Missouri Clean Water Commission
Department of Natural Resources
Lewis and Clark State Office Building
LaCharrette/Nightingale Creek Conference Rooms
1101 Riverside Drive
Jefferson City, Missouri 65102

September 7, 2011

10 CSR 20-8.120 Design of Gravity Sewers
Regulation Public Hearing

Issue: Public Hearing on the Proposed Amendment to 10 CSR 20-8.120, Design of Gravity Sewers regulation.

Background: In July 2008, Department staff convened a stakeholders group to review and amend the Design of Gravity Sewers regulation. It was proposed and accepted that the Chapter 8 Design Standards rules would be based upon the 2004 version of the "Recommended Standards for Wastewater Facilities" developed by the Wastewater Committee of the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (commonly referred to as the 10 States Standards). Missouri is a contributing state to this nationally recognized standard. A draft amendment was completed in the spring of 2011. The Commission signed a Finding of Necessity for Rulemaking on May 4, 2011.

This rulemaking is administrative in nature and does not establish environmental standards or conditions, therefore a Regulatory Impact Report (RIR) and fiscal notes were not developed. No costs are expected for the Department, public, and/or private entities due to its implementation. There is no change to the requirements of the existing rule, although the language is amended in order to clarify and update the rule.

On August 1, 2011, the Proposed Amendment to 10 CSR 20-8.120, Design of Gravity Sewers, was placed on public notice. The public comment period is from August 1, 2011, date of publication in the *Missouri Register*, through September 14, 2011.

Recommended Action: Hearing only.

Suggested Motion Language: None.

List of Attachments:

- Proposed rulemaking for 10 CSR 20-8.120, as published in the *Missouri Register* on August 1, 2011

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: A public hearing on this proposed amendment will begin at 9:00 a.m., September 29, 2011. The public hearing will be held at the Holiday Inn Southeast, Grand Ballroom A, B, and C, 9103 East 39th Street, Kansas City, Missouri. Opportunity to be heard at the hearing shall be afforded any interested person. Interested persons, whether or not heard, may submit a written or email statement of their views until 5:00 p.m., October 6, 2011. Written comments shall be sent to Chief, Air Quality Planning Section, Missouri Department of Natural Resources' Air Pollution Control Program, PO Box 176, Jefferson City, MO 65102-0176. Email comments shall be sent to apcprulespn@dnr.mo.gov.

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

PROPOSED AMENDMENT

10 CSR 20-8.120 Design of *Gravity* Sewers. The Missouri Department of Natural Resources (department) is amending the rule title, the purpose statement, and sections (1), (3), (4), and (6)–(10); deleting sections (2) and (5); adding a new section (2); and renumbering as necessary.

PURPOSE: This amendment will update the rule to current industry practices.

*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 [as] in regard[s] to adequacy of design, submission of plans, approval of plans, and approval of completed [sewage works.] **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 [Sanitary Engineers] **and Provincial Public Health and Environmental Managers' Recommended Standards for** [Sewage Works] **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. [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]* **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.]* **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) 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).]

(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.

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

(4) Design Capacity **and Design Flow**.

(A) *[In general, s]*Sewer capacities *[should]* **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 *[should]* **must** be given to the maximum anticipated capacity of institutions, industrial parks, etc. *[Where future relief sewers are programmed, economic analysis of alternatives should accompany initial permit applications. In determining the required capacities of sanitary sewers, the following factors should be considered: maximum hourly domestic sewage flow;]* **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. *[a]*Additional maximum *[sewage]* **wastewater** or waste flow from industrial plants;

C. *[inflow and groundwater]* **Inflow and** infiltration **(I/I)**;

D. *[t]*Topography of area;

E. *[l]*Location of *[sewage]* **wastewater** treatment *[plant]* **facilities**;

F. *[d]*Depth of excavation; and

G. *[p]*Pumping requirements.

2. The basis of design for all sewer projects shall *[accompany the plan documents]* **be included in the engineering report or facility plan**. More detailed computations may be required by the *[agency]* **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).

[(5) Design Flow.

(A) Per Capita Flow. New sewer systems shall be designed on the basis of an average daily per capita flow of sewage of not less than one hundred (100) gallons per day (.38m³/day). This figure is assumed to cover normal infiltration but an additional allowance should be made where conditions are unfavorable. For existing sewer systems an additional per capita allowance shall be made where the average annual flow exceeds this value and immediate remedial measures are not proposed.

(B) Peak Design Flow. Sanitary sewers shall be designed on a peak design flow basis using one (1) of the following methods: the ratio of peak to average daily flow as determined from the quotient of eighteen (18) plus the square root of the population in thousands divided by four (4) plus the square root of population in thousands or values established from an infiltration/inflow study acceptable to the agency. Use of other values for peak design flow will be considered if justified on the basis of extensive documentation.

(C) Combined Sewer Interceptors. In addition to the requirements in subsection (5)(B) of this rule, interceptor sewers that will receive combined sewage shall have sufficient additional capacity to insure attainment of the appropriate state and federal water quality standards.]

[(6)](5) Details of Design and Construction.

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

(B) Depth. *[In general,]* **All** sewers *[should]* **shall** be sufficiently deep so as to receive *[sewage]* **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. *[Insulation shall be provided for sewers that cannot be placed at a depth sufficient to prevent freezing.]*

(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.

[(C)](D) Slope.

1. All sewers shall be *[so]* designed and constructed to give mean velocities, when flowing full, of not less than two feet (2') per second *[(0.61 m/s), based on Kutter's formula using an "n" value of 0.013]* **(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 *[this are]* **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 *[in.]* inch (20 cm)	0.40
[9 inch (23 cm)]	*[0.33]*
10 *[in.]* inch (25 cm)	0.28
12 *[in.]* inch (30 cm)	0.22
14 *[in.]* inch (36 cm)	0.17
15 *[in.]* inch (38 cm)	0.15
16 *[in.]* inch (41 cm)	0.14
18 *[in.]* inch (46 cm)	0.12
21 *[in.]* inch (53 cm)	0.10
24 *[in.]* inch (61 cm)	0.08
27 *[in.]* inch (69 cm)	0.067
30 *[in.]* inch (76 cm)	0.058
33 inch (84 cm)	0.052
36 *[in.]* 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. The pipe diameter and slope shall be selected to obtain the greatest practical velocities to minimize settling problems. Slopes slightly less than those required for the 2.0 feet per second (0.61m/s) velocity when flowing full may be permitted. Decreased slopes will only be considered where the depth of flow will be 0.3 of the diameter or greater and the velocity from partial flow determination will be 0.9 feet per second (27.4 cm/s) or greater based on design average flow. These reduced slopes may result in better flow characteristics at design flow than minimum slope in a larger pipe. Whenever the decreased slopes are selected, the design engineer must furnish with his/her report computations of the anticipated flow velocities of average and daily or weekly peak flow rates. The operating authority of the sewer system will give written assurance to the agency that any additional sewer maintenance required by reduced slopes will be provided.]

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.

*[3.]*4. **Slope between manholes.** Sewers shall be laid with uniform slope between manholes.

*[4.]*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 *[shock]* **impact**.

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

B. *[n]*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. *[n]*Not over sixteen feet (16') (4.9 m) center-to-center on grades fifty percent (50%) and over.

[(D)](E) Alignment.

1. Sewers twenty-four inches (24") (61 cm) or less shall be laid with straight alignment between manholes. *[The]* **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.

[(E)](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.** *[t]*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. *[even w]*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 *[agency]* **department** may require a schedule for **construction of** future downstream sewer relief.

[(F)](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 *[to withstand extraordinary superimposed loading]*, special bedding, **haunching, initial backfill,** concrete cradle, or **other** special construction *[may]* **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.

[(G)](H) Installation.

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 *[or]* **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 *[backfill]* **bedding and haunching** to be placed and compacted *[as needed]* **to adequately support the pipe**. The trench sides shall be kept as nearly vertical as possible. When wider trenches are *[dug]* **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.

*[B.]*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.** *[Concrete or well-graded granular material (b]*Bedding *[c]*Classes A, B, *[or]* C, **or crushed stone,** as described in ASTM C12*[-74 or WPCP MOP No. 9)]*, 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. Concrete or well-graded granular material (bedding classes I, II or III as described in ASTM D2321-74) shall be used for all flexible pipe provided the proper strength pipe is used with the specified bedding to support the anticipated load.]

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** *[B]*backfill.

A. **Final** *[B]*backfill shall be of a suitable material removed from excavation except where other material is specified. Debris, frozen material, large clods, *[or]* stones, organic matter, or other unstable materials shall not be used for **final** backfill within two feet (2') (0.6*[1]* m) of the top of the pipe.

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

5. Deflection test.

A. Deflection tests shall be performed on all flexible pipe. The test shall be *[run not less than thirty (30) days]* **conducted**

after **the** final backfill has been *[placed]* **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. If the deflection test is to be run using a rigid ball or mandrels, they shall have diameters equal to ninety-five percent (95%) of the inside diameter of the pipe and the tests shall be performed without mechanical pulling devices.]

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.

*[(H)]***(I)** 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. Service connections. Service connections to the sewer main shall be watertight and 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.

*[2.]***3.** Leakage tests. Leakage tests shall be specified. This may include appropriate water or low pressure air testing. *[The leakage outward or inward (exfiltration or infiltration) shall not exceed two hundred (200) gallons per inch of pipe diameter per mile per day (0.19 m^3/cm of pipe dia./km/day) for any section of the system. An exfiltration or infiltration test shall be performed with a minimum positive head of two feet (2') (0.61 m). The air test, if used, as a minimum shall conform to the test procedure described in ASTM C-828-76T, entitled Tentative Recommended Practice for Low-Pressure Air Test of Vitrified Clay Pipe Lines. The testing methods selected should take into consideration the range in groundwater elevations projected and the situation during the test. For the purpose of leakage tests, manholes shall be considered pipe of equivalent diameter and shall be tested by an appropriate test method.]* **The testing methods selected should take into consideration the range in groundwater elevations during the test and anticipated during the design life of the sewer.**

4. 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).

5. 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, and ASTM F1417 for plastic, composite, and ductile iron pipe. All other materials shall have test procedures approved by the department.

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

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

(A) Location.

1. Manholes shall be installed—

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

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

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

D. *[and a]***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 *[eighteen]* **sixteen** inches to thirty inches (*[18"]***16**"-30") (46 cm-76 cm)*[, except that distances up to six hundred feet (600') (180 m)]*.

2. Spacing of manholes greater than five hundred feet (500') (150 m) may be approved **by the department** in cases where adequate *[modern]* cleaning equipment *[for such spacing is provided]* **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.

1. A drop pipe *[should]* **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 *[should]* **shall** be filleted to prevent solids deposition.

2. Drop manholes should be constructed with outside drop connection. Inside drop connections *[(when necessary) shall be secured]* **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 *[interior]* diameter of manholes shall be *[forty-two inches (42") (1.07 m) on eight-inch (8") (20 cm) diameter gravity sewer lines and forty-eight inches (48") (1.22 m) on all sewer lines larger than eight inches (8") (20 cm) in diameter]* **forty-eight inches (48") (122 cm)**. 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)]* **twenty-four inches (24") (61 cm)** shall be provided.

(D) Flow Channel.

1. The flow channel **straight** through **a** manhole*[s]* should be made to conform **as closely as possible** in shape and slope to that of the **connecting** sewers. **The channel walls should be formed or shaped to the full height of the crown of the outlet sewer in such a manner to not obstruct 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) 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 pipe shall discharge onto the surface of the bench.

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

1. Manholes shall be watertight. Manholes shall be of the precast concrete or poured-in-place concrete type. *[Manholes shall be waterproofed on the exterior.]* **Precast manholes shall conform to the design and test methods specified in ASTM C478 and C497.**

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) 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 pass two (2) tests. The first vacuum test shall be conducted prior to backfill and shall conform to the test procedures described in ASTM C1244. The second vacuum test shall be performed after backfill and in accordance with the manufacturer's recommendations.

2. Exfiltration testing, if specified for concrete sewer manholes, shall conform to the test procedures in ASTM C969.

(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.

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

[(8)](7) Inverted Siphons. Inverted siphons *[should]* **shall** have not less than two (2) barrels, with a minimum pipe size of six inches (6") (15 cm). *[and]* **They** shall be provided with necessary appurtenances for **maintenance,** convenient flushing, and *[maintenance; the manholes]* **cleaning equipment. The inlet and discharge structures** shall have adequate clearances for *[rodding; and in general,]* **cleaning equipment, inspection, and flushing. Design shall provide** sufficient head *[shall be provided]* and **appropriate** pipe sizes *[selected]* to secure velocities of at least *[3.0]* **three** feet (3') per second (0.9*[2]* m/s) for **design** average flows. The inlet and outlet details shall be arranged so that the *[normal]* **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.

*[(9)]***(8)** Sewers in Relation to Streams.

(A) Location of Sewers *[on]* **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. *[o]*One foot (1') (0.3 m) of cover is required where the sewer is located in rock;

B. *[t]*Three feet (3') (0.9 m) of cover is required in other material. *[(i]***In** major streams, more than three feet (3') (0.9 m) of cover may be required*[)]*;

C. *[i]***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 *[the]* future *[improvements]* **modifications** to the stream channel. *[Reasons]* **Justification** for requesting less cover *[should]* **shall** be *[given in the project proposal]* **provided to the department**.

2. Horizontal location. Sewers *[located]* along streams shall be located **sufficiently** outside *[of]* the stream bed *[and sufficiently removed therefrom to provide for future possible stream widening and]* 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 *[so]* located *[that]* **so** they do not interfere with the free discharge of flood flows of the stream*[s]*.

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 *[cast- or]* ductile-iron pipe with mechanical joints; *[or shall be so]* otherwise, **they shall be** constructed *[that]* **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** *[to]* 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. *[and e]***E**xposed areas shall not remain unprotected for more than seven (7) days.

*[(10)]***(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.

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

(A) *[Water Supply Interconnections.]* **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 would permit the passage of any *[sewage]* **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.

1. While no general statement can be made to cover all conditions, it is *[generally]* recognized that sewers shall meet the requirements of *[10 CSR 60-2.010]* **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 waterworks 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 *[agency]* **department** may allow deviation on a case-by-case basis, if supported by data from the design engineer. *[This]* **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 *[that]* **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, both the water main and 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) (1034 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. *[When]* **Where** a water main crosses under a sewer, adequate structural support shall be provided for the sewer to *[prevent damage to the water main.]* **maintain line and grade.**

B. When it is impossible to obtain proper horizontal and 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 the sewer line may be encased 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.

[3. Special conditions. When it is impossible to obtain proper horizontal and vertical separation as stipulated previously, the sewer shall be designed and constructed equal to water pipe and shall be pressure tested to assure watertightness prior to backfilling.]

AUTHORITY: section 644.026, RSMo [Supp. 1993] 2000. Original rule filed Aug. 10, 1978, effective March 11, 1979. Amended: Filed May 17, 1994, effective Dec. 30, 1994. Amended: Filed June 28, 2011.

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, Water Protection Program, Emily Carpenter, PO Box 176, Jefferson City, MO 65102 or hand-delivered to the Lewis and Clark State Office Building, 1101 Riverside Drive, Jefferson City, Missouri. Comments may be sent with name and address through email to emily.carpenter@dnr.mo.gov. Public comments must be received by September 14, 2011. The Missouri Clean Water Commission will hold a public hearing on this proposed rule at 9:00 a.m., September 7, 2011, at the Lewis and Clark State Office Building, La Charrette & Nightingale Creek Conference Room, 1101 Riverside Drive, Jefferson City, Missouri 65102.

Title 10—DEPARTMENT OF NATURAL RESOURCES
Division 40—Land Reclamation Commission
Chapter 5—Prohibitions and Limitations on Mining in Certain Areas and Areas Unsuitable for Mining

PROPOSED AMENDMENT

10 CSR 40-5.010 Prohibitions and Limitations on Mining in Certain Areas. The commission is amending sections (1), (2), and (3) and adding new sections (4), (5), (6), and (7).

PURPOSE: This proposed amendment is designed to offer increased opportunity for proof of valid existing rights and defines in great detail what the company must prove and how the regulatory authority must decide whether or not the rights asserted are, in fact, valid.

(1) Definitions. For the purposes of this chapter—

(A) Valid existing rights means—

[1. Except for haul roads—

A. Those property rights in existence on August 3, 1977 that were created by a legally binding conveyance, lease, deed, contract or other document legally binding under Missouri statutes and Missouri case law entitling one to surface mine coal in this state; and

B. The person proposing to conduct surface coal mining operations on these lands either—

(I) Had on or before August 3, 1977 been validly issued or made a good faith effort to obtain all state and federal permits necessary to conduct surface coal mining operations on those lands; or

(II) Can demonstrate to the commission or director that the coal is both needed for, and immediately adjacent to, an on-going surface coal mining operation for which all permits were obtained prior to August 3, 1977;

2. For haul roads—

A. A recorded right-of-way, recorded easement or a permit for a coal haul road recorded as of August 3, 1977; or

B. Any other road in existence as of August 3, 1977;

3. That interpretation of the terms of the document relied upon to establish valid existing rights shall be based upon the usage and custom at the time and place where it came into existence and upon a showing by the applicant that the parties to the document actually contemplated a right to conduct the same underground or surface mining activities for which the applicant claims a valid existing right; and

4. Not the mere expectation of a right to conduct surface coal mining operations or the right to conduct underground coal mining. Examples of rights which alone do not constitute valid existing rights include, but are not limited to, coal exploration permits or licenses, applications or bids for leases, or where a person has only applied for a state or federal permit;]

1. A set of circumstances under which a person may, subject to regulatory authority approval, conduct surface coal mining operations on lands where section 444.890.4, RSMo, and this rule, would otherwise prohibit such operations. Possession of valid existing rights only confers an exception from the prohibitions of section 444.890.4, RSMo, and this rule. A person seeking to exercise valid existing rights must comply with all other pertinent requirements of the law and 10 CSR 40-3–10 CSR 40-8.

2. Property rights demonstration. Except as provided in paragraph (1)(A)4. of this definition, a person claiming valid existing rights must demonstrate that a legally binding conveyance, lease, deed, contract, or other document vests that person, or a predecessor in interest, with the right to conduct the