. The operational reliability and effectiveness of the process or device shall have been demonstrated with a suitably-sized prototype unit operating at its design load conditions to the extent required by the department; and

2. The department may require additional tests including:

A. Results and engineering evaluations demonstrating the efficiency of the processes or equipment; and

B. Appropriate, independent testing/evaluation conducted under the supervision of an engineer not employed by the manufacturer or developer.

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

*[(3)]***(2)** Permit Application Documents. *[Applicants for a construction permit for earthen basins shall include one (1) set of documents described in this section for department approval as part of the construction permit application process. Applicants who are not constructing earthen basins and are seeking an operating permit shall develop and maintain these documents and submit those required in 10 CSR 20-6.300. The engineering documents shall provide the basic information, present design criteria and assumptions, examine alternate systems, where appropriate, and provide plans and specifications. The documents shall also include process description, sizing, data, controlling assumptions, and considerations for the functional operation of an animal waste management system.]* All engineering documents shall be prepared by or under the direct supervision of a registered professional engineer licensed to practice in Missouri. *[The department will not examine the adequacy or efficiency of the structural, mechanical, or electrical components of the animal waste management systems, only adherence to rules and regulations.]*

[(A) Engineering report—The following paragraphs list requirements for the content of the project engineering report to be submitted to the department for review and approval:

1. Title page. Title of project, date, operation's name and address, name and address of firm preparing the report, and seal and signature of the engineer;

2. Project location map. This map shall include state and county roads, county boundaries, and city boundaries, and show the location of the proposed project;

3. Narrative project summary. Provide an explanation of any existing conditions at the operation and a summary of the proposed modifications to the operation;

4. Summary of design. This section should include the design data, calculations, all assumptions, and all relevant information used to justify the design. If the engineering documents contain known deviations from the design criteria contained in this rule, documentation and justification for the deviation should be submitted with the design criteria. The following items should be included:

A. Each animal type and number within the production area, the maximum design animal capacity, and the average weight for each animal type;

B. A detailed explanation of the process by which manure is deposited, handled, managed, and transferred within the operation;

C. Calculations showing the estimated annual amount of manure generated at the production area and wastewater flows with average rainfall. Where possible, design manure volume shall be based on past operating records or operating data from facilities with similar feed inputs and animal characteristics. Documentation of these volumes shall be included. If operating data is not available, the design manure volume shall be estimated using the most recent edition of a research based reference. The reference name, edition, and data shall be included;

D. Design calculations justifying the size of manure storage structures. This includes safety volume, storage volume, total storage capacity, design storage period, and treatment volume. For waste treatment lagoons, the volume of treatment shall be based on the geographical region of the proposed structure and calculated using the most recent edition of a research-based reference. The reference name, edition, and data shall be included;

E. Stage-storage tables on at least one-foot (1') increments for all earthen basins with design operating depths (elevation of lower and upper pumpdown levels) shall be clearly identified;

F. Collection, treatment, and disposal of all domestic wastewater flows associated with the operation; and

G. If applicable, justifications for constructing an uncovered manure storage structure. Covered storages are preferred due to the lower risk of environmental damage from excessive rainfall;

5. Soils report/soils information. The engineering report shall contain county soil survey information for the soil types and characteristics of the production areas. Unless required otherwise by the department, soils information shall include soil series name, soil textural class, and physical properties and water features for earthen basins and solid manure components. The soils map shall show approximate boundaries of the different soils. When applicable, the design of all structures shall be sufficient to address the site limitations identified by the Missouri Geological Survey and should be discussed in the engineering report. Any soil boring or test pit logs shall also be included in the report; and

6. Operation and maintenance plan—An operation and maintenance plan shall be provided to explain the key operating procedures. At a minimum, the plan shall address operation and maintenance of mechanical equipment.

(B) General layout drawings. Plans shall include both an aerial and a topographic map or drawing that shows the spatial location and extent of the production area. Each drawing or map must be easily readable and include a visual scale, preferably one inch (1") per one thousand feet (1,000'), a north directional arrow, a fixed geographic reference point, and the date the drawing or map was completed. Each drawing or map shall include the following:

1. All confinement barns, open lots, manure storage,

and control structures, along with the other various components of the operation such as areas designated for stockpiling, composting, and for the management of animal mortalities;

2. The source of the operation's water supply and all wells within three hundred feet (300') of the production area; and

3. The location of all surface water features within the boundaries or immediately adjacent to the production area.

(C) Construction plan drawings. Plan drawings shall include the following:

1. The name of the operation and the scale in feet, a graphic scale, a north directional arrow, and the signed and dated engineer's seal;

2. The plans shall be clear and legible. They shall be drawn to a scale which will permit all necessary information to be plainly shown. The size of the plans generally should not be larger than thirty inches by forty-two inches (30" × 42"), with a preference for smaller sizes;

3. Locations of all test borings with date shall be shown on the plans;

4. Detail plans shall consist of plan views, elevation views, profiles, sections, and supplementary views which, together with the specifications and general layouts, provide the working information for the construction of the containment facilities; and

5. Include dimensions and relative elevations of manure storage structures, the location of components of the animal waste management system, alignment and size of piping, and profiles of piping with grades.

(D) Specifications. When specifically directed by the department, technical specifications shall accompany the plans.]

*[(4)]***(3)** Location.

(A) Protection from Flooding—Manure storage structures, confinement buildings, open lots, composting pads, and other manure storage areas in the production area shall be protected from inundation or damage due to the one hundred- (100-) year flood.

(B) The minimum setback distances from manure storage structures, manure storage areas, confinement buildings, open lots, or mortality composters *[are]* **shall be** as follows:

1. Ten feet (10') to public water supply pipelines;
2. Fifty feet (50') to property lines;
3. Fifty feet (50') to public roads;
4. One hundred feet (100') to wetlands, ponds, or lakes not used for human water supply;
5. One hundred feet (100') to gaining streams (classified or unclassified; perennial or intermittent);
6. Three hundred feet (300') to human water supply lakes or impoundments; and
7. Three hundred feet (300') to losing streams (classified or unclassified; perennial or intermittent) and sinkholes.

(C) Distances from earthen basins shall be measured from the outside edge of the top of the berm.

[(D) Separation distance from wells for manure storage structures or confinement buildings shall be in accordance with 10 CSR 23-3.010.

(E) An all-weather access road shall be provided from a public road. Sufficient room shall be provided at the site to permit turning vehicles around. In determining the type of roadway and method of construction, consideration shall be given to the types of vehicles and equipment necessary to maintain and operate the CAFO.]

*[(5)]***(4)** Manure Storage Structure Sizing.

(A) No Discharge Requirement. All manure storage structures shall *[comply with the design standards and effluent limitations of 10 CSR 20-6.300(4)]* **be designed as no-discharge**.

(B) Design Storage Period. **The minimum design storage period for manure storage structures shall be as follows:**

[1. The recommended design storage period is three hundred sixty-five (365) days.]

*[2.]***1.** The minimum design storage period for liquid manure, solid manure, and dry process waste to be land applied is one hundred eighty (180) days*[.]***;**

*[3.]***2. The minimum design storage period for** *[S]***s**olid manure and dry process waste to be sold or used as bedding *[shall have a minimum design storage period of]* **is** ninety (90) days *[unless justification is given for a shorter time period.]***; and**

*[4.]***3.** The minimum design storage period for waste treatment lagoons without an impermeable cover is three hundred sixty-five (365) days.

[5. Stormwater runoff from the production area will be diverted from lagoons as possible.]

(C) New Class I swine, veal, or poultry operations shall evaluate proposed uncovered manure storage structures in accordance with applicable federal regulation as set forth in 40 CFR 412.46(a)(1), November 20, 2008, which is hereby incorporated by reference, without any later amendments or additions, as published by the Office of the Federal Register, National Archives and Records Administration, Superintendent of Documents, Pittsburgh, PA 15250-7954.

(D) Sizing Manure Storage Structures.

1. The structure shall be designed to hold all inputs, between the upper and lower operating levels, anticipated during the design storage period. *[This typically includes:]*

[A. Animal manure;

B. Bedding material;

C. Wash water;

D. Flush water (excluding recycled flush water);

E. Cooling water for animals or from equipment; and

F. Runoff from pervious and impervious areas, due to average rainfall.]

2. Uncovered liquid storage*[s]* **structures** shall also include:

A. *[R-E]* **1-in-10 year rainfall minus evaporation** from the surface of the structure, held between the operating levels; and

B. Safety *[depth,]* **volume based on the 25 year, 24 hour storm event** above the upper operating level.

3. Tanks and pits shall also include six inches (6") of depth below the lower operating level for incomplete removal allowance *[unless there is adequate justification for not including this depth]*.

4. Earthen basins shall also include:

A. *[Freeboard of a]***A**t least one foot (1')*[.]* **of freeboard or** *[T]***t**wo feet (2') *[is required]* for structures that receive storm water from open lots larger than the surface area of the storage structure;

B.Two feet (2') of permanent liquid depth below the lower operating level. Anaerobic treatment volume greater than two feet (2') will satisfy this requirement;

C. Sludge accumulation volume; and

D. *[Anaerobic treatment lagoons shall include t]***T**reatment volume below the lower operating level **for anaerobic treatment lagoons**.

*[(6)]***(5)** Construction of Earthen basins.

(A) Geohydrologic Evaluation. A geohydrologic evaluation of the proposed earthen basin prepared by the Missouri Geological Survey shall be submitted **to the department**. *[To obtain a geohydrologic evaluation of the proposed site, the engineer shall submit the appropriate request form to the Missouri Geological Survey. All potential basin sites will receive two (2) ratings from the geohydrologic evaluation. The ratings will infer the relative geological limitations for designing and constructing a basin at the site in question.*

1. Collapse potential rating.] If the geohydrologic evaluation

gives a severe rating for collapse potential, an earthen basin *[is not acceptable. Concrete or steel structures or an alternate site should be considered]* **shall not be used**.

[2. Overall geologic limitations rating. Sites that have a severe rating for the overall geologic limitations but a slight or moderate collapse potential will be reviewed on a case-by-case basis. The department may require artificial liners or additional geotechnical exploration and design implementation and/or post-construction testing in these situations.]

(B) Detailed Soils Investigation.

[1.] A detailed soils investigation is required to substantiate feasibility*[.]* **and to determine** *[T]***t**he quantity and quality of soil materials on-site and from a borrow area *[must be identified and evaluated]* for use in the basin and/or liner.

[2. Exploration shall be sufficient to identify and define the quantity and quality of the soil material. The use of test pits, split spoon (barrel), or thin-walled tube sampling or a combination of these techniques may be used depending on the total area of investigation and the depth to which exploration is needed.] The following information, in whole or in part, is required:

A. Atterburg limits;

B. Standard proctor density (moisture/density relationships);

C. Coefficient of permeability (undisturbed and remolded);

D. Depth to bedrock;

E. Particle size analysis; and

F. Depth to *[seasonal high]* groundwater table.

[3. Information gathered from the investigation shall be presented on a map drawn to scale. Slope, location, and other surface features should also be included. The soil profile should be shown of the representative soil material. Copies of original boring and other soil test logs shall also be included. An interpretation of the collected data shall be incorporated into the report. Any site constraints and how they will be dealt with should be discussed.]

(C) Shape and Location.

1. *[Shape of cells.]* The shape of all cells *[should]* **shall** be such that there are no narrow or elongated portions*[. Round, square, or rectangular cells (length not exceeding three (3) times the width) are recommended. No]* **or** islands, peninsulas, or coves *[shall be permitted]*.

2. *[Constant elevation of floor.]* The floor of the structure shall be a consistent elevation*[.]* **with** *[F]***f**inished elevations *[shall]* not be more than three inches (3") above or below the average elevation of the floor.

3. *[Distance to groundwater and bedrock.]* The floor of the basin shall be at least four feet (4') above the *[high]* **ground**water table or the water table as modified by subsurface drainage*[. In addition, the floor shall be]* **and** at least two feet (2') above bedrock. *[For perched water tables, a curtain drain with a positive outlet may be installed around the structure.]*

(D) *[Slopes. Inner and o]***O**uter berm slopes shall not be steeper than three to one (3:1), horizontal to vertical*[.]* **and** *[I]***i**nner slopes *[shall]* not be flatter than four to one (4:1) **or steeper than 3:1 for uncovered lagoons or 2.5:1 for covered lagoons**. *[Consideration may be given to steeper inner slopes provided special attention is given to stabilizing the slope with rip-rap, concrete, or other rigid materials. These stabilization methods shall be specified. The flatness of the outer slope is of no concern provided surface water can be diverted around the lagoon. Long outer slopes should be flatter than three to one (3:1) to assist in safe mowing of vegetation.]*

(E) Berm Construction and Width. **Construction specifications shall include the following:**

1. **Compact** *[S]***s**oil used in constructing the basin floor (not including clay liner) and berm cores *[shall be relatively incompressible, tight, and compacted]* **to** between two percent (2%) below and four percent (4%) above the optimum water content and *[compacted]* to at least ninety percent (90%) standard proctor density*[.]***;**

2. *[Compaction of]* **Use** lifts for berm construction *[shall]* not exceed**ing** twelve inches (12")*[.]*

[3.] **with a** *[M]***m**aximum rock size *[should]* not exceed**ing** one-half (1/2) *[of]* the thickness of the compacted lift*[.]***; and**

*[4.]***3.** *[The minimum]* **Construct the** top **width** of **the** berm *[width shall be]* **a minimum of** eight feet (8')*[. F]***f**or fill heights from fifteen to twenty feet (15'–20'), **use minimum** top widths *[shall be]* **of** ten feet (10')*[;]* **and** for fill heights from twenty to twenty-five feet (20'–25'), **use minimum** top widths *[shall be]* **of** twelve feet (12'). *[Exceptions to minimum top widths can be made with documentation from a slope stability analysis.]*

(F) Emergency Spillway. To prevent overtopping and cutting of berms, an emergency overflow shall be provided*[. The spillway shall]* **that**—

[1. Be in the location with the minimum amount of constructed earthen fill;

2. Provide passage of liquid at a safe velocity to a point outside of the berm(s);]

*[3.]***1.** *[Have]* **Has** a minimum bottom width of ten feet (10') and a minimum depth of one foot (1'); and

*[4.]***2.** *[Be]* **Is** compacted and vegetated or otherwise constructed to prevent erosion due to possible flow.

(G) Compacted Clay Liner. *[The following criteria are for design and construction of soil liners. Engineering reports, plans, and specifications should address these criteria.]*

[1. Soils information. The soils used for construction of an earthen basin liner should meet the following minimum specifications:

A. Be classified under the Unified Soil Classification System (ASTM D2487) as CL, CH, GC, or SC;

B. Allow more than fifty percent (50%) passage through a Number 200 sieve;

C. Have a liquid limit equal to or greater than thirty (30);

D. Have a plasticity index equal to or greater than twenty (20); and

E. Have a coefficient of permeability equal to or less than 1×10^{-7} *centimeters per second (cm/sec) when compacted to ninety percent (90%) of standard proctor density with the moisture content between two percent (2%) below and four percent (4%) above the optimum moisture content.]*

*[2.]***1.** Liner construction. **Compacted clay liners shall be constructed to—**

A. *[Construction shall include scarification]* **Be scarified** and *[compaction of base material]* **compacted to** between two percent (2%) below and four percent (4%) above the optimum water content and *[compacted]* to at least ninety percent (90%) standard proctor density.

B. *[Compaction of]* **Be raised in** lifts *[shall]* not exceed**ing** six inches (6")*[.]* **with a** *[M]***m**aximum rock size *[should]* not exceed**ing** one-half (1/2) *[of]* the thickness of the compacted lift.

C. *[The completed seal shall b]***B**e maintained at or above the optimum water content until the basin is prefilled with water *[in accordance with this section of the rule]*.

D. *[Fill around pipes installed through embankments shall be compacted to prevent seepage.]* **Have a minimum thickness of twelve inches (12").**

*[3.]***2.** Permeability. All earthen basins shall be sealed so that seepage loss through the seal is minimized*[. The basin seal shall]* **and to meet the following specifications:**

A. *[c]***C**over the floor and extend up the inner slope to where the side slope intersects with the top of the berm.

*[A.]***B.** *[The]* **Have a** design permeability of the basin seal *[shall]* not exceed**ing** *[five hundred (500) gallons per acre per day in areas where potable groundwater might become contaminated or when the wastewater contains industrial contributions of concern. Design seepage rates up to three*

thousand five hundred (3,500) gallons per acre per day may be considered in other areas where potable groundwater contamination is not a concern, provided that the cells will maintain adequate water levels to provide treatment and avoid nuisance conditions] **1.0 x 10^{-7} centimeter per second (cm/sec)**.

[B. Liner thickness. The minimum thickness of the liner is twelve inches (12").] For soils which have a coefficient of permeability greater than 1**.0** × 10^{-7} *[centimeter per second]* (cm/sec), unusual depth, or potable ground water contamination potential, liner thickness of more than twelve inches (12") may be required. The following equation shall be used to determine minimum seal thickness:

$$t = (H \times K) / 5.4 \times 10^{-7} \text{cm/sec}$$

where
K = permeability coefficient of the soil in question;
H = head (maximum water level depth) of water in the basin; and
t = thickness of the soil seal.
[Units for H and t may be English (feet) or metric (meters); however, they must be the same.

4. Soil additives. Bentonite, soda ash, or other sealing aids may be used to achieve an adequate seal in systems using soil. The design shall include information on the type of soil additive and the method of application.

(H) Prefilling. The basin shall be prefilled in order to protect the liner, prevent weed growth, reduce odor, allow measurement of percolation losses, and maintain moisture content of the seal. However, the berms must be completely prepared before the introduction of water. If the clay liner is allowed to dry, the liner must be scarified and recompacted as described in this section of the rule.]

*[(I)]***(H)** Protection of Berms.

[1. Livestock, burrowing animals, and woody vegetation must be excluded from basins to protect the integrity of the berms and liners.

2. The berms, diversion ditches, and terraces shall be seeded and a good vegetative cover established to minimize erosion and aid in weed control. The inner berms should be seeded down to the upper operating level of the structure. Where the structure is not anticipated to reach its upper operating level during the first growing season, consideration should be given to further seeding on the berm slope. Long rooted grasses shall not be used for seeding of berms. Fertilization needs, mulching, and watering must be considered for all basins to ensure that a good growth of grass occurs rapidly and is sustained. Specifications shall detail specific amounts and variety of seeds to be used, mulching, and fertilizer requirements as appropriate and the proper time period for application to be reasonably assured that vegetative cover will be established.]

[3.] Rip-rap or some other acceptable method of erosion control is required as a minimum around all piping entrances and exits*[.]***,** *[F]***f**or aerated cell(s), *[the design should ensure erosion protection]* on the slopes and floor in the areas where turbulence will occur*[.]***, and**

*[4. F]***f**or **protection from wave action for** basins with a surface area greater than five (5) acres*[, consideration shall be given to providing embankment protection from wave action]*.

*[(J)]***(I) If** *[A]***a**lternative *[L]***l**iners. *[Seals consisting of reinforced concrete, soil cement, or synthetic liners may be]* **are** used**,** *[provided the]* permeability, durability, and integrity of the proposed materials *[can be]* **must be** satisfactorily demonstrated for anticipated conditions.

[(K) Percolation Losses. Measurement of percolation losses, when required, shall consider flow into and out of the lagoon, rainfall and evaporation, and changes in water level. Measured percolation losses in excess of one-sixteenth inch (1/16") per day will be considered excessive. The barrel test as described in 10 CSR 20-8.020(16) is an acceptable water balance study. Other tests will require department approval.]

*[(L)]***(J)** Depth Gauges. A permanent depth measurement gauge or marker shall be installed and maintained in the basin *[and shall be]* **that is** easily readable at one-foot (1') *[increments]* or smaller*[. It shall]* **increments and** clearly display**ed** *[the]* lower**,** *[and]* upper**,** *[operating]* **and emergency spillway** levels *[and the spillway elevation. The gauge shall be placed in a suitable location where it is easily accessible during routine operations]*.

[(M) Sludge Removal. Sludge levels shall be maintained so as to not reduce the approved storage volume of the basin.

(N) Protection of clay liner. The minimum liquid depth at maximum drawdown shall be two feet (2').]

*[(O)]***(K)** Piping. *[Piping through the lagoon berm shall be located at a point of minimum fill, preferably on cut slope,]* **Fill around pipes installed through embankments shall be compacted to prevent seepage** and **pressurized piping** must be valved. Valves are not required on gravity piping into the lagoon.

*[(P)]***(L)** Safety. Consideration *[should]* **shall** be given for safety in using open storage structures including the use of prevention and recovery components.

*[(Q)]***(M)** Operation and Maintenance. An operation and maintenance plan is required addressing the major components of the animal waste management system.

*[(7)]***(6)** Construction of Tanks and Pits. C**onstruction of tanks and pits shall meet the following requirements:**

(A) Soils and Foundation. A thorough site investigation shall be made to determine the physical characteristics and suitability of the soil and foundation for the fabricated storage structure. **Position** *[T]***t**he floor of the below-ground storage tanks *[shall be]* two feet (2') above the groundwater table *[unless curtain drains or interception drains are installed around the perimeter of the structure to permanently lower the water table. The drain shall be at an elevation of at least one foot (1') below the floor to permanently lower the water table. A sump or a positive outlet for the drain shall be provided.]***;**

(B) *[Depth Allowance for Agitation and Ventilation. An allowance of]* **Allow** one foot (1') *[should be provided]* **of depth** at the top of covered structures for agitation and/or ventilation *[requirements.]***;**

(C) *[Depth Gauges. Uncovered tanks and pits shall i]***I**nclude a permanent depth measurement gauge or marker that is easily readable at one-foot (1') *[increments]* or smaller*[.]* **increments for uncovered tanks and pits;**

(D) *[Footing Drains/Perimeter Tiling.]* **Use** *[P]***p**erimeter tiling and granular backfill *[are required]* for below-ground pits *[unless justification is given that they are not needed. Tiles should be located below the base of the outside of the footing. At least two feet (2') of granular drain material, such as pea gravel or three-quarter inch (3/4") crushed rock shall be placed around the tile. A positive outlet or sump for the drain shall be provided.]***;**

(E) **Locate** *[T]***t**ank and pit footings *[are to be located]* at or below the maximum frost depth *[unless adequate justification is given that it is not needed. A compacted foundation of frost-free material such as drained granular material, extending to below frost depth, may be used as an alternate to extending the structural footing.]***;**

(F) **Design** *[C]***c**oncrete and steel features *[shall be designed]* according to published guidelines. *[These guidelines must be referenced in the application packet.]***; and**

(G) *[Watertight Requirement.]* **Design and construct** *[T]***t**anks and pits *[must be designed, constructed, and maintained]* to be watertight.

*[(8)]***(7)** Construction of Solid Manure Components. *[This section covers the construction of]* **The following requirements shall be met when constructing** poultry buildings, open lots, stacking pads, stacksheds, and other similar structures*[.]***:**

(A) **Divert** *[S]***s**urface water *[shall be diverted around or]* away from animal confinement areas and buildings*[.]***;**

(B) Floors and Pads. **Construct** *[T]***t**he base of covered and uncovered lots, poultry buildings, and other solid manure storage areas *[can be made]* of concrete or other rigid, essentially watertight materials or from a firm, compacted, earthen base *[that meets the following criteria:]* **of Unified Soil Classification System (USCS) class CH, MH, CL, GC, or SC soils**

[1. The base can utilize existing consolidated soils if there is one (1) continuous foot of soil classified as class CH, MH, CL, GC, or SC in the Unified Soil Classification System (USCS) within four feet (4') of the proposed earthen floor;

2. The finished earthen floor shall be] a minimum of two feet (2') above the groundwater table *[as modified by subsurface drainage;]*

[3. The finished earthen floor shall be] **and be** at least two feet (2') above bedrock;

[4. The compacted earthen base shall be constructed from soils classified as Unified Soil Classification System (USCS) class CH, MH, CL, GC, or SC;

5. Inplace soils, amended soils, or borrow soils shall meet permeability group III or IV as defined by the United States Department of Agriculture's (USDA's) National Engineering Handbook, Agricultural Waste Management Field Handbook or other soil permeability description; and

6. The use of one (1) five-foot- (5'-) deep test pit, near the center of each proposed set of four (4) buildings, or each acre, will generally be sufficient to satisfy the intent of this section.]

(C) Uncovered solids storage areas must also meet the following:

1. Have an overall slope between two percent (2%) and four percent (4%) for unpaved lots;

2. Be maintained in a way that prevents ponding; and

3. Have a runoff collection structure that meets the requirements of this rule.

[(D) Roofed areas of five thousand (5,000) square feet or less, that are used for mortality composting or to store solid manure, are exempt from the requirements of this section.]

[(9) Temporary Stockpiling of Dry Process Waste.

(A) Temporary stockpiling of uncovered dry process waste within the production area, without runoff collection, is not allowed.

(B) Temporary stockpiling within the land applications areas shall be in accordance with the following:

1. Location.

A. Any temporary stockpiles need to be placed to prevent storm water from draining into or through the pile. If storm water does drain through the pile, a one-foot (1') berm will be required on the up-slope side of the pile.

B. No location shall be used for stockpiling for more than two (2) weeks, unless the pile is covered.

C. Separation distances shall be maintained between the stockpile and other features as follows:

(I) Three hundred feet (300') from any losing stream, well, sinkhole, water supply (for human consumption) reservoir, nonowned dwelling or residence, public building, or public use area;

(II) One hundred feet (100') from intermittent and permanent flowing streams; and

(III) Fifty feet (50') from public roads and property lines.

D. Stockpiles cannot be placed on slopes steeper than six percent (6%);

2. Size. No temporary storage site can be larger than two (2) acres;

3. Formation. All piles shall be placed so as to minimize forming pockets, hollows, or mini-dams that would collect and hold water. One (1) pile with an angle of repose so that it forms a crust and will tend to shed water off the pile will be the desirable design. If there are two (2) or more stockpiles, they should be placed far enough apart that they do not trap and hold water;

4. In no case shall runoff from a stockpile cause a violation of water quality standards.]

*[(10)]***(8)** Design and Construction of Pipelines, Pump Stations, and Land Application Systems.

(A) General. Design of pipelines shall be *[in accordance with sound engineering principles considering the manure properties, management operations, exposure, etc.]* **based on the following requirements:**

1. *[The minimum pipeline capacity from storage/treatment facilities to utilization areas shall e]***E**nsure the storage/treatment facilities can be emptied within the time limits stated in the nutrient management plan*[.]***;**

2. *[All pipes shall be designed to c]***C**onvey the required flow without plugging, based on the type of material and total solids content*[.]***;**

3. *[All pressure pipelines shall be i]***I**nstall*[ed]* at a depth sufficient to protect against freezing*[.]***;**

4. *[Pipelines shall be i]***I**nstall*[ed]* with appropriate connection devices to prevent contamination of private or public water supply distribution systems and groundwater*[.]***;**

5. **Size** *[P]***p**umps *[shall be sized]* to transfer material at the required system head and volume*[.]***;** *[Type of pump shall be based on the consistency of the material and the type of solids. Requirements for pump installations shall be based on manufacturer's recommendations.]*

6. *[The top of all pipelines entering or crossing streams shall be at sufficient depth below the natural floor of the stream bed to protect the pipe. The top of the pipe should be]* **Install** a minimum of three feet (3') below the natural stream floor*[. Pipelines crossing streams should be designed to cross the stream]* **and** as nearly perpendicular to the stream flow as possible*[. Aerial pipeline crossing of streams shall be in accordance with 10 CSR 20-8.120(9).]***;**

7. **Encase when** *[B]***b**uried *[pipeline crossings]* under **public** roads *[shall be properly cased.]***; and**

8. **Separate from** *[P]***p**otable water lines *[and buried manure pipeline separation. There shall be no permanent physical connection between a potable water supply and buried manure pipeline or appurtenances thereto which will permit the passage of wastewater or contaminated water into the potable water supply. Whenever possible, buried manure pipelines and pump stations should be located] at least ten feet (10') horizontally [from any existing or proposed water line. Should local conditions prevent a lateral separation of ten feet (10'), a manure pipeline may be laid closer than ten feet (10') if it is in a separate trench or if it is in the same trench with the waterline located at one (1) side on a bench of undisturbed earth. In either case, the elevation of the top of the manure pipeline must be]* **and** at least eighteen inches (18") below the base of the water line.

9. Aerial pipeline crossings of streams shall:

A. Provide support for all joints in pipes utilized in the crossing;

B. Protect from the impact of flood waters and debris; and

C. Be constructed so that they will remain watertight and free from changes in alignment or grade.

(B) Gravity Pipelines. **Design of pipelines shall be based on the following requirements:**

1. *[The]* **Use a** minimum slope *[for a gravity pipe installation is]* **of** one percent (1%) for four inch (4") pipe, six-tenths percent (0.6%) for six inch (6") pipe, and four-tenths percent (0.4%) for eight inch (8") pipe*[.]***;**

2. **Design with** *[C]***c**lean-outs *[access shall be provided for gravity pipelines]* at a maximum interval of three hundred feet (300') *[unless an alternative design is approved. Gravity pipelines shall not have]* **and with maximum** horizontal curves *[or bends except minor deflections (less than]* **of** ten (10) degrees*[). in the]* **at** pipe joints *[unless special design considerations are used.]***; and**

3. **Design** *[G]***g**ravity discharge pipes used for emptying a storage/treatment structure *[shall have]* **with** a minimum of two (2) *[gates or]* valves in series*[, one (1) of which shall be manually operated]*.

(C) Force Mains and Pressure Pipes. *[To minimize settling of solids in the pipeline, d]***D**esign velocities shall be between three (3) and six (6) feet per second.

(D) Testing. Hydro-pressure tests shall be made only after the completion of backfilling operations *[and after the concrete thrust blocks have set for at least thirty-six (36) hours.]* **and**

[1. The duration of pressure tests shall be] **for** a minimum of one (1) hour *[unless otherwise directed by the engineer.]*

[2. The] **using a** minimum test pressure *[shall be]* **of** the maximum system operating pressure. *[All tests are to be conducted under the supervision of the engineer.]*

[3. The pipe line shall be slowly filled with water. The specified pressure measured at the lowest point of elevation shall be applied by means of a pump connected to the pipe in a manner satisfactory to the engineer.]

(E) Pump Stations.

1. Water supply protection. *[There shall be no physical interconnection between any potable water supply and a]* **Manure** pump station**s** *[or any of its components which under any conditions might cause contamination of a potable water supply unless otherwise approved by the Missouri Geological Survey. Manure pumping stations]* shall **not be connected to a potable water supply and shall** be located at least three hundred feet (300') from any potable water supply well.

2. Alarm systems. Alarm systems are required for pumping stations *[where a failure could cause an overflow. Alarm systems shall be]* **that are** activated in cases of power failure, pump failure, or any cause of high water in the wet well.

(F) Land Application Systems. *[The following shall be considered in the design of land application systems]* **Land application systems shall be designed with**:

1. *[Any s]***S**pray application equipment specified *[shall]* **that** minimize**s** the formation of aerosols;

2. The pumping system and distribution system *[shall be]* sized for the flow and operating pressure requirements of the distribution equipment and the application restrictions of the soils and topography;

3. Provisions *[shall be made]* for draining the pipes to prevent freezing, if pipes are located above the frost line;

4. A suitable structure *[shall be]* provided for either a portable pumping unit or a permanent pump installation*[.]***,** *[T]***t**he intake to the pumping system *[shall provide]* **providing** the capability for varying the withdrawal depth*[.]***,** *[T]***t**he intake elevation *[should be]* maintained twelve to twenty-four inches (12"–24") below the liquid elevation*[.]***,** *[T]***t**he intake *[shall be]* screened so as to minimize clogging of the sprinkler nozzle or distribution system orifices*[.]***, and,** *[F]***f**or use of a portable pump, a stable platform and flexible intake line with flotation device to control depth of intake *[will be acceptable]*;

5. Thrust blocking of pressure pipes *[shall be provided. For use of above-ground risers for sprinklers, a concrete pad and support bracing should be considered]*; and

6. **An** *[A]***a**utomatic pump or engine shut-offs in case of pressure drop*[, are required]*.

*[(11)]***(9)** General System Details.

(A) Mechanical Equipment. Mechanical equipment shall be used and installed in accordance with manufacturers' recommendations and specifications*[.]* **and** *[M]***m**ajor mechanical units *[should be]* installed under the supervision of the manufacturer's representative.

[(B) Construction Materials. Due consideration should be given to the use of construction materials which are resistant to the action of hydrogen sulfide and other corrosives frequently present in manure.

(C) Grading and Groundcover. Upon completion of construction, the ground shall be graded and reseeded to prevent erosion and the entrance of surface water into any storage structure or animal confinement area.]

*[(D)]***(B)** Potable Water Supply Protection. No piping or other connections shall exist in any part of the animal waste management system**,** which*[,]* under any conditions, might cause the contamination of a potable water supply.

[(12) Groundwater Monitoring. An approved groundwater monitoring program may be required around the perimeter of a manure storage site and/or land application areas to facilitate groundwater monitoring. The necessity of a groundwater monitoring program, which may include monitoring wells and/or lysimeters, will be determined by the Missouri Geological Survey on a case-by-case basis and will be based on potential to contaminate a drinking water aquifer due to soil permeability, bedrock, distance to aquifer, etc. Where the Missouri Geological Survey has deemed groundwater monitoring necessary, a geohydrological site characterization will be required prior to the design of the groundwater monitoring program.]

*[(13)]***(10)** Mortality Management.

[(A)] Class I operations shall not use burial as a permanent mortality management method to dispose of routine mortalities.

[(B) Operations shall first receive approval from the department before burying significant numbers of unexpected mortalities and shall conduct the burial in accordance with Missouri Department of Agriculture requirements. Rendering, composting, incineration, or landfilling, in accordance with Chapter 269, RSMo, shall be considered acceptable options and do not require prior approval.]

AUTHORITY: sections 640.710[, RSMo 2000,] and [section] 644.026, RSMo [Supp. 2014] ***2016****. Original rule filed July 14, 2011, effective April 30, 2012. Amended: Filed Jan. 26, 2016, effective Oct. 30, 2016. Amended: Filed June 15, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Department of Natural Resources, Division of Environmental Quality, Water Protection Program, John Rustige, PO Box 176, Jefferson City, MO 65102. Comments may be sent with name and address through email to john.rustige@dnr.mo.gov. Public comments must be received by August 23, 2018. The public hearing is scheduled for 10 AM, on August 15, 2018, at the Department of Natural Resources, Elm Street Conference Center, Bennett Springs Conference Room, 1730 East Elm Street, Jefferson City, Missouri 65101.

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

PROPOSED AMENDMENT

10 CSR 20-8.500 Design Requirements for Agrichemical Facilities. The Clean Water Commission is amending the purpose, deleting sections (1), (4), (13), (14), and (15), amending and renumbering sections (2), (3), (5)–(9).

PURPOSE: This amendment will retain and add minimum design standards for agrichemical facilities that are required to protect or improve public health, safety, and water quality.

PURPOSE: [The following criteria serve as a guide for the design, construction, and operation of primary, secondary, and operational containment structures at bulk agrichemical facilities.] ***This rule specifies the minimum standards for the design of agrichemical facilities. It does not address all aspects of design, and the design engineer may refer to other appropriate reference materials so long as these minimum standards set forth in this rule are met.***

PUBLISHER'S NOTE: The secretary of state has determined that the publication of the entire text of the material which is incorporated by reference as a portion of this rule would be unduly cumbersome or expensive. This material as incorporated by reference in this rule shall be maintained by the agency at its headquarters and shall be made available to the public for inspection and copying at no more than the actual cost of reproduction. This note applies only to the reference material. The entire text of the rule is printed here.

[(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 agency is concerned, unless justification is presented for deviation from the requirements. Other terms such as should, recommend, preferred and the like, indicate discretionary requirements on the part of the agency and deviations are subject to individual consideration.]

*[(2)]***(1)** *[General. A facility need only to comply with these rules when they come within the definition of an agrichemical facility. Any construction after the effective date of this rule shall be in compliance with all of these rules before the commencement of any operational activities or any storage or use of agrichemicals. Any existing agrichemical facility that has a discharge of agrichemicals or process generated wastewater is required to take immediate steps to implement the secondary and operational containment requirements contained in this rule in addition to any other remedy required. All new operations shall be designed to be no discharge.]* **Applicability. This rule applies to all new agrichemical facilities and to the construction of new secondary and operational containment of agrichemicals at existing facilities. All facilities to which this rule applies shall be designed as no-discharge systems.**

*[(3)]***(2)** Exceptions. *[The following exceptions shall apply to agrichemical facilities:]*

[(A) This rule shall not apply to agrichemical facilities storing or handling less than the regulated quantities of agrichemicals unless an on-site evaluation by the department determines that compliance with the regulations is necessary to protect the environment.

(B) Liquid fertilizer storage tanks that were in use prior to January 13, 1992, having a storage capacity greater than forty thousand (40,000) gallons shall be exempt from the requirement of installing a liner underneath the tank itself. Spill containment diking is required around these tanks. These facilities shall submit to the department for approval a program outlining the monitoring, tank testing, and record keeping that will be done at the facility to document that a release of agrichemicals from these tanks has not occurred either to surface or subsurface waters of the state.]

*[(C)]***(A)** The prohibition of storing bulk liquid fertilizer in a mobile container for more than thirty (30) days shall not apply to barges and rail cars used solely for transporting liquid fertilizer from chemical production facilities to retail or wholesale facilities.

*[(D)]***(B)** The prohibition of burying pipes used for transferring full strength agrichemicals shall not apply to piping used solely for the loading and unloading of liquid fertilizer from barges and rail cars. These pipes shall be pressure tested on a yearly basis to certify the integrity of the pipes. Records of the pressure testing shall be kept on file at the facility and made available to **Missouri Department of Natural Resources (**department**)** personnel upon request.

[(4) Deviations. The department may require a construction permit with a substantial deviation from these requirements as addressed in 10 CSR 20-6.010. Deviations from these rules may be approved by the department when engineering justification satisfactory to the department is provided. Justification must 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. Containment structures for agrichemical facilities that are not addressed or covered in this design guide are considered deviations. A written request for any deviation must include a certification that indicates compliance with all other design guide requirements.]

*[(5)]***(3)** Engineering Report. An engineering report is required for all facilities required **by 10 CSR 20-6.010** to submit an application for a construction permit *[and is recommended for all facilities]*. *[The engineering report assembles basic information, presents design criteria and assumptions, examines alternate projects with preliminary layouts and cost estimates, offers a conclusion with a proposed project for client consideration, and outlines official actions and procedures to implement the project. Engineering reports shall contain the following information and other pertinent information and may be combined with other engineering documentation:]*

[(A) Title of project, agrichemical facility name and address, name and address of firm preparing the report, seal and signature of the professional engineer in charge of project;

(B) Introduction. Reasons for the report and circumstances leading up to the report;

(C) Existing conditions at the agrichemical facility and proposed construction at the facility shall be discussed;

(D) Design criteria—

1. Design and sizing of secondary and operational containment structures should be discussed;

2. Process diagrams. A process configuration showing the interconnection of all pumps, piping, and storage tanks associated with the operation of the agrichemical facility should be shown;

(E) The process by which bulk chemicals are received, unloaded, and transferred within the facility should be discussed. The mixing, loading, and unloading of spreading or spraying equipment should be discussed. All cleaning of

chemical handling equipment, spraying or spreading vehicles, nurse vehicles, and containment areas should be discussed. Collection, storage and disposal of rinsates, process generated wastewaters, and collected precipitation should be discussed. Collection, treatment, and disposal of all domestic wastewater flows associated with the facility should be discussed;

(F) Method of operation, estimation of the number of cropping programs for which agrichemical services will be provided, sources of wastewater, proposed disposal or treatment practices, and the project recommended to client for construction shall be included; and

(G) Antidegradation must be implemented according to the procedures in 10 CSR 20-7.031(3)(D).]

*[(6)]***(4)** Primary Containment for Bulk **Liquid** Agrichemicals for new construction. Containers and appurtenances used as the primary containment in the storage and handling of bulk agrichemicals shall be constructed, installed, and maintained to prevent a discharge and shall be of materials and construction compatible with the specifications of the product stored*[.]* **with:**

(A) *[In the event of a discharge or accumulation of storm water in the secondary containment area storage containers subject to flotation shall be anchored or placed on a raised stand to prevent flotation of the container in the event of a discharge or accumulation of storm water in the secondary containment area. The anchoring devices used to secure the storage container as well as any support structure for the storage container shall not compromise the structural integrity of the containment area or the ability of the containment area to adequately contain liquids that have accumulated in the containment area.]* **Tank anchors or raised stands;**

(B) *[All containers and appurtenances shall be designed]* **For self-supporting tanks, the ability** to handle all operating stresses, *[taking into account]* hydrostatic head, pressure buildup from pumps and compressors and any other mechanical stresses to which the containers and appurtenances may be subject to in the foreseeable course of operation*[.]***;**

(C) **No** *[E]***x**ternal sight gauges *[shall not be]* used with bulk pesticide storage containers*[.]***;**

(D) *[External sight gauges may be used for bulk liquid fertilizer containers, but the gauge shall have a l]***L**ockable valves **for bulk liquid fertilizer containers** located between the sight gauge and the storage container *[so that if the sight gauge is damaged, the contents of the storage container will not leak out.]***;**

(E) *[The]* **A lockable** main discharge valve *[from the storage container shall be lockable.]***;**

(F) All appurtenances *[shall be]* protected against damage from operating personnel and moving vehicles*[. All appurtenances shall be]* **and** located within the secondary containment or operational containment area*[.]***;**

(G) **All** *[S]***s**torage **structures** *[of]* **for** bulk liquid pesticides or bulk liquid fertilizers *[in an underground storage tank as defined by 10 CSR 20-10.010 is prohibited. This prohibition does not apply to a water-tight catch basin used for the temporary collection of runoff or rinsate from transfer and loading areas.]* **located above ground; and**

(H) *[All filling of containers acting as the primary containment vessel shall be done in a manner that the individual handling the transfer hose has both feet on the floor of the containment structure or a working platform adjacent to the container. The transfer hose used in the filling process shall be securely connected to the storage container by appropriate plumbing connections.]* **Secure transfer hose connections.**

*[(7)]***(5)** Secondary Containment for Bulk **Liquid** Agrichemicals for new construction. Secondary containment for nonmobile bulk **liquid** pesticides and nonmobile bulk **liquid** fertilizers shall be designed to contain any spilled product to prevent a discharge*[.]* **with—**

(A) *[Nonmobile Bulk Liquid Pesticides.]* **Containment structures sized according to 40 CFR Part 165.85(c)(1) & (2) as published October 29, 2008. This standard is hereby incorporated by reference into this rule as published by the EPA Docket Center, EPA West 1301 Constitution Avenue NW., Washington, DC 20004. This rule does not incorporate any subsequent amendments or additions;**

[1. The volume of the secondary containment area when not protected from precipitation shall have a minimum volume of one hundred twenty-five percent (125%) of the volume of the largest storage container located within the containment area plus the space occupied by any other tanks located within the containment area.

2. The volume of the secondary containment when protected from precipitation shall have a minimum volume of one hundred ten percent (110%) of the volume of the largest storage container located within the containment area plus the space occupied by any other tanks located within the containment area;]

[3. The secondary containment structure shall not have a]

(B) No discharge outlet or gravity drain through the wall or floor of the containment structure*[.]***;**

*[4.]***(C)** The walls and floors *[of the secondary containment structure for nonmobile bulk liquid pesticide containers shall be]* constructed of *[suitable]* material that is compatible with the specifications of the product being stored*[. The walls and floors shall be]***;** resistant to penetration by moisture and agrichemicals*[. The walls and floors shall be]***; and** designed to support the gravity load of the storage containers and any hydrostatic loads that would result from a massive spill within the containment structure*[.]***;**

[5. For concrete floors and walls,]

(D) *[e]***E**xpansion joints *[shall be]* spaced to prevent cracks from forming*[. The joints shall be]***;** sealed with a material resistant to agrichemicals*[.]***; and with** *[W]***w**ater stops *[shall be]* installed between the containment walls and floor*[.]***;**

*[6.]***(E)** A collection sump *[may be included in the secondary containment area. The structure]***, if needed,** shall not be more than two feet (2') deep or *[hold more than one hundred fifty (150) gallons of liquid. The sump shall be]* **larger than 20 cubic feet;** constructed of materials that resist penetration by moisture and agrichemicals*[. The]***; with a sealed** connection point between the containment area floor**;** and *[the sump shall be sealed to prevent leakage of liquids from the containment area. The secondary containment structure floor should be sloped to the collection sump to allow for removal of liquids accumulating in the containment area.]* **at a low point in the containment area to allow for removal of accumulated liquids;**

*[7.]***(F)** No piping *[shall be]* installed through the walls or floor *[of the secondary containment structure]* except for **through common,** interconnecting *[more than one (1) bulk liquid pesticide containment structure to another having a common wall.]* **containment walls and** *[A]***a**ll piping entering and leaving the secondary containment structure shall go up and over the containment walls*[.]***;**

*[8.]***(G) No buried transfer** *[P]***p**iping *[used for transferring full strength agrichemicals, process wastewaters, and rinsates shall not be buried underground.]***;**

*[9.]***(H)** *[Secondary containment for]* **Separation of** bulk liquid pesticides and bulk liquid fertilizers *[shall be separated at a minimum]* with a common wall*[. There shall be]* **and with** no *[interconnection of]* **interconnecting** piping *[through a common wall between a bulk liquid pesticide secondary containment structure and a bulk liquid fertilizer secondary containment structure.]***; and**

*[10.]***(I) All** *[A]***a**uxiliary tanks for storage of rinsate or precipitation collected in the secondary or operational containment area *[shall be]* located within a secondary containment structure.

[(B) Nonmobile Bulk Liquid Fertilizer.

1. The volume of the secondary containment area when not protected from precipitation shall have a minimum volume of one hundred twenty-five percent (125%) of the volume of the largest storage container located within the containment area plus the space occupied by any other tanks located within the containment area.

2. The volume of secondary containment area when protected from precipitation shall have a minimum volume of one hundred ten percent (110%) of the volume of the largest storage container located within the containment area plus the space occupied by any other tanks located within the containment area.

3. The secondary containment structure shall not have a discharge outlet or gravity drain through the wall or floor of the containment structure.

4. The walls and floors of the secondary containment area for nonmobile bulk liquid fertilizer containers shall be constructed of suitable material compatible with the specifications of the product being stored. The walls and floors shall be designed to support the gravity load of the storage tanks and the hydrostatic loads of a massive spill within the containment structure.

A. Floors and walls may be covered by a synthetic liner installed according to the manufacturer's written directions and repaired and maintained according to the manufacturer's recommendations. The liner shall have an in-place permeability of 1 × 10^{-7} cm/sec. or less. The liner material shall be compatible with the chemicals being stored and the liner shall be resistant to punctures, abrasion, cracking, and weathering.]

(J) Earthen structures used for secondary containment shall be designed as follows:

*[B.]***1.** *[Floors and walls may b]***B**e constructed *[of suitable]* **with a compacted** soil *[so that the finished compacted]* **liner or synthetic linerwith a** permeability rate of *[the floor and berm walls shall be]* 1×10^{-7} cm/sec. or less.

[C. Soils used in the construction of the walls and floors of the secondary containment structure may be treated with bentonite clay so that the finished compacted permeability rate of the floor and berm walls shall be 1 × 10^{-7} cm/sec. or less.]

*[D.]***2.** *[The inner and outer slope and floors of an earthen secondary containment structure should b]***B**e protected against erosion *[(for example, top soil placed over the seal with sodding or seeding, a compacted layer of washed river gravel or riprap material of a suitable size). If the inner side slope and floors of the containment structure are seeded or sodded, a six inch (6")-layer of top soil shall be placed over the floor and side slope prior to seeding or sodding to prevent the roots of the cover material from penetrating the earthen liner. Long rooted grasses shall not be used for seeding the side slopes and floors. If gravel or riprap is used inside the containment structure, the depth of the gravel or riprap layer shall be at least six inches (6") in depth.]* **with** *[S]***s**ide slopes *[of the earthen containment structure should]* no*[t be]* steeper than *[a]* three to one (3:1) *[ratio of horizontal to vertical. The]* **and with a** top width *[of earthen walls should]* no*[t be]* less than two and one-half feet (2 1/2').

[E. Floors and walls may be constructed of concrete or steel provided the material is protected from corrosion or deterioration from the materials being stored.

5. For concrete floors and walls, expansion joints shall be spaced to prevent cracks from forming. The joints shall be sealed with a material resistant to agrichemicals. water stops shall be installed between the containment walls and floor.

6. A collection sump may be included in the secondary containment area. The structure shall not be more than two feet (2') deep or hold more than one hundred fifty (150) gallons of liquid. The sump shall be constructed of materials that resist penetration by moisture and agrichemicals. The connection point between the containment area floor; and the sump shall be sealed to prevent leakage of liquids from the containment area. The secondary containment structure floor should be sloped to the collection sump to allow for removal of liquids accumulating in the containment area.

7. No piping shall be installed through the walls or floor of the secondary containment structure except for interconnecting more than one (1) bulk liquid fertilizer containment structure to another and piping exempted in subsection (3)(D). All piping entering and leaving the secondary containment structure shall go up and over the containment walls.

8. Piping used for transferring full strength agrichemicals, process wastewaters and rinsates shall not be buried.

9. Auxiliary tanks to hold rinsate or precipitation collected in the secondary or operational containment area shall be located within a secondary containment area.]

*[(C)]***(6)** Nonmobile *[B]***b**ulk *[D]***d**ry *[F]***f**ertilizer *[S]***s**torage*[.]* **shall be designed to—**

*[1.]***(A)** *[Dry fertilizer shall b]***B**e stored inside a sound structure to prevent contact with precipitation*[.]* **with** *[A]***a**ll surface water runoff *[shall be]* diverted away from the storage structure*[.]***;**

*[2.]***(B) Allow for** *[A]***a**ll unloading, loading, mixing, and handling of dry bulk fertilizers *[should]* **to** be done on an operational containment area*[.]***;**

*[3.]***(C)** *[Pesticide impregnation of dry fertilizer shall take place within]* **Have** an **adequately sized** operational containment area *[adequate in size]* to hold the volume of pesticides used and impregnation equipment*[.]***;**

*[4.]***(D) Allow for** *[D]***d**aily cleanup of the dry fertilizer loading, unloading, mixing, and handling areas *[shall take place.]***;**

[5. Whenever feasible, dry fertilizer spreading equipment should be cleaned in the field to minimize containment and disposal requirements at the operational containment area.]

*[6.]***(E)** *[The floors of the bulk dry fertilizer storage area shall be paved with concrete or other approved materials that will p]***P**revent the downward movement of fertilizer materials and moisture through the floor*[. For concrete floors and walls,]* **with** expansion joints *[shall be placed on a close enough spacing]* **spaced** to prevent cracks from forming*[. The expansion joints shall be]* **and** sealed with a material resistant to agrichemicals*[. Cracks that occur in the floors and walls shall be sealed to prevent the downward or lateral movement of fertilizer materials and moisture.]***; and**

*[7.]***(F) Have** *[A]***a** mixing and loading pad *[shall be]* constructed under any exterior transfer area of a conveyance system.

*[(D)]***(7)** Nonmobile *[B]***b**ulk *[D]***d**ry *[P]***p**esticide *[S]***s**torage*[.]* **shall be designed to—**

*[1.]***(A)** *[Dry pesticides shall b]***B**e stored inside a sound structure to prevent contact with precipitation*[.]* **and with** *[A]***a**ll surface water runoff *[shall be]* diverted away from the storage structure*[.]***;**

*[2.]***(B) Allow for** *[A]***a**ll loading, mixing, and handling of bulk dry pesticides *[should]* **to** be done on an operational containment area*[.]***;**

*[3.]***(C) Allow for** *[D]***d**aily cleanup of the bulk dry pesticide loading, unloading, mixing, and handling areas *[shall take place.]***;**

[4. Whenever feasible, bulk dry pesticide spreading equipment should be cleaned in the field to minimize containment and disposal requirements at the operational containment area.]

*[5.]***(D)** *[The floors of the bulk dry pesticide storage area shall be paved with concrete or other approved materials that will p]***P**revent the downward movement of pesticides *[materials]* and moisture through the floor*[. For concrete floors and*

walls,] **with** expansion joints *[shall be placed on a close enough spacing]* **spaced** to prevent cracks from forming*[. The expansion joints shall be]* **and** sealed with a material resistant to agrichemicals*[. Cracks that occur in the floors and walls shall be sealed to prevent the downward or lateral movement of pesticide materials and moisture.]*; **and**

*[6.]***(E) Have** *[A]***a** mixing and loading pad *[shall be constructed]* under any exterior transfer area of a conveyance system.

(8) Operational *[C]***c**ontainment for bulk liquid pesticides and bulk liquid fertilizers for new construction*[. The operational containment area for bulk liquid pesticides and bulk liquid fertilizers]* shall be designed to *[contain any product discharged or collected precipitation for the amount of time required for proper cleanup and recovery.]*:

[(A) Wherever feasible, application equipment should be rinsed in the field to minimize containment and disposal requirements at the operational containment area.]

*[(B)]***(A)** *[Precipitation should be diverted]* **Divert runoff** away from the operational containment area*[.]*;

(B) Contain any spilled product and any collected precipitation for the amount of time needed for proper cleanup and recovery;

(C) *[The]* **Have a minimum** volume of *[the operational containment area shall be]* one hundred ten percent (110%) of the volume of the largest vehicle that will be loaded or unloaded in the operational containment area. This volume may be achieved through the use of above ground tank(s) located within the secondary containment area connected to an automatic sump pump in the operational containment area*[.]*;

(D) **Have** *[A]***a** sediment trap and sump *[may be designed in the operational containment area. The structure shall]***, if needed,** not *[be]* more than two feet (2') deep or *[hold more than one hundred fifty (150) gallons of liquid. The sump shall be]* **larger than 20 cubic feet and** constructed of materials that resist penetration by moisture and agrichemicals*[. The]* **with a sealed** connection point between the operational containment area floor and the sump *[shall be sealed]* to prevent leakage of liquids from the containment area*[.]*;

(E) *[The operational containment area shall e]***E**xtend beneath any pump, appurtenance, or plumbing connection not located within the secondary containment area and that is used to transfer liquid fertilizer or pesticide*[.]*; **and**

(F) **Allow for** *[B]***b**ulk repackaging containment of agrichemicals *[may be satisfied by the operational containment area]*.

(9) Operational Containment Area for bulk dry pesticides and bulk dry fertilizers for new construction*[. The operational containment area for bulk dry pesticides and bulk dry fertilizers]* shall be sized *[and designed]* to *[contain any spillage or leakage of dry materials that occurs from the loading and unloading of hauling or spreading equipment and from the mixing and blending equipment or precipitation that comes in contact with the operational containment area for the amount of time required for proper cleanup and recovery.]*—

[(A) Wherever feasible, spreading equipment should be cleaned in the field to minimize containment and disposal requirements at the operational containment area.]

*[(B)]***(A)** *[Precipitation should be diverted]* **Divert runoff** away from the operational containment area*[.]*;

(B) Contain any spillage of dry materials that occurs from loading, unloading, or hauling; from spreading equipment; and from mixing and blending equipment. Operational containment areas must also contain precipitation that comes in contact with the operational containment area for the amount of time needed for proper cleanup and recovery;

(C) *[Individual catchment basins or portable pans/containers may be used to satisfy the requirement for operational containment. The individual basins or portable containers shall be placed to c]***C**atch or recover spillage and leakage from transfer connections and conveyors*[.]* **with the use of individual catchment basins or portable pans/containers; and**

(D) *[For unloading dry pesticides and dry fertilizers from rail cars, a catchment basin or concrete pad that can e]***E**ffectively contain the dry fertilizer or pesticide that may be *[discharged]* **spilled** during the unloading process *[shall be used]* **from rail cars**.

(12) Operation and Management of Agrichemical Facilities. *[Bulk agrichemicals shall be stored, handled, transported, loaded, and unloaded in a manner to prevent discharge that may result in unreasonable adverse effects to humans or the environment. All applicable hazards of the pesticide shall be considered in the handling and loading practices to ensure proper protection of facility personnel and the environment.]*

[(A) Spills occurring within the secondary containment and operational containment area shall be recovered promptly. All waste and wastewater associated with the recovery process shall be disposed of in accordance with the permit for the facility and the product labeling.

(B) Precipitation collected in the secondary containment and operational containment area shall be disposed of in accordance with the permit for the facility.

(C)] Field application of rinsate and collected precipitation is acceptable and recommended.

[(D) Appropriate security measures at the agrichemical facility, such as lighting or security fencing to discourage ready access by unauthorized personnel to the facility when unattended, are encouraged.

(E) Agrichemical rinsates or collected precipitation shall not be disposed through storm sewers, sanitary sewer systems, or waters of the state without an approved permit.

(F) Prior to repackaging or refilling mobile containers, the containers must be thoroughly cleaned and inspected except when a dedicated pesticide container is refilled and the tamper indicator is otherwise intact.

(13) Emergency and Discharge Response Plan. The operator of a bulk agrichemical facility shall prepare a written emergency and discharge response plan for the storage facility. The plan shall comply with Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requirements.

(14) Plans.

(A) General. All plans for primary, secondary, and operational containment structures for new construction at agrichemical facilities shall bear the name of the agrichemical facility and shall show the scale in feet, a graphic scale, the north point, date, and the name of the engineer, certificate number and imprint of his/her registration seal. The plans shall be clear and legible. They shall be drawn to a scale which will permit all necessary information to be plainly shown. The size of the plans generally should not be larger than thirty inches by forty-two inches (30" × 42") (76 cm × 107 cm). Datum used should be indicated. Locations and logs of test borings and when made shall be shown on the plans. Detail plans shall consist of 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 containment facilities. Plans shall include dimensions and relative elevations of structures, the location and outline form of equipment, storage tanks, location and size of piping, and ground elevations.

(B) Plans for new construction.

1. Location plan. A plan shall show the location of the agrichemical facility in relation to streams, roads, water supply systems, property lines, and any dwellings or structures not owned by the agrichemical facility in the immediate area

of the facility.

2. General layout. Layouts of the proposed agrichemical containment facility shall show topography of the site, size, and location of storage tanks and containment structures, schematic flow diagram showing the flow through the various agrichemical mixing and handling systems, piping including any arrangements for bypassing individual systems, agrichemical handled and direction of flow through pipes, pumps and valves used for handling agrichemicals, storage areas for waste materials that cannot be reused (mud and sediment from sumps, dry fertilizer, and pesticide materials accumulated during clean up processes, etc.), any test borings showing soil and rock elevations and composition at the proposed site, and information showing existing groundwater elevations in relation to proposed liner installation and containment area floors shall be provided.

3. Detail plans. Unless otherwise covered by the specifications or engineer's report, detail plans shall show location, dimensions, and elevations of all existing and proposed facilities; elevations of high and low groundwater level; size, pertinent features, and operating capacity of all pumps, tanks, containment areas, and other mechanical devices associated with the operation of the agrichemical facility and adequate description of any other features pertinent to the design and operation of the agrichemical containment facility.

(15) Specifications. Complete technical specifications for new construction shall be included with the plans. The specifications included with construction drawings shall include, but not be limited to, all construction information not shown on the drawings which is necessary to inform the builder in detail of the design requirements as to the quality of materials and workmanship and fabrication of the project and type, size, strength, operating characteristics, and rating of equipment; the complete requirements for all mechanical and electrical equipment, including machinery, valves, piping and jointing of pipe; electrical apparatus, wiring, and instrumentation; operating tools; construction materials; special construction materials such as clay, sand, concrete, or steel; miscellaneous appurtenances; instructions for testing materials and equipment as necessary to meet design standards and performance tests for the completed works and component units. It is suggested that these performance tests be conducted at the design conditions for the operation of the agrichemical facility whenever practical.]

AUTHORITY: sections 644.026 and 644.036, RSMo 2016. Original rule filed July 15, 1991, effective Jan. 13, 1992. Amended: Filed Aug. 1, 2016, effective April 30, 2017. Amended: Filed June 15, 2018.

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Department of Natural Resources, Division of Environmental Quality, Water Protection Program, John Rustige, PO Box 176, Jefferson City, MO 65102. Comments may be sent with name and address through email to john.rustige@dnr.mo.gov. Public comments must be received by August 23, 2018. The public hearing is scheduled for 10 AM, on August 15, 2018, at the Department of Natural Resources, Elm Street Conference Center, Bennett Springs Conference Room, 1730 East Elm Street, Jefferson City, Missouri 65101.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 20—Clean Water Commission
Chapter 9—Treatment Plant Operations

PROPOSED AMENDMENT

10 CSR 20-9.010 Wastewater Treatment Systems Operation Scope Monitoring. The department is amending sections (1), (2), (3), and (4), removing from (5)(A), and (B), and adding (C), and renumbering thereafter. Removing and replacing language in (6), removing (7) and renumbering, removing (9), (10), and (11).

PURPOSE: The amendment will revise minimum operational monitoring requirements for wastewater treatment facilities to include technologies that are not reflected in the current rules.

(1) Definitions. Definitions as set forth in the Missouri Clean Water Law and 10 CSR 20-2.010 *[shall]* apply to the terms to be used in this rule, unless the context clearly requires otherwise.

(2) Operational laboratory tests and related monitoring for wastewater treatment systems control *[shall be considered as]* **are** a supplement to the *[National Pollutant Discharge Elimination System (NPDES)]* **Missouri State Operating (MSOP)** permit requirements. These **operational** monitoring reports **shall be submitted** to the department *[shall accompany NPDES]* **along with the MSOP** discharge monitoring reports *[and shall be submitted at the frequency specified for NPDES discharge monitoring report submittal]*.

(3) The department may modify *[required]* monitoring frequency required in this rule based upon the department's judgement of monitoring needs for process control at a specified facility.

(4) These requirements for laboratory tests *[shall]* apply to all wastewater treatment systems owned or operated by or for municipalities, public sewer districts or other local government entities, private sewer companies regulated by the Public Service Commission, and the state agencies or any subdivision of them, *[servicing]* **with a** population equivalent*[s]*, **as defined in 10 CSR 20-9.020,** greater than two hundred (200) *[or with twenty-five (25) or more service connections]*. All other systems are exempt.

(5) Minimum monitoring requirements to ensure adequate wastewater treatment systems in-plant operational control are as follows:

(A) Lagoons *[(All Types)]*

1. Discharging - Two (2)/Week Frequency.

*[Weather Conditions—Ambient temperature, cloud cover and p]***P**recipitation	
Flow	Influent or Effluent
pH	Primary Cell
D.O.	Primary Cell

2. Non-Discharging – Two (2)/Month Frequency.

Precipitation	
Flow	**Influent or Effluent**
pH	**Primary Cell**
D.O.	**Primary Cell**

(B) Mechanical Plants.

1. All types—daily **(Monday – Friday)** frequency.

*[Weather Conditions—Ambient temperature and p]***P**recipitation	
Flow	Influent or Effluent
pH	Influent
Temperature	**Aeration basin**

2. Additional laboratory test requirements for wastewater activated sludge processes and modifications:

	Influent	Mixed Liquor
*[NFR]***TSS**	1/week	1/week *[(sample reaeration basin for contact stabilization)]*
Settleability		Daily **(Monday – Friday)** (sample contact and reaeration basins for contact stabilization)
D.O.		Daily **(Monday – Friday)** (sample contact and reaeration basins for contact stabilization)
Temperature		**Daily (Monday – Friday) (sample contact and reaeration basins for contact stabilization)**

3. **Additional tests for** *[F]***f**acilities having digesters *[shall perform the following additional laboratory tests]*:

	Anaerobic	Aerobic
pH	Daily **(Monday – Friday)**	—
Temperature	Daily **(Monday – Friday)** *[(if heated)]*	—
D.O.	—	Daily **(Monday – Friday)**

(C) Recirculating filter media beds:

Pressure	**2/year by measuring squirt height in each zone at the orifice furthest from the pump. Use each pump independently during the monitoring to ensure each pump is functioning.**

*[(C)]***(D)** Facilities which chlorinate for disinfection shall perform total chlorine residual analyses of the effluent on a daily **(Monday – Friday)** basis during those periods when chlorination facilities are in use.

*[(D)]***(E)** Facilities employing disinfection technology other than chlorine shall have disinfection process control testing parameters and frequency determined by the department on a case-by-case basis.

(6) Laboratory procedures shall be performed *[according to the most current edition of Standard Methods for the Examination of Water and Wastewater or other methods approved by the department]* **in accordance with 10 CSR 20-7.015**.

[(7) All owners of wastewater facilities operated by or for municipalities, sewer and water districts or Public Service Commission (PSC) regulated sewer companies may complete a self-analysis of the wastewater utility each calendar year utilizing the Missouri Municipal Water Pollution Prevention (MWPP) survey forms supplied by the department. Participation in this program is voluntary. For owners who have submitted an MWPP survey for the last five (5) consecutive calendar years; or for owners who have submitted an MWPP survey for every calendar year since the inception of the program, the department will—

(A) Not impose administrative penalties until the process of conference, conciliation and persuasion (CC&P) as per 10 CSR 20-3.010 plus at least one (1) additional communication separated by at least ten (10) days from other communications are completed by the department; and

(B) Reduce any base penalty calculated as per 10 CSR 20-3.010(8)(B)6. by up to one-third (1/3) of the amount between the midpoint and least figure of the penalty range.]

*[(8)]***(7)** A copy of all reports required by this rule shall be retained by the facility for a minimum of three (3) years.

[(9) Penalties. Penalties for violation of this rule shall be as provided in the Missouri Clean Water Law.

(10) Severance. If a section, subsection, paragraph, subparagraph, part or subpart of these rules or any part of them be declared unconstitutional or invalid for any reason, the remainder of these rules shall not be affected and shall remain in full force and effect.

(11) Effective Date. This rule becomes effective July 1, 1977, after adoption and compliance with the requirements of section 644.036.3. of the Missouri Clean Water Law and Chapter 536, RSMo.]

*AUTHORITY: section 644.026, RSMo[, Supp. 1997] **2016**. Original rule filed July 15, 1976, effective July 1, 1977. Amended: Filed Nov. 1, 1983, effective July 1, 1984. Amended: Filed July 29, 1994, effective March 30, 1995. Amended: Filed Nov. 3, 1997, effective July 30, 1998. Amended: Filed June 13, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Department of Natural Resources, Sheri Fry, Public Drinking Water Branch, PO Box 176, Jefferson City, MO 65101 or to sheri.fry@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on August 23, 2018 at 5:00 p.m. A public hearing is scheduled for 10:00 a.m. on August 15, 2018, at the Department of Natural Resources, Bennett Springs Conference Room, 1730 East Elm Street, Jefferson City, MO 65101.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 20—Clean Water Commission
Chapter 9—Treatment Plant Operations

PROPOSED AMENDMENT

10 CSR 20-9.020 Classification of Wastewater Treatment Systems. The department is amending section (1) by removing and replacing rule language and adding subsection (F), removing and replacing language in section (2), removing and replacing language in point system chart in (2)(D), removing and replacing language in (2)(E) and (F), and adding subsection (G), and removing (3),(4), and (5).

PURPOSE: This amendment will revise the classification criteria for wastewater treatment facilities to include technologies that are not reflected in the current rules.

(1) Definitions. Definitions as set forth in the Missouri 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 or as noted in the subsections of this rule.

(A) Wastewater treatment systems. Interrelated or interconnected facilities, equipment, machinery, sewers, piping, valves, land, tanks, basins, ponds, lagoons, and any other device, method and process used to reduce or eliminate the contaminants in *[sewage]* **domestic wastewater** and **similar organic** water-borne wastes.

(B) Operator. Any individual who operates or determines the method of operating a wastewater treatment system, either directly or by order.

(C) *[Supervisor]* **Chief operator**. An operator who directs or who has the authority to direct other individuals, or an operator in

direct responsible charge for the operation of a wastewater treatment system*[, including superintendent, foreman, crew chief and shift supervisor]*.

(D) Population equivalent (P.E.). The calculated population which normally contributes the same amount of biochemical oxygen demand (BOD_5) per day. The common base is 0.17 pounds of five-(5-)*[-]* day BOD_5 per capita per day. The calculated population which normally contributes the same amount of flow per day. The common base is one hundred (100) gallons per capita per day.

(E) Wastewater Collection System. Any series of pipes and lift stations to collect, convey, and equalize wastewater flow to the wastewater treatment system.

(2) Wastewater Treatment Systems Requirements.

(A) Requirements for operation by certified personnel shall apply to all wastewater treatment systems, *[serving]* **with a** population equivalent*[s]* greater than two hundred (200) *[or with fifty (50) or more service connections]*, owned or operated by or for municipalities, public sewer districts, counties, public water supply districts, private sewer companies regulated by the Public Service Commission and the state or federal agencies. All other systems are exempt from this rule unless the department determines that certified personnel are necessary to protect the waters of the state.

(B) Owners or other persons legally responsible for the operation of wastewater treatment systems subject to this rule shall be responsible for assuring that operators and *[supervisors]* **chief operators** of wastewater treatment systems comply with certification requirements as set forth in this rule.

(C) All operators of wastewater treatment systems included in subsection (2)(A) of this rule shall possess, as a minimum, a level D certificate of competency issued by the department. **New employees that are not yet certified wastewater treatment operators cannot make process control decisions and will be directly supervised by a certified operator or chief operator.**

(D) Minimum certification of competency classification requirements for *[supervisors]* **chief operators** of wastewater treatment systems shall be determined by the department using the following point system as a guide*[:]*. **Wastewater treatment systems will remain classified at the level determined prior to the effective date of this rule until the facility's MSOP is renewed, at which time, the MSOP will include the facility classification.**

CLASSIFICATION OF WASTEWATER TREATMENT PLANTS

Certification Level	D	C	B	A
Points	25 and Less	26-50	51-70	71 and Greater

Assign points for every item that applies:

Size/Item	Points
Maximum population equivalent (P.E.) served, peak day	1 pt. per 10,000 P.E. or major fraction thereof (maximum 10 pts.)
Design flow (avg. day) or peak month's flow, (avg. day) whichever is larger	1 pt. per MGD or major fraction thereof (maximum 10 pts.)

Effluent Discharge *[Receiving Water Sensitivity]*

Missouri or Mississippi River	0
All other stream discharges except to losing streams and stream reaches supporting whole body contact recreation	1
Discharge to lake or reservoir outside of designated whole body contact recreational area	2
Discharge to losing stream, lake or reservoir area supporting whole body contact recreation	3
Direct reuse or recycle of effluent	6

Land *[Disposal]* **Application/Irrigation**

[Low rate] **Drip irrigation**	3
[High rate] **Land application/irrigation**	5
Overland flow	4

Variation in Raw Wastes (highest level only)

Variations do not exceed those normally or typically expected	0
Recurring deviations or excessive variations of 100 to 200 percent in strength and/or flow	2
Recurring deviations or excessive variations of more than 200 percent in strength and/or flow	4
[Raw wastes subject to toxic waste discharges] **Department-approved pre-treatment program**	6

Preliminary Treatment

STEP systems (operated by the permittee)	**3**
Screening and/or comminution	3
Grit removal	3
Plant pumping of main flow	3
Flow equalization	**5**

Primary Treatment

Primary clarifiers	5
[Combined sedimentation/digestion]	*[5]*
Chemical addition (except chlorine, enzymes)	4

Secondary *[t]***T**reatment

Trickling filter and other fixed film media with **or without** secondary clarifiers	10
Activated sludge *[with secondary clarifiers]* (including extended aeration *[and]***,** oxidation ditches**, sequencing batch reactors, membrane bioreactors, and contact stabilization**)	15
Stabilization ponds without aeration	5
Aerated lagoon	8
Advanced *[Waste]* **Lagoon** Treatment - *[Polishing pond]* **Aerobic cells, anaerobic cells, covers, or fixed film**	*[2]* **10**
[Chemical/physical--without secondary]	*[15]*
[Chemical/physical--following secondary]	*[10]*
Biological**, physical,** or chemical*[/biological]*	12
Carbon regeneration	4

Solids Handling

[Thickening] **Sludge holding**	5
Anaerobic digestion	10
Aerobic digestion	6
Evaporative sludge drying	2
Mechanical dewatering	8
Solids reduction (incineration, wet oxidation)	12
Land application	6

Disinfection

Chlorination or comparable	5
On-site generation of disinfectant (except ultraviolet light)	5
Dechlorination	2
Ultraviolet light	4

Required Laboratory Control Performed by *[p]***P**lant *[p]***P**ersonnel (highest level only)

Lab work done outside the plant	0
Push-button or visual methods for simple tests such as pH, settleable solids	3
Additional procedures such as DO, COD, BOD, titrations, solids, volatile content	5
More advanced determinations such as BOD seeding procedure, fecal coliform, nutrients, total oils, phenols, etc.	7
Highly sophisticated instrumentation, such as atomic absorption and gas chromatograph	10

TOTAL*

*If unique treatment plant conditions distort the point total, the department may adjust the facility classification.

(E) *[The owners of wastewater treatment systems shall furnish the department, upon request, the names, addresses and positions of all employees who are operators or supervisors of wastewater treatment systems.]* **The owner will notify the department of any change in the identity of the chief operator within fifteen (15) calendar days.**

(F) *[In the event a facility's staff does not meet the certification requirements of this rule, the facility owner shall notify the department in writing within ten (10) days of occurrence. Following consultation with the facility owner, the department shall establish a schedule of activities including the date by which compliance with this rule shall be obtained.]* **In the event the chief operator is no longer available to serve, the owner of the wastewater treatment system will notify the department of the vacancy within fifteen (15) calendar days and appoint an interim operator. The interim operator will be considered the certified chief operator for the purposes of complying with 10 CSR 20-9.010 and 10 CSR 20-9.020 on a temporary basis until a properly certified chief operator is hired. Following consultation with the wastewater system owner, the department will establish a schedule of activities and a timeline for the system to have a certified chief operator who has met all applicable certification requirements.**

(G) No person, firm, corporation, municipal corporation or other governmental subdivision or agency may operate a wastewater system unless the operator of the facility is duly certified by the department as provided in 10 CSR 20-9.030 or 10 CSR 20-9.020(F) except during periods of emergency or disaster.

[(3) Penalties. Penalties for violation of this rule shall be as provided in the Missouri Clean Water Law.

(4) Severance. If a section, subsection, paragraph, subparagraph, part, subpart, item or subitem of these rules or any part of them be declared unconstitutional or invalid for any reason, the remainder of these rules shall not be affected and shall remain in full force and effect.

(5) Effective Date. This rule becomes effective immediately upon adoption and compliance with the requirements of section 644.036.3. of the Missouri Clean Water Law and Chapter 536, RSMo (Cum. Supp. 1989).]

*AUTHORITY: section 644.026, RSMo [1994] **2016**. Original rule filed July 15, 1976, effective March 1, 1977. Rescinded and readopted: Filed Nov. 1, 1983, effective July 1, 1984. Rescinded and readopted: Filed July 15, 1991, effective March 1, 1992. Amended: Filed June 13, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Department of Natural Resources, Sheri Fry, Public Drinking Water Branch, PO Box 176, Jefferson City, MO 65102 or to sheri.fry@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on August 23, 2018 at 5:00 p.m. A public hearing is scheduled for 10:00 a.m. on August 15, 2018, at the Department of Natural Resources, Bennett Springs Conference Room, 1730 Elm Street, Jefferson City, MO 65101.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 20—Clean Water Commission
Chapter 9—Treatment Plant Operations

PROPOSED AMENDMENT

10 CSR 20-9.030 Certification of Wastewater Operators. The department is amending the rule by removing (1)(B), removing and replacing language in (2)(B) with language that reflects changes to section 621.250, RSMo., updates section (3) with new rule citations,

adds language to (3)(D) to clarify the fee required to take the exam, adds subsection (3)(G) to require an applicant that fails the exam three (3) times to take a department approved training course prior to taking the exam again and renumbering thereafter, revises (3)(H) to allow an applicant to take the exam twice within one year of the application date, revises (3)(I) including Table 1 to revise the experience required for certification, adds and removes language in (3)(K) to lengthen the time required to obtain necessary operational experience, removes (3)(K)2., removes previous subsection (3)(K), changes (3)(L) to (3)(M) and adds language to require an applicant be eighteen years of age, adds language in (3)(M)1. and 2. to clarify education requirements, remove section (4) and renumber thereafter, add clarifying language to previous (6)(E) and removes language from previous (6)(F) and (G), renumbers (7) to (5) and removes and replaces language in (5)(A), changes the language in (5)(A)3. and (D) to lengthen the number of days a letter of intent to issue a certification, renumbers (8) to (6) and adds language to (6)(A), (B), (C), and (D) to deny or suspend a certification, renumbers (9) to (7) and (10) to (8), and removes (11) and (12).

PURPOSE: The amendment will include changes to the operator certification criteria to more closely align it with the requirements for drinking water operator certification.

(1) Definitions. Definitions as set forth in the Missouri 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 or as noted in the subsections of this rule.

[(B) Certificate of Examination. A document issued by the department stating that the recipient named on the certificate has passed the certification examination for the certification level specified pursuant to this rule.]

(2) Administration.

(B) *[Any conflict arising from departmental actions or decisions made in the execution of this rule and not satisfactorily resolved through the Missouri Clean Water Commission's director of staff may be appealed to the commission. The appeal shall be made in writing to the Missouri Clean Water Commission, Attention: Commission Secretary, P.O. Box 176, Jefferson City, MO 65102, within thirty (30) days of the contested action or decision. The appeal shall indicate the interest of the party filing the action. The commission shall set the appeal for hearing no sooner than thirty (30) days after receipt of a proper appeal. Appeals may be heard by a hearing officer appointed by the commission chairman. Hearings shall be conducted in accordance with sections 644.066, RSMo.]* **Any applicant whose certification is denied, suspended, or revoked may appeal to the Administrative Hearing Commission as provided in section 621.250, RSMo.**

(3) Certification of Competency.

(A) Certificates issued by the department, and valid on March 1, 1992, are valid as certifications of competency in the equivalent class and shall be governed by the provisions of this rule. Initial renewal of the certificates shall be as outlined in *[sub]*section *[(6)(A)]* **(4)** of this rule.

(B) Certifications at the appropriate level shall be issued to individuals successfully passing the certification examination and fulfilling experience requirements of subsection (3)*[(H)]***(I)** of this rule. The expiration date of the certifications shall coincide with renewal requirements as provided in subsection (6)(B) of this rule. An examination score of seventy percent (70%) correct shall be considered a passing grade.

(D) A completed application form for examination must be submitted to the department no later than thirty (30) days before the scheduled examination session. An application fee of twenty dollars ($20) **and a certification fee of twenty-five dollars ($25) for a total of forty-five dollars ($45)** shall accompany each application.

(G) Any examinee who fails a certification examination three (3) times and has not successfully completed a department-approved multi-day training course approved for wastewater treatment within the previous twelve (12) months must do so prior to any further reexamination at that level.

*[(G)]***(H)** An individual applying to take the examination will be allowed to reschedule *[once]* **twice within one year of the application date**. After that, s/he must reapply as required in subsection (3)(D) of this rule.

*[(H)]***(I)** Approval of applicant eligibility for certification of competency shall be the responsibility of the department. *[Assessment of applicant qualifications shall include the following criteria:]* **In order to be eligible for a certificate, the applicant will have accumulated actual or equivalent operational experience in accordance with Table 1.**

1. Actual wastewater treatment operating experience means the skills and knowledge acquired from making or acting upon day-to-day process control/system integrity decisions rather than from textbook study or supervisory observation. It means the applicant has actually operated a wastewater treatment system. In addition, the applicant should have experience in some combination of wastewater treatment system operational tasks such as: sample collection, routine operational monitoring, interpretation of test results, calculation of chemical dosages and subsequent adjustment of chemical feeders, flow rate and pumping adjustments, disinfection, and completion of operational reports.

2. Equivalent wastewater treatment operating experience means skills and knowledge acquired from education as described in this rule or work experience that has a substantial relationship to wastewater treatment.

Certification Level	In-Plant Actual Operating Experience Required
A	*[6]* **5 1/2** years (2 years of which may be equivalent)
B	*[4]* **3 1/2** years (1 year of which may be equivalent)
C	*[2]* **1 1/2** years (1 year of which may be equivalent)
D	*[1 year]* **6 months** (all of which may be equivalent)

*[(I)]***(J)** Years of equivalent experience shall be computed from the following criteria. *[Experience equivalence for high school and college degrees is nonadditive:]*

[High school diploma or GED]	*[1/2 year]*
Graduation from approved one (1)-year certificate program in water/wastewater technology	1 year
College level courses in biological/ environmental sciences (grade C or better required)—maximum credit of six (6) months	1 month per 3 semester hours
Two (2)-year associate degree in allied field (for example, environmental health/science, biology, chemistry)	1 1/2 years
Four (4)-year college degree in allied fields (for example environmental sciences, biology, chemistry and engineering)	2 years
Approved multi-week entry level, advanced or correspondence courses—maximum credit of one (1) year	1/2 year

1. Operation of potable water treatment facilities **and wastewater collection systems** will be given equivalent credit of actual calendar years of operation *[in the potable water treatment field]*.

2. General vocational training or work experience in related areas will be considered by the department on a case-by-case basis and limited to a maximum of six (6) months' equivalent experience.

3. Documentation submitted for equivalent experience credit that does not fit the previously mentioned criteria will be evaluated by the department on a case-by-case basis.

*[(J)]***(K)** Any person not possessing the necessary operational experience may take the examination.

1. Upon successful completion of the examination, the individual will have to obtain the necessary operational experience within *[one (1) year]* **eighteen months**. If the necessary experience is not

obtained with the *[one (1) year]* **eighteen-month** limit, the individual must reexamine to be certified at that level of competency.

[2. Application for issuing a certificate must be made on the proper form as described in subsection (12)(A) and must be accompanied by the certification fee of twenty-five dollars ($25).]

[(K) An individual is not certified until the certification fee has been paid and the certificate has been issued.]

(L) The minimum age for certification shall be *[sixteen (16)]* **eighteen (18)** years.

(M) Education Requirement.

1. The minimum education requirement for certification is fulfilled by meeting any one (1) of the following conditions: a high school diploma; a general equivalency diploma (GED); successful completion of special department-approved training appropriate to wastewater treatment; or six (6) months of experience.

2. Training or experience used to meet the education requirement will not be counted as equivalent experience credit. Training or experience used to meet the education requirement is not included in the maximum limit on equivalent experience in subsection (3)(J).

[(4) Certification Without Examination.

(A) Certification of competency in the equivalent classification will be issued to operators and supervisors who, on March 1, 1992, hold current exemptions issued by the department provided that the individual fulfills the following requirements:

1. Was certified by exemption at the level required for that facility immediately prior to March 1, 1992;

2. Is employed as supervisor on March 1, 1992;

3. Continues employment in the same capacity with the employer; and

4. Was judged by the department to not be responsible for operational and/or maintenance deficiencies cited for the facility within the twelve (12) months prior to March 1, 1992.

(B) All certifications without examination issued under subsection (4)(A) of this rule shall expire if the certificate holder changes position or employer. If a substantial change occurs in the treatment process, the certification without examination shall expire upon construction completion.

(5) Certificate of Examination. Any person holding a valid certificate of examination on the effective date of this rule must meet experience requirements for that level and apply to upgrade the certificate to a certificate of competency according to the following schedule. If the certificate is not converted within this time frame, the certificate of examination will lapse and the person will have to reexamine.

Certificate of Examination Level	*Time Allowed for Upgrade*
A	*February 28, 1998*
B	*February 28, 1996*
C	*February 28, 1994*
D	*February 28, 1993]*

*[(6)]***(4)** Certificate Renewal.

(A) All certificates issued by the department shall be renewed at least every three (3) years, unless prorated by the department to some other time frame. All applicants for renewal shall meet the training requirements set forth in subsection (6)(B) prior to the expiration date stated on each individual's certificate.

(B) Before a certificate will be renewed, the applicant must submit suitable documentation that s/he has obtained not less than thirty (30) hours of approved renewal training. Only training approved by the department will be accepted. Each certified operator is responsible for documenting his/her training.

(C) The department shall send notification of certification expiration to the certificate holder at the last known address at least sixty (60) days prior to the certificate's expiration date. Failure of the department to notify the certificate holder of certification expiration does not relieve the certificate holder of the responsibility for renewal.

(D) Any certificate not renewed within sixty (60) days of the expiration date will be considered lapsed. Any person with a lapsed certification will have to reexamine as provided in section (3) of this rule.

(E) Provided the *[certificate holder has submitted]* **department has received** a timely and complete application for certification renewal, possesses sufficient renewal training and through no fault of the certificate holder the department is unable to issue a new certification before the expiration date of the previous certification, automatically the validity of the expired certification shall continue until the department acts on the renewal application.

(F) Certification renewal fee is forty-five dollars ($45) and shall accompany the certificate holder's application for renewal. Application for renewal must be made on the form provided by the department *[as described in subsection (12)(B)]*.

(G) A late fee of ten dollars ($10) per month*[, or fraction of the fee]*, up to a total of twenty dollars ($20) shall be assessed for any certification renewed after the expiration date.

*[(7)]***(5)** Reciprocity.

(A) *[Individuals having valid certification issued by another state or country, or its authorized representative, having examination, experience and renewal requirements equal to or more stringent than those of the department, as determined by the department, will be granted a certificate of competency provided that the applicant—]* **Certificates may be issued, without examination, to any person who holds a valid certificate obtained by examination in any state, territory, country, or any other certifying authority, if the requirements for certification of operators under which the person's certificate was issued do not conflict with the provisions of this rule, are at least as stringent as this rule, and provide the applicant—**

1. Has working experience with a wastewater treatment system in the state or other authorized area which supplied the certification for which reciprocity is requested;

2. Obtains employment with a Missouri wastewater treatment system; and

3. Makes application for reciprocity within one hundred *[twenty (120)]* **eighty (180)** days after beginning that employment. The form described in subsection (12)(C) must be submitted along with the application fee of forty dollars ($40).

(B) The fee for a certificate issued under the provisions of this section is twenty-five dollars ($25).

(C) The level of certification issued will be determined by the state of origin's minimum requirements for the level of certification held in that state.

(D) If the applicant is not employed in a Missouri wastewater facility, but meets all other requirements for reciprocal certification, the department will issue a letter of intent to issue certification which will be valid for one hundred *[twenty (120)]* **eighty (180)** days. Upon employment in a Missouri wastewater facility, and provided all other requirements are met, the applicant may apply for a certificate. If the applicant does not obtain Missouri employment before the expiration date of the letter, s/he will have to reapply for reciprocal certification.

*[(8)]***(6) Denial, Suspension or** Revocation.

(A) The department may **deny, suspend or** revoke any certification for any of the following reasons: fraud or deceit in obtaining certification; negligence, incompetence or willful malpractice in the holder's action in operating a wastewater treatment facility or appurtenances, or falsification of facility operating records or reports required by 10 CSR 20, or willful violation of 10 CSR 20.

(B) Notice of **suspension or** revocation action shall be issued by the commission's director of staff with service by hand delivery or through certified mail to the certificate holder at that individual's last known address. That notice shall state the reason(s) for revocation, the effective date of the revocation and the action(s) the certificate holder may take to contest the revocation.

[(C) A written request for a hearing may be made by the certificate holder no more than thirty (30) days following notification from the commission's director of staff that revocation proceedings have been initiated. A hearing will be conducted as outlined in subsection (2)(B) of this rule.]

*[(D)]***(C)** Application for certification examination by the holder of a revoked certificate may not be made sooner than one (1) year from the effective date of revocation. Acceptance of any such application shall be at the discretion of the department. Certification by reciprocity shall not be available for a certificate holder whose certification has been revoked.

*[(E)]***(D)** Any revoked certificate shall be returned to the department.

*[(9)]***(7)** The certificate holder shall notify the department of any change in status including, but not limited to, change of name, change of address and change of employer.

*[(10)]***(8)** All fees are nonrefundable and nontransferable.

[(11) Penalties. Penalties for violation of this rule shall be as provided in the Missouri Clean Water Law.

(12) Forms.
(A) Examination Application.
(B) Reserved.
(C) Reciprocity Application.]

*AUTHORITY: section 644.026, RSMo [1994] **2016**. Original rule filed July 15, 1991, effective March 1, 1992. Amended: Filed June 13, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Department of Natural Resources, Sheri Fry, Public Drinking Water Branch, PO Box 176, Jefferson City, MO 65102 or to sheri.fry@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on August 23, 2018 at 5:00 p.m. A public hearing is scheduled for 10:00 a.m. on August 15, 2018, at the Department of Natural Resources, Bennett Springs Conference Room, 1730 East Elm Street, Jefferson City, MO 65101.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 20—Clean Water Commission
Chapter 14—Concentrated Animal Feeding Operation Waste Management System Operations

PROPOSED AMENDMENT

10 CSR 20-14.010 Classification of Concentrated Animal Feeding Operation Waste Management Systems. The department is amending subsection (2)(C) by removing language that defines when an applicant should apply for a certificate and reducing the examination fee for a failed exam; adding language to subsections (2)(C) and (E) to add the term "initial employment date"; and removing section (5).

PURPOSE: This amendment will streamling the types of concentrated animal feeding operation certification available.

(2) CAFO Waste Management Systems Requirements.

(C) All persons performing the duties of a CAFO operator, as defined in subsection (1)(C) and (D) of this rule, at systems included in subsection (2)(A) of this rule shall *[apply to the department for CAFO waste management system operator certification within sixty (60) days of cumulative employment in a CAFO waste management system]* **be certified**. *[In cases of change of CAFO employers, "employment" is the total of all CAFO waste management system employment.]* A CAFO operator trainee shall complete department-approved entry level training and pass the examination within eighteen (18) calendar months of initial employment at a CAFO waste management system that is required to be operated by certified personnel as specified in subsection (2)(A) of this rule. *[If the trainee fails to successfully complete the required training and pass the examination within eighteen (18) months, the owner must notify the department as required in subsection (2)(F) of this rule. At this time, the application will be considered inactive and the trainee must submit a new application with application fee in order to continue the CAFO operator certification process.]* Any trainee who is unable to pass the certification examination after three (3) attempts, or within eighteen (18) calendar months of *[their]* initial *[exam]* **employment**, must attend an additional twelve (12) hours of department-approved CAFO training prior to reexamination.

(E) The owners of CAFO waste management systems shall furnish the department, upon request, the names, business addresses**, initial employment dates,** and positions of all employees who are operator trainees, CAFO operators or CAFO supervisors within their CAFO waste management systems.

[(5) Effective Date. This rule becomes effective July 30, 2001, or ninety (90) days after adoption and compliance with the requirements of section 644.036.3 of the Missouri Clean Water Law and Chapter 536, RSMo whichever is later.]

*AUTHORITY: section 644.026, RSMo [2000] **2016**. Original rule filed March 1, 1996, effective Nov. 30, 1996. Amended: Filed Nov. 14, 2000, effective July 30, 2001. Amended: Filed June 13, 2018.*

PUBLIC COST: This proposed amendment will not cost state agencies or political subdivisions more than five hundred dollars ($500) in the aggregate.

PRIVATE COST: This proposed amendment will not cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Department of Natural Resources, Sheri Fry, Public Drinking Water Branch, PO Box 176, Jefferson City, MO 65102 or to sheri.fry@dnr.mo.gov. To be considered, comments must be received by the close of the public comment period on August 23, 2018 at 5:00 p.m. A public hearing is scheduled for 10:00 a.m. on August 15, 2018, at the Department of Natural Resources, Bennett Springs Conference Room, 1730 East Elm Street, Jefferson City, MO 65101.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 20—Clean Water Commission
Chapter 14—Concentrated Animal Feeding Operation Waste Management System Operations

PROPOSED AMENDMENT

10 CSR 20-14.020 Certification of Concentrated Animal Feeding Operation Waste Management System Operators. The department is amending sections (2), (3), and (5), removing subparagraph

(3)(G)1.A. and removing and replacing language in subparagraph B., removing and adding language in paragraph (3)(G)2., removing language in subsection (3)(H), removing and replacing language in subsection (3)(I), removing subsections (3)(L), (M), and (N), removing in paragraphs (4)(B)1. and 2., moving language from (4)(B)1. to (4)(B), removing and replacing language in subsections (4)(E) and (G), and removing and replacing language in subsections (6)(A) and (C).

PURPOSE: The amendment updates appeal language regarding section 621.250, RSMo, and removes language that distinguishes between dry and wet concentrated animal feeding operation certificates.

(2) *[Administration.*

(A)] The department shall serve as the certifying agency for concentrated animal feeding operations (CAFO) waste management system personnel.

[(B) Any conflict arising from departmental actions or decisions made in the execution of this rule and not satisfactorily resolved through the Missouri Clean Water Commission's director of staff may be appealed to the commission. The appeal shall be made in writing to the Missouri Clean Water Commission, Attention: Commission Secretary, within thirty (30) days of the contested action or decision. The appeal shall indicate the interest of the party filing the action. The commission shall set the appeal for hearing no sooner than thirty (30) days after receipt of a proper appeal. Appeals may be heard by a hearing officer appointed by the commission chair. Hearings shall be conducted in accordance with section 644.066, RSMo.] **Any applicant whose certification is denied, suspended, or revoked may appeal to the Administrative Hearing Commission as provided in section 621.250, RSMo.**

(3) Certification of Competency.

(C) A completed application form for examination must be submitted to the department no later than thirty (30) days before the scheduled examination session. A nonrefundable application fee of forty-five dollars ($45) shall accompany each application **or twenty dollars ($20) for an application for subsequent exams for the same certification level if the applicant fails the initial exam**.

(D) Examinations shall contain, but not necessarily be limited to, questions pertaining to the Missouri CAFO regulations, general CAFO waste management systems knowledge, water quality, agronomy, irrigation management, general agriculture, soil science, applied mathematics, chemistry, hydraulics, pumps and operation of irrigation and land application equipment, as applied to CAFO waste management systems.

(F) An individual applying to take the examination will be allowed to reschedule *[once]* **two (2) times** within twelve (12) months of the application date. After that, the applicant must reapply as required in subsection (3)(C) of this rule.

(G) Approval of applicant eligibility for certification of competency shall be the responsibility of the department. Assessment of applicant qualifications shall include the following criteria:

1. Successful completion of a department approved, pre-certification, entry level CAFO waste management system training course of *[the following minimum length:]* **at least twenty four (24) contact hours.**

[A. Wet handling CAFO waste management systems—thirty (30) hours; and

B. Dry handling CAFO waste management systems—eighteen (18) hours; and]

2. Actual CAFO waste management system operating experience required for classification level:

*["]*A*["]*	*[4 years (2 years of which may be equivalent)]* **3 years (1.5 years of which may be equivalent)** *[(* Up to 2.5 years equivalency for graduate degree in a related field)]*
*["]*B*["]*	*[1 year (All of which shall be actual experience) As of the effective date of this amended rule, all CAFO waste handling system operators who currently possess a CAFO level "C" certificate will be reissued a CAFO level "B" certificate.]* **Six (6) months (all of which may be equivalent)**
CAFO Operator Trainee	No experience requirement

(H) Years of equivalent experience shall be computed from the following criteria:

1. General vocational training or work experience in related areas will be considered by the department on a case-by-case basis and shall be limited to a maximum of six (6) months' equivalent experience.

[Graduation from approved one (1)-year certificate program in water/waste water technology or irrigation management]	*[1 year]*
College level courses in agriculture, animal science, biology, chemistry, engineering, environmental health/science, irrigation management, soil science, **water/wastewater technology,** etc. (grade of C or better is required)—maximum credit of *[six (6) months]* **one (1) year**.	1 month per every 3 semester hours
[Two (2)-year associate degree in a related field (for example, agriculture, animal science, biology, chemistry, engineering, environmental health/science, irrigation management, soil science, etc.)]	*[1 1/2 years]*
Four (4)-year college degree **or higher** in a related field (for example, agriculture, animal science, biology, chemistry, engineering, environmental health/science, irrigation management, soil science, etc.)	*[2 years]* **1 year**
[Graduate level degree in a related field (for example, agriculture, animal science, biology, chemistry, engineering, environmental health/science, irrigation management, soil science, etc.)]	*[1/2 year]*
Department-approved CAFO waste management system correspondence course *[or department approved]*, **pre-certification entry level CAFO course, or** advanced course in CAFO waste management (**each course with a** minimum of *[30]* **24** contact hours in length) *[and is in addition to the required entry level training course outlined in subsection (3)(G)1. of this rule].*	1/2 year per course with a maximum of 1 year credit **(For multi-day courses, attendance of at least eighty percent (80%) of the course hours is required to receive credit.)**

(I) Any person having completed a department-approved entry level CAFO waste management course as required in *[subsection]* **paragraph** (3)(G)1. of this rule, but not possessing the necessary operational experience, may take the certification examination. All CAFO operator applicants must complete the department-approved entry level training course outlined in *[subsection]* **paragraph** (3)(G)1. of this rule *[before taking any CAFO certification examination]* **prior to certification**.

1. Upon passing the examination, the individual will have eighteen (18) cumulative months of employment within a CAFO waste management system to obtain the necessary operational experience for the certification level requested. If the necessary experience is not obtained within the eighteen (18)-month time frame, the individual must retake the examination to continue the CAFO operator certification process.

2. Application for a certificate must be made on the proper forms provided by the department.

[(L) A valid wet handling CAFO waste management system certificate shall be considered equal to a dry handling certificate of the same level and is approved for use at a dry handling system.

(M) A valid dry handling CAFO waste management system certificate shall not be considered equal to a CAFO wet handling system certificate of any level and is not approved for use at a CAFO wet handling system. A separate test specific to dry handling systems will be administered to these individuals. A CAFO dry handling system operator may attain a CAFO wet handling system certification by taking an additional twelve (12) hours of entry level training that is specific to CAFO wet handling systems and passing a CAFO wet handling system certification examination.

(N) An operator possessing a valid Missouri dry handling CAFO waste management system certificate desiring to obtain a wet handling certificate will be given fifty percent (50%) equivalent credit for actual years' experience at a dry handling CAFO waste management system.]

(4) Certificate Renewal.

(B) Before a certificate will be renewed, the applicant must submit suitable documentation that not less than*[—*

1. Twenty-four (24)] **twelve (12)** hours of department-approved renewal training has been obtained for individuals who are certified for *[wet handling]* CAFO waste management systems. Each certified CAFO operator is responsible for documenting such training*[; and]***.**

[2. Twelve (12) hours of department-approved renewal training for individuals who are certified for dry handling CAFO waste management systems. Each certified CAFO operator is responsible for documenting such training.]

(E) Provided the *[certificate holder has submitted]* **department has received** a timely and complete application for certification renewal, possesses sufficient renewal training and through no fault of the certificate holder, the department is unable to issue a new certificate before the expiration date of the previous certificate, the validity of the expired certificate shall continue until the department acts on the renewal application.

(G) A late fee of ten dollars ($10) per month*[, or fraction thereof,]* up to a total of twenty dollars ($20) shall be assessed for any certificate renewed after the expiration date.

(5) Reciprocity.

(D) Reciprocal *[permits]* **certificates** will only be issued to persons who are employed within Missouri CAFO waste management systems. Eligible applicants must submit twenty-five dollars ($25) for issuance of a reciprocated certificate. If employment with a Missouri CAFO waste management system is dependent upon the Missouri certification, the department will send a letter of intent to issue a certificate to the applicant. The letter of intent is valid for one hundred eighty (180) days provided that the certificate that the application is based upon remains valid. If the applicant does not obtain Missouri employment before the expiration date of the letter, he/she must reapply for reciprocal certification.

(6) **Denial,** Suspension**,** and Revocation.

(A) The department may **deny,** suspend or revoke any certification *[for a period of not more than five (5) years]* for any of the following reasons: fraud or deceit in obtaining certification, cheating on the certification examination, negligence, incompetence, misconduct, dishonesty, bribery or extortion, misrepresentation or malfeasance in the holder's action in operating a CAFO waste management system or appurtenances, sabotage, selective sampling, falsification of facility operating records or reports required by 10 CSR 20, or any violation of 10 CSR 20 or the Missouri Clean Water Law, Chapter 644, RSMo. An operator should not be held responsible for a condition in which that person cannot obtain the necessary resources to correct. The permit holder is responsible for providing the necessary resources to the operator.

(B) Notice of a suspension or revocation action will be issued by the *[commission's director of staff]* **department** with service by hand delivery or through certified mail to the certificate holder at that individual's last known address. That notice shall state the reason(s) for suspension or revocation, the effective date of the suspension or revocation and the action(s) the certificate holder may take to contest the suspension or revocation.

[(C) The certificate holder may make a written request for a hearing to the department no more than thirty (30) days following receipt of notification from the commission's director of staff that suspension or revocation proceedings have been initiated. A hearing will be conducted as outlined in subsection (2)(B) of this rule.]

*[(D)]***(C)** Individuals with revoked certificates must reapply and retake the certification examination to regain operator certification. Application for certification examination by an individual whose certificate is suspended or revoked may not be made sooner than one (1) year from the effective date of suspension or revocation. Acceptance of any such application shall be at the discretion of the department. When the deficiency is related to a particular weakness, the department may require the operator to complete training in that deficient area. Suspended certificates may be reinstated upon written request from the operator after the suspension term has expired and all suspension requirements have been met.

*[(E)]***(D)**Any suspended or revoked certificate shall be returned to the department.

*AUTHORITY: section 644.026, RSMo [2000] **2016**. Original rule filed March 1, 1996, effective Nov. 30, 1996. Amended: Filed Nov. 14, 2000, effective July 30, 2001. Amended: Filed June 13, 2018.*

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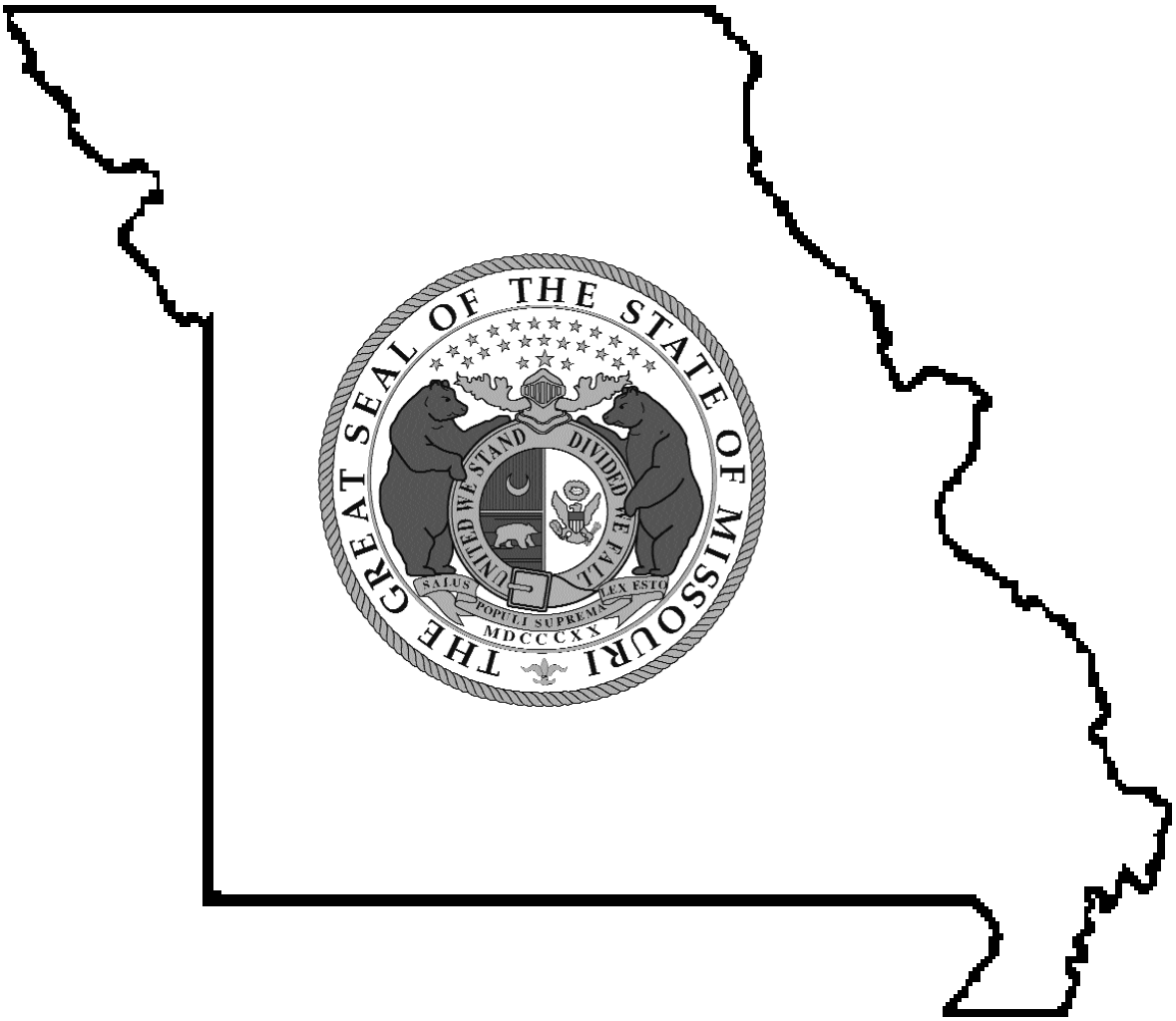

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