MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

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

WORKING DOCUMENT
Strawman

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

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

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

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

PROPOSED AMENDMENT

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

PURPOSE: This amendment is intended to remove restrictions that are not mandatory for the construction of wastewater treatment systems and to reflect new requirements associated with treatment technologies that were previously unaddressed.

[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.]

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

[(1) Definitions. Definitions as set forth in the Clean Water Law and 10 CSR 20-2.010 shall apply to those terms when used in this rule, unless the context clearly requires otherwise. Where the terms shall and must are used, they are to mean a mandatory requirement insofar as approval by the 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.]

(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. To the extent 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. Design guide and criteria for these facilities are found in 10 CSR 20-8.300.

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

[(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).]

(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) 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(6)(B).

(*[A]***B**) *[Bar Racks and Screens]***Course Screens. 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 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 de-watering 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]***C**) Fine Screens. **When used, a minimum of two (2) fine screens shall be provided; with each unit being capable of independent operation. Capacity shall be provided to treat design peak instantaneous flow with the largest unit out-of-service.**

[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) Comminutors. **Provisions for location and safety shall be in accordance with screening devices, paragraph (3)(B) 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) 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 de-watering 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.]

(6) 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. Refer to ASTM F2649 – 14 Standard Specification for Corrugated High Density Polyethylene (HDPE) Grease Interceptor Tanks, as approved and published September 1, 2014, for corrugated HDPE grease interceptors and ASTM C1613 – 17 Standard Specification for Precast Concrete Grease Interceptor Tanks, as approved and published September 1, 2017, for precast concrete grease interceptors. These standards are incorporated by reference in this rule, as published by ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959. This rule does not incorporate any subsequent amendments or additions.

[(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.]

(7) Leachate. Leachate shall not be accepted by wastewater treatment facilities with subsurface soil dispersal systems.

AUTHORITY: section 644.026, RSMo Supp. 1988. Original rule filed Aug. 10, 1978, effective March 11, 1979.*
**Original authority 1972, amended 1973, 1987, 1993.*